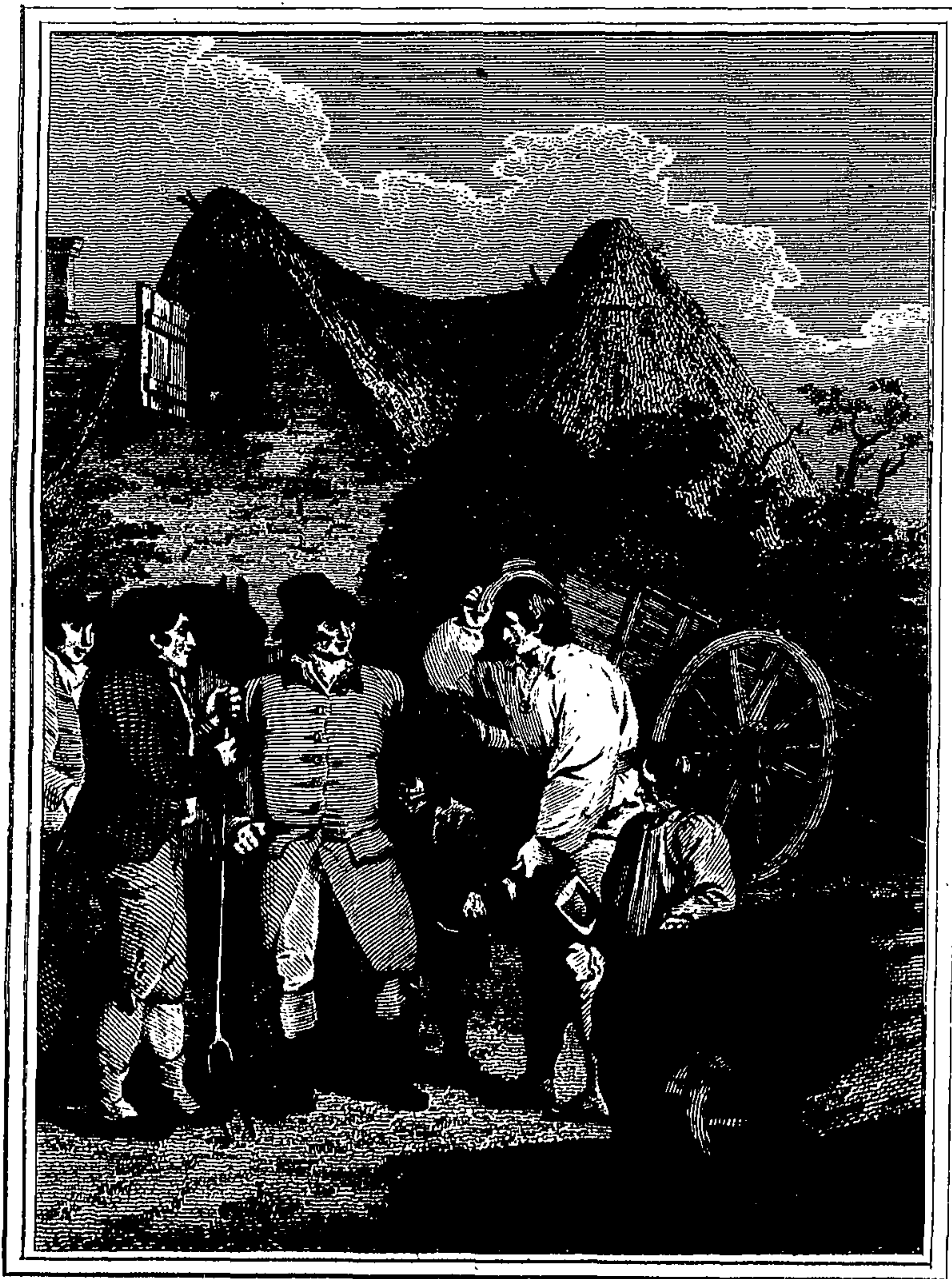


J. R. C. V. T. T. P. 1868.



A FARM-YARD.

E. Dictionaries.

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T H E

COMPLETE FARMER:

OR, A GENERAL

DICTIONARY OF HUSBANDRY

IN ALL ITS BRANCHES;

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By A SOCIETY of GENTLEMEN,

MEMBERS OF THE SOCIETY FOR THE ENCOURAGEMENT OF ARTS, MANUFACTURES, AND COMMERCE.

L O N D O N,

PRINTED FOR T. LONGMAN, B. LAW, G. G. J. AND J. ROBINSON, T. CADELL, R. BALDWIN, W. OTTRIDGE,
AND W. LOWNDES.

ADVERTISEMENT.

HUSBANDRY is, with great justice, placed at the head of human arts, as having a very great advantage over all others, both with regard to antiquity and usefulness. It had its birth with the world, and has always been the genuine source of solid wealth, and real treasures; for it will furnish a people with every thing necessary to render life happy and desirable, form the principal revenues of the state, and even supply the defect of all others, when they happen.

It is therefore no wonder that the wisest princes, and the most able ministers, among the ancients, made it their principal study to encourage and improve the Art of Husbandry; they well knew that the strength of a state should not be estimated by the extent of its territories, but by the number of its inhabitants, and the utility of their labours. And it should be remembered, that some of the most noble consuls and dictators among the ancient Romans were taken from the Plough, and that the senators of that flourishing people spent the greater part of their time in the country, where they tilled their fields with their own hands. “In those happy times, says Pliny, the earth, pleased at seeing herself cultivated by the hands of triumphant victors, seemed to make stronger efforts, and to produce her fruit in greater abundance.” Doubtless because they applied themselves to the task with greater attention, and took the wisest precautions to render their labours successful: for when men of genius and abilities apply themselves to any art, they soon make great improvements, and advance it to a much higher degree of perfection: while the common people, by servilely confining themselves to the common mode of practice, seldom make any farther progress in their profession.

But when destructive luxury was introduced among the old Romans, Husbandry declined, and has never since reached the honourable station it before possessed: owing in a great measure, to an opinion founded on falsehood, namely, that the practice of Husbandry requires neither study, reflection, nor precepts; and is therefore beneath the notice of men of fortune and genius. The ancients, however, thought very differently: they were persuaded, that, in order to cultivate lands to advantage, it was necessary to study the works of those who had written on this subject, and to add the experience of others to their own. This opinion is now happily established; and the Study of Husbandry pursued with such assiduity in different parts of Europe, by persons of rank and fortune, that an amazing number of the most important discoveries have been lately made in that useful and necessary branch of knowledge.

But these useful Discoveries and Improvements are scattered through a multitude of volumes, written in different languages, and published in different countries; so that they can only be known to those who have abilities to purchase, and leisure sufficient to peruse so great a variety of books.

A D V E R T I S E M E N T.

The authors of this undertaking were therefore persuaded, that a Work, containing the Precepts relating to the Theory and Practice of every Branch of Husbandry, delivered in the plainest and most intelligent manner, and enriched with the Discoveries hitherto made in any part of Europe, would greatly tend to promote the Interest of their country. Filled with this pleasing Idea, they cheerfully undertook the laborious task; and have accordingly collected in this Dictionary all the valuable Precepts, Observations, Discoveries, and Improvements, contained in the writings of *Linnaeus, Barck, Tarello, Dubamel, Chateauvieux, De Lisle*, the Marquis of *Turbilly, Fitz-Herbert, Hartlib, Platt, Evelyn, Houghton, Worlidge, Stillingfleet, Mortimer, Tull, Ellis, Miller, Hale, Lisle, Roque, Mills, Young, Marshall*, and several other Authors; together with those published by the Societies of *Berne, Lyons, Tours, Paris, Rouen, Dublin, Edinburgh, London, &c. &c.*

And they hope that this Attempt to give a COMPLETE SYSTEM of every branch of Husbandry, and to blend in One Work the various Discoveries made in different Nations, deserves the most serious Encouragement. They also hope that the pains they have taken to insert every thing belonging to the same subject in one article, and to range the whole in alphabetical order, will be approved of by the Public, as it evidently tends to facilitate the Study of Husbandry, by enabling the Reader to find, with the greatest ease and expedition, whatever subject he may be desirous of considering.

The great number of COPPER-PLATES with which this work is illustrated, must also prove a very valuable addition, and render it far superior to any single Treatise of this kind ever yet offered to the world; as it is impossible to convey an adequate idea of the various instruments, lately invented or improved, for facilitating the practice of Husbandry, without the assistance of accurate drawings. This has, however, rendered the work far more expensive: but being determined to make it as complete as possible, they have spared nothing in their power to succeed; as the great success works of this kind have met with from the generous Public, and of which they hope to partake, in proportion to the merit of the production.

GENERAL DICTIONARY

OF

HUSBANDRY.

A B E

A B O

ABELE-TREE, a species of poplar, growing naturally in all the temperate parts of Europe, and called by botanists *populus foliis lobatis dentatis subus tomentosis*.

The leaves of the abele-tree are large, and divided into three, four, or five lobes, which are indented on their edges, of a very dark colour on their upper side, but very white and downy on their under, standing upon foot-stalks about an inch long. The young branches have a purple bark; and are covered with a white down; but the bark of the stem and older branch is grey. In the beginning of April, the male flowers or catkins appear, which are cylindrical, scaly, and about three inches long; about a week after come out the female flowers, or catkins, which have no stamina like those of the male. Soon after these come out, the male catkins fall off, and in five or six weeks after, the female flowers will have ripe seeds inclosed in a hairy covering; then the catkins will drop, and the seeds will be wafted by the winds a great distance. This tree is often confounded with the white poplar; but they are in reality distinct species.

The abele-tree may be propagated either by layers or cuttings, which will readily take root, or by suckers, which they send up from their roots in great plenty. The best time for transplanting these suckers is in October, when their leaves begin to decay. These may be placed in a nursery for two or three years to get strength before they are planted out where they are designed to remain; but if they are propagated from cuttings, it is better to defer the work till February, at which time truncheons of two or three feet long should be thrust about a foot and a half into the ground. These will readily take root, and, if the soil, in which they are planted, be moist, will arrive to a considerable bulk in a few years.

A considerable advantage may be made by planting these trees upon boggy soils, where few other trees will thrive. Many such places there are in England, which do not at present bring in much money to their owners; whereas, if they were planted with these trees, they would in a very few years, be of more value than the ground, clear of all expences; but there are many persons, who think nothing, except corn, worth cultivating in England; or, if they plant timber, it must be oak, ash, or elm; and if their land be not proper for either of these, it is considered as of little value: whereas, if the nature of the soil was examined, and proper sorts of plants adapted to it, there might be very great advantages made of several large tracts of land, which at this time lie neglected.

The wood of the abele-tree is very good for floors, where it will last many years, and for its exceeding whiteness is, by many persons, preferred to oak; but being of a soft nature, is very subject to take the impressions of nails, &c. which renders it less proper for this purpose. It is also very good for wainscoting rooms, being less subject to swell or shrink

than most other woods; but for turnery-ware there is no wood equal to this for its exceeding whiteness. So that trays, bowls, and many other utensils are made of it; the bellows-makers also prefer it for their use, as do also the shoe-makers for heels of shoes; it is likewise very good to make light carts, and the poles are very proper to support hops, vines, &c. and the lopping will afford good fuel, which in many countries is much wanted. *Miller's Dict.*

The abele-tree is very proper for planting where you desire a speedy shelter and walks, it often making shoots of eighteen or twenty feet long in a year. *Mortimer's Husbandry.*

ABLAQUEATION, the removing the earth, and laying bare the roots of fruit trees in winter, that they may be the more readily exposed to the influence of rains, snow, air, &c. an operation formerly thought necessary for their future welfare; but experience has shewn it to be a dangerous practice, especially where the trees are much exposed to the winds, particularly the south-west, which are generally the most violent. The practice of ablaqueation is therefore with very good reason laid aside in the present practice.

ABORTIVE CORN, a distemper of corn mentioned by Mr. Tillet, in a Dissertation which gained the prize at the academy of Bourdeaux.

This distemper, says that ingenious naturalist, shews itself long before harvest, when the stalk is not above eighteen inches high; and may be known by a deformity of the stalk, the leaves, the ear, and even the grain.

The stem of abortive corn is generally shorter than that of other plants of the same age; it is crooked, knotted, and ricketty; the leaves are commonly of a bluish green colour, curled up in various forms; sometimes turned like wafer cakes, and often rolled in a spiral form. The ears have very little of their natural form; they are lean, withered, and shew very imperfect rudiments, either of the chaff or grain.

All these symptoms are however only to be found in plants that are in the height of the distemper. The stalks are often pretty strait, the leaves but little curled, and the chaff tolerably well formed; but instead of enclosing a small embryo, white and soft at the summit, it contains only a green kernel terminating in a point, not unlike a young pea when forming in its pod.

These abortive kernels have two or three points very visible; they are then fashioned as if two or three kernels were joined together at the base. When these kernels are ripe, or rather when they are dried up, they grow black, and so greatly resemble the seeds of cockle, that husbandmen, who are not acquainted with this distemper, often confound abortive wheat with the seeds of that weed.

This distemper, Mr. Tillet suspects to be occasioned by insects; for he perceived on the sickly plants small drops of a very limpid liquor, which he judged to be extravasated sap.

ACORNS, the fruit of the oak, and too well known to need any description. See **OAK**.

Acorns are said to have been the primitive food of mankind; but at present they are principally used in fattening hogs, for which they are very proper.

Mr. Marshall, in his *Rural Economy of Gloucestershire*, says, that acorns in the vale of Berkeley are in high esteem. The farmers there seem to be as anxious about their acorns as their apples. They consider them as the best of fattening. They think the acorns make the bacon firm, and cause it to weigh better than bean-fed bacon. How various are opinions in different countries! The price of acorns there is 1s. and 6d. to 2s. per bushel, according to the season; and according to the price of beans. But few are sold. Every farmer collects his own, or tends his pigs upon them. Acorns in the year 1783 were unusually plenty, when several trees had branches broken down with them; and many bent down like apple or pear trees under their load.

Some care is, however, necessary to be taken when hogs are fed upon acorns, for otherwise they will be subject to a distemper called the garget. To prevent which, the best way is to moisten some pease or beans with water, and sprinkle over it some antimony pounded and sifted; if this be repeated every other day for a fortnight or three weeks, it will effectually preserve them from the disorder. Or if the acorns be collected and prepared in the following manner, they may be given to hogs without any danger.

Dig a hole in the ground in a warm place, large enough to contain several bushels of acorns; in this let the acorns be put, and well moistened with water, in which a handful or two of common salt has been dissolved: in a few days they will begin to heat and spire: observe them therefore attentively, and when they have made a shoot about three inches long, take them out of the hole, and spread them to dry on a barn floor, and in a day or two they will be fit to be given to the hogs. This matter must, however, be managed with care and caution; they must not have too many given at a time; at first twice a day is often enough to feed them for a day or two; afterwards three times a day. Nor should they, while they eat this food, be confined to a sty, but suffered to run at large; for if their liberty be too much abridged, they will never thrive well, or grow fat on acorns.

It is no uncommon thing in Hertfordshire, with the management above directed, and the assistance of a little wash, and a few grains now and then, for a farmer to kill several hogs in a season, which shall weigh from eight to ten score, and sometimes even more.

These hogs make very good meat, but it is not so fine as when the hogs are taken up, and four or five bushels of pease or barley meal given to each, to complete their fattening before they are killed. *Museum Rusticum*, Vol. I. p. 475.

The method of planting acorns by some is to raise plants by making a hole to receive the acorn in an oblique direction, so as to raise up a tongue of turf, under which the acorn is to be deposited, where it will require no kind of nursing. In about thirty years the spat will be fit to be coppiced, that is, partially cut down as underwood, leaving the most healthy plants. The weeding may be sold for railing, and will fetch a good price. Mr. Marshall says that a piece of ground somewhat more than four acres, in Warwickshire, planted about 1730, has already paid its owner upwards of 400%. and the timber, is still too thick; some of them are worth twenty to twenty-five shillings a tree, from 40 to 50 feet high, and from 6 to 10 inches timber girth. The soil is an hungry clay, worth about 7s. or 8s. an acre; the clay continuing a considerable depth.

Acorns might be dibbled in by women. Indeed they are frequently scattered over some grounds, two or three within a square yard, by some unaccountable manner if not by rooks or wood-pigeons, and trodden into the ground by cattle. They may be sown broad cast, when the surface is moist, and rolled in with a light roller. On examination, after the plants appear, the acorns remain as perfect as they could be the day they were dropt, notwithstanding some of the seedling plants may be six inches high, and their roots not less than a foot long. From the manner in which the acorns adhere to the plant, which is by two tough ligaments growing out of the two lobes of the acorn, the roots appear to have struck first, and the stem to have afterwards shot up from it. They may be sown about the middle of November, set out by a land chain, a quarter of

a rod asunder, and six inches apart in the rows; dibbling them in zigzag, alternately on either side, a line stretched tightly on the surface, with blunt-pointed dibbles, letting a little mould fall down to the bottoms of the holes, to prevent water lodging round the acorns, burying them about two inches beneath the surface. Each square rod planted this way takes 132 acorns, nearly the contents of a pint when they are middle sized. A pint a rod is equal to two statute bushels and half on an acre. The expence of planting acorns in this way is about 5s. an acre.

ACRE, a superficial measure of land, containing, according to the statute, one hundred and sixty square poles or perches, of sixteen feet and a half long.

But this measure does not prevail in all parts of England; for though one hundred and sixty square poles or perches, are allowed to be an acre, yet the length of the pole varies in different counties, and is generally called customary measure.

Thus the customary perch in Staffordshire is twenty-four feet. In the forest of Sherwood twenty-one. In Herefordshire the perch of walling is sixteen feet and a half; but a perch for digging twenty-one feet.

Old farmers also estimate the acre of land by the proportion of seed used in sowing it; by which means it must vary in proportion to the fertility or barrenness of the soil; and hence in many counties of England they have two sorts of acres, distinguished by seed acres and statute acres.

The French acre, or arpent, according to Mr. Greaves's calculation, consists of 100 perches of twenty-two feet each, amounting to 48,400 square French feet, which are equal to 51,691 square English feet, or very near one acre, and three quarters of a rood, English measure.

The Irish acre is to the English, as 196 to 121. For the number of poles in each are the same; but the Irish pole is twenty-one feet, whereas the English contains only sixteen feet and a half: and the Welch acre is equal to two English statute-acres.

ACREME, a quantity of land consisting of ten acres.

ADDER'S-TONGUE, a weed growing in low moist meadows, where it is commonly hid among the grass.

From a very low stalk arises a single, thick, smooth oblong leaf, from the bottom of which issues a kind of tongue, ending in a point, and indented on each side like a file.

ADDER-STUNG, is said of cattle when stung by adders, or bit by a hedge-hog; to remedy which use an ointment made of dragon's blood with a little barley meal and the white of an egg.

AFTERMATH, the second crop, or grass which springs up after mowing, or the grass cut after the corn.

In the neighbourhood of London, the aftermath when made into hay, is of considerable value: but in haying this crop, so as to make it sell well, great nicety is requisite; the nature of the aftermath-grass being more soft, spongy, and porous, than the first growth, and therefore more liable to be hurt by rains. See **HAY**.

Mr. Marshall, in his *Rural Economy of the Midland Counties*, commends their management of aftergrass, as in general judicious. It is generally suffered to get up to a full bite before it be broken: not turned in upon, as soon as the hay is off, nor suffered to stand until much of it be wasted.

If we examine the remaining herbage of ground recently mown, we find it consist, either of the stubs and root-leaves of plants which have run up to seed, or of weak underling plants which have not been able to cope with their more powerful neighbours, or of late flowering plants.

The quality of the first is, of course, injured by age, and by the strength of the root having been spent on the upper leaves, fructifications, and seeds. That of the second cannot be good: they are in a similar predicament to grass growing under a hedge, or in a wood, checked in their growth, and shaded from the sun. And the last partakes, in some degree, of the same disadvantages; though, of the three classes, they probably contain the most nourishment.

Two of the ablest rural economists of these kingdoms, (one in Lancashire, the other in Leicestershire) make a point of saving autumnal grass for spring-feed; and they assert that it is the most certain, and on the whole the best spring-feed at present known. The forwardest ought to be broken sufficiently early to be eaten, without waste, before winter set in; and the latest, that is to say, the shortest, should be shut up for spring-feed. If aftergrass be too long and grossly it is apt to lodge, and rot upon the ground in winter; therefore on rich land it ought to be more or less

less fed before Michaelmas ; and then, of a due length, be shut up for the winter.

Mr. Young, in his *Annals of Agriculture*, says, that he found, from repeated experiments, that this old grass feeds the sheep, that give milk, better than turnips, which are more adapted to dry or fatten stock. He further says, that this grass holds to a period, if wanted when most other resources fail, the last half of April, and the first half of May ; periods always of want and difficulty, where rye grass is not sown. Mr. Marshall says, that as a certain and wholesome supply of food for ewes and lambs in early spring, this preserved pasture is depended upon as the sheet-anchor ; in preference to turnips, cabbages, or any other species whatever of what is termed spring-feed.

AGE of a horse. This is easily known by his mouth, till he comes eight, after which the usual marks wear out. A horse, like many other brute animals, has his teeth divided into three ranks, viz. his fore-teeth, which are flat and smooth, his tusks, and his back-teeth. His back-teeth, or jaw-teeth, are called his grinders, being those by which a horse chews and grinds his provender, and are twenty-four in number, twelve above, and twelve below : they are strong double teeth with sharp edges ; but when a horse grows old they wear much smoother.

The first that grows are his foal teeth, which begin to appear a few months after he is foaled : they are twelve in number, six above, and six below ; and are easily distinguished from the teeth that come afterwards, by their smallness and whiteness, not unlike the foreteeth of a man.

When the colt is about two years and a half old, he casts the four middlemost of his foal-teeth, viz. two above and two below ; but some do not cast any of their foal teeth, till they are near three years old. The new teeth are easily distinguished from the foal teeth, being much stronger, and always twice their size, and are called the nippers or gatherers, being those by which a horse nips off the grass, when he is feeding abroad in the fields, or, in the house, gathers his hay from the rack. When a horse has got these four teeth complete, he is reckoned three years old.

When he is about three and a half, or in the spring before he is four years old, he casts out four more of his foal teeth, viz. two above, and two below, one on each side the nippers, or middle teeth : so that when you look into a horse's mouth, and see the two middle teeth full grown, and none of the foal teeth, except the common teeth remaining, you may conclude he is four that year, about April or May. Some indeed are later colts, but that makes little alteration in the mouth.

The tusks appear near the same time with the four last mentioned teeth, sometimes sooner than these, and sometimes not till after a horse is full four years old : they are curved like the tusks of other beasts, only in a young horse they have a sharp edge all round the top, and on both sides, the inside being somewhat grooved and flattish, inclined to a hollowness.

When a horse's tusks do not appear for some time after the foal teeth are cast out, and the new ones come in their room, it is generally owing to their foal teeth having been pulled out before their time, by the breeders or other dealers in horses, to make a colt of three years old appear like one of four, that he may be the more saleable ; for when any of the foal teeth have been pulled out, the others soon come in their places ; but the tusks having none that go before them can never make their appearance till their proper time, viz. when a horse is about four, or coming four ; and therefore one of the surest marks to know a four year old horse, is by his tusks, which are then very small, and sharp on the top and edges.

When a horse comes five, or rather in the spring before he is five, the corner teeth begin to appear, and at first but just equal with the gums, being filled with flesh in the middle. The tusks are also by this time grown to a more distinct size, though not very large : they likewise continue rough and sharp on the top and edges. But the corner teeth are now most to be remarked ; they differ from the middle teeth in being more fleshy on the inside, and the gums generally look rawish upon their first shooting out, whereas the others do not appear discoloured. The middle teeth arrive at their full growth in less than three weeks, but the corner teeth grow leisurely, and are seldom much above the gums till a horse is full five : they differ also from the other fore-teeth in this, that they somewhat resemble a shell ; and thence are called the shell teeth, because they environ the flesh in the middle half way round ; and as they grow,

the flesh within disappears, leaving a distinct hollowiness and openness on the inside. When a horse is full five, these teeth are generally about the thickness of a crown piece above the gums. From five to five and a half they will grow about a quarter of an inch high, or more ; and when a horse is full six, they will be near half an inch, and in some large horses a full half inch above the gums.

The corner teeth in the upper jaw fall out before those in the under, so that the upper corner teeth are seen before those below ; on the contrary the tusks in the under gums come out before those in the upper.

When a horse is full six years old, the hollowiness on the inside begins visibly to fill up and that which was at first fleshy grows into a brownish spot, not unlike the eye of a dried garden bean, and continues so till he is seven ; with this difference only, that the tooth is more filled up, and the mark, or spot, becomes faint, and of a lighter colour. At eight the mark in most horses is quite worn out, though some retain the vestiges of it a long time ; and those who have not had a good deal of experience, may sometimes be deceived by taking a horse of nine or ten years old for one of eight. It is at this time only, when a horse is past mark, that one can easily err in knowing the age of a horse ; for what practices are used to make a very young horse or colt appear older than he is, by pulling out the foal teeth before their time may be discovered by feeling along the edges where the tusks grow, for they may be felt in the gums before the corner teeth are put forth ; whereas, if the corner teeth come in some months before the tusks rise in the gums, we may reasonably suspect that the foal teeth have been pulled out at three years old.

It will perhaps, be needless to mention the tricks that are used to make a false mark in a horse's mouth, by hollowing the tooth with a graver, and burning a mark with a small hot iron ; because those who are acquainted with the true marks, will easily discover the cheat by the size and colour of the teeth, by the roundness and bluntness of the tusks, by the colour of the false mark, which is generally blacker, and more impressed than the true mark, and by many other visible tokens, which denote the advanced age of a horse.

After the horse has passed his eighth year, and sometimes at seven, nothing certain can be known by the mouth. It must, however, be remembered, that some horses have but indifferent mouths when they are young, and soon lose their mark ; others have their mouths good for a long time, their teeth being white, even, and regular, till they are sixteen years old and upwards, together with many other marks of freshness and vigour ; but when a horse comes to be very old, it may be discovered by several indications, the constant attendants of age, viz. his gums wear away insensibly, leaving his teeth long and naked at their roots : the teeth also grow yellow, and sometimes brownish. The bars of the mouth, which in a young horse are always fleshy, and form so many distinct ridges, are, in an old horse, lean, dry, and smooth, with little or no rising. The eye-pits in a young horse (except those come of old stallions) are generally filled up with flesh, look plump and smooth ; whereas in an old horse, they are sunk and hollow, and make him look ghastly, and with a melancholy aspect. There are also other marks which discover a horse to be very old, viz. grey horses turn white, and many of them all over flea-bitten, except their joints. This, however, happens sometimes later, and sometimes sooner, according to the variety of colour and constitution. Black horses are apt to grow grey over their eye-brows, and very often over a good part of their face, especially those who have a star or blaze fringed round with grey when they are young. All horses, when very old, sink more or less in their backs, and some horses, that are naturally long backed, grow so hollow with age, that it is scarce possible to fit them with a saddle. Of this kind are several Spanish and Barbary horses, and many of the Danish and Flanders breed. Their joints also grow stiff with old age, and their knees and hocks bend so, that they are apt to trip and stumble upon the least descent, though the way be smooth, and no ways rugged. After which they can be of little use to the owner. *Gibson on Horses.*

AGE of neat cattle, viz. the ox, cow, and bull. The age of these animals is known by the teeth and horns. At the end of ten months they shed their first fore-teeth, which are replaced by others, larger, but not so white ; and in three years all the incisive teeth are renewed. These teeth are at first equal, long, and pretty white ; but as the creatures advance in years, they wear, become unequal, and black. They

They also shed their horns at the end of three years; and these also are replaced by other horns, which, like the second teeth, continue. The manner of the growth of these horns is not uniform, nor the shooting of them equal. The first year, that is the fourth year of the creature's age, two small pointed horns make their appearance, neatly formed, smooth, and towards the head terminated by a kind of button. The following year this button moves from the head, being impelled by a horny cylinder, which lengthening in the same manner, is also terminated by another button, and so on: for the horns continue growing as long as the creature lives. These buttons become annular joints, which are easily distinguished in the horn, and by which the age of the creature may be easily known; counting three years for the point of the horn, and one for each of the joints. *Buffon's Histoire Naturelle, tom. IV.*

AGE of sheep. These animals in their second year have two broad teeth; in their third year they have four broad teeth before; in their fourth year six broad teeth, and in their fifth year eight broad teeth. After which none can tell how old a sheep is while their teeth remain, except by being worn down. *Ellis on Sheep.*

At the end of one year, rams, sheep, and weathers, lose the two fore-teeth of the lower jaw; and they are known to want the incisive teeth in the upper-jaw. At eighteen months the two teeth joining to the former, also fall out; and at three years, being all replaced, they are even and pretty white. But as the creature advances in age, they become loose, blunt, and afterwards black. The age of the ram, and all horned sheep, may also be known by their horns, which shew themselves in their very first year, and often at the birth, and continue to grow a ring annually to the last period of the creature's life. *Buffon's Histoire Naturelle, tom. V.*

AGE of goats. The age of goats is known by the same tokens as those of the sheep, viz. by their teeth, and the annular rings on their horns.

AGRICULTURE, the art of tilling, manuring, and cultivating the earth, in order to render it fertile.

This art claims the precedence of all others in point of antiquity, it having been the sole employment of our first parents in the delightful garden of Eden.

Adam instructed his children in this necessary art, both by precept and example; and we are told by the sacred historian, that Cain applied himself to husbandry, while Abel led the life of a shepherd, and contented himself with feeding his flocks.

After the deluge the descendants of Noah carried with them the art of husbandry, and established it in the various countries where they settled. It was, however, very simple in these early ages, and its advances towards perfection slow and almost imperceptible.

Abraham and the rest of the patriarchs, who had no fixed residence, applied themselves to a pastoral life, enobling, by their example, a profession, which has now for many ages lost its original dignity, from its being practised only by the meaner sort of people. But as soon as their descendants were fixed in Palestine, they all became husbandmen, from the chief of the tribe of Judah, to the lowest branch of the family of Benjamin: birth at that time made no distinction, and agriculture was considered as a very honourable employment.

The Chaldeans, who inhabited the countries where agriculture had its birth, carried that valuable art to a considerable degree of perfection; they cultivated their lands with great assiduity, and enjoyed the pleasing satisfaction of receiving from their fields a very plentiful harvest. The Egyptians, who from the fertility of their country, caused by the annual overflowings of the Nile, raised prodigious quantities of corn, were so sensible of the blessings resulting from agriculture, that they ascribed the invention of it to Osiris; and even carried their superstitious gratitude so far, as to worship those animals that laboured in tilling the ground.

The Phœnicians, so well known in the sacred writings by the name of Philistines, were also famous for their skill in agriculture; but finding themselves too much confined in their native country by the conquests of the Israelites, they spread themselves through the greater part of the islands of the Mediterranean, and carried with them their knowledge in husbandry.

The Carthaginians followed the taste of their ancestors, and applied themselves assiduously to the study of agricul-

ture. Mago, their famous general, wrote no less than twenty-eight books on that subject, and which Columella tells us were translated into Latin by an express decree of the Roman senate. Servius adds, that Virgil used these books as a model when he wrote his *Georgics*.

The ancients tell us, that the goddess Ceres was born in Sicily, where she invented the art of sowing corn, and the tillage of land. The meaning of this fable is very evident; that island was very fruitful in corn, and agriculture was there esteemed so honourable an employment, that even their kings did not disdain to practise it with their own hands.

But time, which at first gave birth to arts, often caused them also to be forgotten, when they were removed from the place of their origin. The children of Noah, who settled in Europe, doubtless carried with them the knowledge of agriculture; but their descendants, who took possession of Greece, were such a savage race, that they fed on herbs, after the manner of beasts. Pelasgus taught them the culture of the oak, and the use of acorns as food, for which divine honours were paid him.

The Athenians, who were the first that received any tincture of politeness, taught the use of corn to the rest of the Greeks; they also taught them the manner of cultivating the ground, and preparing it for seed. The Greeks soon perceived that bread was more wholesome, and its taste more delicate than acorns; and accordingly thanked the gods for such an unexpected and beneficial present. After this the Athenian kings thinking it more glorious to govern a small state wisely, than to aggrandize themselves by foreign conquests, withdrew their subjects from war, and employed them solely in cultivating the earth. This constant application carried agriculture to a considerable degree of perfection, and soon reduced it into an art.

Hesiod, who is generally thought to have been contemporary with Homer, was the first among the Greeks who wrote on this subject. He calls his poem "Works and Days;" because agriculture requires exact observations of times and seasons.

The other eminent Greek writers upon agriculture, are Democritus of Abdera, Socraticus, Xenophon, Tarentinus, Architas, Aristotle, and Theophrastus, from whom the art received considerable improvements; as also from Hieron, Epicharmus, Philometer, and Attalus.

The old Romans esteemed agriculture so honourable an employment, that in the earliest times of the republic, the highest praise that could be given a man, was to say of him, that he cultivated well his own spot of ground. The most illustrious senators applied themselves to this profession; nor had they either splendor or majesty, but when they appeared in public. And their greatest generals, at their return from the toils of war, from taking of cities, and subduing of nations, were impatient till they were again employed in cultivating their lands, and thought it no disgrace to follow the plough, though they were at the same time prepared to serve the wants of the republic, attend her councils, or put themselves at the head of her armies.

It must indeed be allowed, that when the Romans became tainted with the luxury of Asia, they gradually lost the noble simplicity of their ancestors, and employed their slaves in the severer labours of a country life. But though they did not themselves hold the plough, yet even men of consular dignity looked upon it as a reward for their public services, when they obtained leave to retire into the country, and were equally respected when overlooking their farms, as when seated in the chair of magistracy. M. Cato, the Censor, that illustrious Roman general, orator, politician, and lawyer, after having governed provinces, and subdued nations, did not think it below his station to write a large treatise on agriculture.

This work, according to Servius, was dedicated to his own son, and was the first Latin treatise on that subject. This work, has been handed down to us in all its purity, in the same manner as Cato wrote it. Varro composed a treatise on the same subject, and on a more regular plan. This work is embellished with all the Greek and Latin erudition of that learned author.—Agriculture also received great improvements from the two Salsernæ, and likewise from Scorsus, Tremellius, and M. Terentius. Virgil has adorned it with the language of the muses, and given it majesty by his verse. He has finely embellished the precepts of husbandry left by Hesiod and Mago.

Columella, who flourished in the reign of the emperor Claudius,

Claudius, wrote twelve books on husbandry. He was a native of Bœtica in Spain, and had devoted his time to the study of husbandry.

From this time till the reign of Constantine IV. husbandry continued in a declining state, when that wise emperor caused a large collection of the most useful precepts relating to agriculture to be extracted from the best writers, and published under the title of *Geoponics*.—Some say he made this collection with his own hand. Nor is this at all improbable, as it is well known, that after he had conquered the Saracens and Arabians, he not only practised, but studied the arts of peace, fixing his chief attention on the advancement of husbandry.

But from the time of Constantine IV. till about the year 1478, agriculture lay in a kind of dormant state, when Crescenzi published an excellent performance on agriculture at Florence. He was soon followed by several of his countrymen, among whom Tatti, Stefano, Augustino Gallo, Sanfovino, Lâuro, and Tarello, deserve particular honour.

In the mean time Fitz-Herbert, judge of the Common Pleas, shone with unrivalled lustre in the practical parts of husbandry. He published two treatises on this subject; the first, which was entitled, *The Book of Husbandry*, appeared in 1534, and the second, called, *The Book of Surveying and Improvements*, in 1539.

Fitz-Herbert's books of agriculture soon raised a spirit of emulation in his countrymen, and many treatises of the same kind successively appeared; but time has deprived us of many of those writings, or at least they are become so very scarce, as only to be found in the libraries of the curious.

About the year 1600, France made some considerable efforts to revive husbandry, as appears from several large works, particularly *Les Moyens de devenir Riche*, and the *Cosmopolite*, by Barnard de Palissy, a poor potter; *Le Theatre d'Agriculture*, by de Serres; *L'Agriculture & Maison Rustique*, by Messrs. Etienne and Liebault, &c.

The Flemings, about the same period, dealt more in the practice of husbandry, than in publishing books on the subject; so that their attention doubtless was to carry on a private lucrative trade, without instructing their neighbours: and hence it happened, that whoever was desirous of copying their method of agriculture, was obliged to travel into their country, and make his own remarks. The principal, and indeed just, idea of husbandry consisted in this, namely, to make a farm resemble a garden as near as possible. Such an excellent principle at first setting out, led them of course to undertake the culture of small estates only, which they kept free from weeds, continually turning the ground, and manuring it plentifully and judiciously.

When they had by this method brought the soil to a proper degree of cleanliness, health, and sweetness, they ventured chiefly upon the culture of the more delicate grasses, as the surest means of acquiring wealth in husbandry upon a small estate, without the expence of keeping many draught horses or servants.

A few years experience was abundantly sufficient to convince them, that ten acres of the best vegetables for feeding cattle, properly cultivated, would maintain a larger stock of grazing animals, than forty acres of common farm grass. They also found that the best vegetables for this purpose were lucern, saintfoin, trefoil of most denominations, sweet fenugreek, buck and cow-wheat, field turnips, and spurrey.

The political secret of their husbandry, therefore, consisted in letting farms on improvement. They also discovered eight or ten new sorts of manure. They were the first among the moderns who ploughed-in living crops for the sake of fertilising the earth, and confined their sheep, at night, in large sheds built on purpose, whose floors were covered with sand or virgin earth, &c. which the shepherd carted away every morning to the compost dunghill.

Our fatal domestic wars, during the reign of Charles I. changed the instruments of husbandry into martial weapons; but after the death of that unfortunate monarch, artful and avaricious men crept into the confiscated estates of the nobility, gentry, and clergy; and as many of these new encroachers had risen from the plough, so they returned with pleasure to their old profession, being chiefly animated by the love of gain. Plattes, Hartlib, Blythe, and others, seized this favourable disposition of the common people, and encouraged it by writings, which have since had few equals; nor was Cromwell wanting to lend his assistance.

Sir Hugh Platt was one of the most ingenious husbandmen of the age in which he lived; yet so great was his modesty, that all his works, except his *Paradise of Flora*, seem to be posthumous. He held a correspondence with all the lovers of agriculture and gardening in England; and such was the justice and modesty of his temper, that he always named the author of every discovery communicated to him. Perhaps no man, in any age, discovered, or, at least, brought into use, so many new sorts of manure. Witness his account of the compost and covered dunghill, and his observations on the fertilising qualities lodged in salt, street-dirt, and the fullage of streets in great cities, clay, fuller's-earth, moorish earth, dung-hills made in layers, fern, hair, calcination of all vegetables, malt-dust, willow-tree earth, soap-boiler's ashes, marle, and broken pilchards.

Gabriel Plattes may be esteemed an original genius in husbandry. He began his observations in the time of queen Elizabeth, and continued them through the reigns of James I. Charles I. and during the first three or four years of the commonwealth. But notwithstanding the great merit of this writer, the public suffered him to starve and perish in the streets of London; nor had he a shirt upon his back when he died.

Samuel Hartlib, a celebrated writer on husbandry in the last century, was highly beloved and esteemed by Milton, and other great men of that time. In his preface to a work commonly called his *Legacy*, he laments that no public director of husbandry was established in England by authority; and that we had not adopted the Flemish method of letting farms upon improvement. This remark of Hartlib procured him a pension of one hundred pounds a year from Cromwell; and the writer afterwards, the better to fulfil the intention of his benefactor, procured Dr. Beati's excellent annotation on the *Legacy*, with other valuable pieces from his numerous correspondents.

About the time when this author flourished seems to have been an æra when the English husbandry rose to great perfection; for the preceding wars had made the country gentry poor, and, in consequence thereof, industrious. They found the cultivation of their own lands to be the most profitable post they could occupy. But a few years after, when the Restoration took place, all this industry and knowledge were exchanged for dissipation and heedlessness; and then husbandry passed almost entirely into the hands of farmers.

The famous work attributed to Hartlib, and called the *Legacy*, was only drawn up at Hartlib's request; and, after passing through his correction and revision, was published by him. The real author of this treatise was R. Child. It consists of one general answer to the following question, namely, "What are the actual defects and omissions, as also the possible improvements, in English husbandry?"

Several other pieces on husbandry followed the publication of the *Legacy*, and greatly improved that necessary and useful art.

The first writer that inspired his countrymen with a desire of reviving the study of agriculture after the Restoration, was Evelyn; who, being followed by the famous Tull, opened a new sphere for the minds of mankind to range in; and since this period several valuable improvements have been made in the English husbandry, by a great variety of authors.

Ireland, about the middle of the last century, began to make no inconsiderable figure in the art of husbandry. It must, indeed, be confessed that Ireland had very strong prejudices in behalf of a very wretched method of agriculture, till about the middle of the last century, when Blythe opened the eyes of that people by his incomparable writings. Since which a certain spirit of improvement has, more or less, been promoted and carried on with great zeal and constancy by the nobility, clergy, and gentry of that kingdom. In proof of which it will be sufficient to observe, that the transactions of the Dublin society for encouraging husbandry, are now cited by all foreigners in the *Memoirs* relating to that subject.

After the peace of Aix-la-Chapelle, almost all the nations of Europe, by a sort of tacit consent, applied themselves to the study of agriculture; and continued to do so, more or less, amidst the universal confusion that soon succeeded. The French found, by repeated experience, that they could never maintain a long war, or procure a tolerable peace, without they raised corn enough to support themselves in such a manner as they should not be obliged to submit to harsh terms on the one hand, or perish by famine on the other. Their king, therefore, thought proper to give public encourage-

encouragement to agriculture, and has even been present at the making of several experiments. The great and rich, of various ranks and stations, followed this example, and the very ladies put in for their share of fame in this commendable undertaking. Even during the hurry and distresses of the last war, some attention was paid to agriculture. Prize questions were then proposed annually in rural academies, particularly at the two academies of Lyons and Bourdeaux. And many alterations were made by the society for improving agriculture in Britany.

Since the conclusion of the peace, matters have been carried on with great vigour. The university of Amiens has made various proposals to the public for the advancement of husbandry; while the marquis de Tourbilly, a writer who proceeds chiefly on experience, has the principal direction of a Georgical society, lately established at Tours.

The society of Rouen also deserves our notice; the archbishop of the diocese is one of the members.

We shall only add on this subject, that there are at present societies existing in France, established by royal approbation, for the promoting of agriculture; and these thirteen societies have nineteen co-operating societies belonging to them, whenever it happened that a district was too large to be effectually taken care of by one society.

The art of agriculture is, at present, publicly taught both in the Swedish, Danish, and German universities, where the professors may render effectual service to their respective countries, if they understand the practical as well as the speculative parts, and can converse to as much advantage with the farmer and peasant, as with Virgil and Columella.

Nor has Italy been inactive. The Neapolitans of the present age have condescended to return back to the first rudiments of revived husbandry, and begun to study afresh the agriculture of Crescenzo, first published in the year 1478. The people of Bergamo have pursued the same track, and given the world a new edition of the *Ricardo d'Agricoltura di Tarello*, which was originally published at Mantua in 1577.

The duchy of Tuscany has imbibed the same spirit. A private gentleman left his whole fortune to endow an academy of agriculture. Even Ferrara, a small territory in the papal dominions, has contributed its just contingent, and made some laudable attempts in husbandry.

Animated with a desire that the people, under his government should excel in husbandry, his Sardinian majesty sent subjects to learn the practice of foreign countries, and made several attempts to establish a better method of agriculture among his subjects.

In Poland, where a natural fertility of soil seems to dispense with the necessity of calling in improvements, Mr. de Bieleuski, grand-marshal of the crown, made abundance of successful attempts to introduce the new husbandry among his countrymen, and procured the best instruments for that purpose from France and other parts of Europe.

The Hollanders give little attention to agriculture, if we except one single collateral instance, namely, the draining of fens and morasses; and even that has proceeded more from the motive of self-preservation, than any particular turn towards husbandry.

In the year 1759, a society established itself at Berne, in Switzerland, for the advancement of agriculture, and rural oeconomies. That society consists of many ingenious private persons, and also of some of great weight and influence in the republic; most of them men of a true cast for the improvement of husbandry, being enabled to join the practice with the theory. They published several useful pieces, which we have inserted under their proper heads.

We must not omit to mention here, that Linnaeus and his disciples performed great things in the north of Europe, particularly in discovering new, profitable and well-tasted food for cattle. At the same time Sweden has bestowed successful labours on a soil, which was before looked upon as cold, barren, and incapable of melioration; of this the memoirs published at Stockholm will be a lasting monument.

Denmark, as well as many courts in Germany, follow the like example. His Danish majesty encourages, in particular, the woollen manufacture; and the late king sent three persons into Arabia Felix, to make remarks, and bring over such plants and trees as may be useful in husbandry, building, &c.

At the same time the duchy of Wirtemberg, a country

no ways unfavourable to corn and pasturage, has not failed to contribute its assistance towards the improvement of agriculture, having some time ago communicated to the public its oeconomical relations from the press at Stuttgart.

Nor have the learned of Leipzig and Hanover been inattentive to this great art of supporting human kind, and that amidst all the rage and devastations of war; witness the *Journal d'Agriculture*, printed at Leipzig, and the *Recueil d'Hanovre*, printed at that city.

Even Spain, naturally inactive on these occasions, in spite of all the prejudices of a bigoted religion, invited Linnaeus, with the offer of a large pension, to superintend a college, founded for the sake of making new enquiries into the history of nature, and the art of agriculture.

But England alone exceeds all modern nations in husbandry; and there is reason to hope, from the spirit that now animates a great number of the nobility and gentry, that this useful art will, in a few years, be carried to a much greater degree of perfection than it ever yet reached in any age or country. The respectable patriots that form the society established at London, for the encouragement of arts, seem determined to contribute all that lies in their power towards the advancement of agriculture. They have already done much, and there is reason to hope they will do more. A vast variety of different machines for facilitating the practice of agriculture, have been sent them in consequence of their large premiums and bounties. Such munificence and attention to public prosperity may be truly called royal, as it would cast a lustre on the greatest monarch that ever swayed a sceptre. The late institutions of societies in different parts of the kingdom for agriculture, and the professorship of agriculture lately established at Edinburgh, cannot but promote the study, and point out the utility of it. We shall conclude this history, with observing, that the reader will find, under the proper articles, a more minute account of the various improvements that have been lately made in the different parts of Europe.

AGRIMONY, a troublesome perennial plant in pasture grounds. It has generally a single, round, rough stalk, with leaves placed alternately upon it, which are winged with smaller leaves placed between the larger pairs. The yellow flowers grow alternately along the stalk, in a long row, after the manner of a spike, and are succeeded by rough seeds.

AGROSTIS CORNUCOPIA, or new American grass, introduced into England lately. It was first introduced into Georgia, where it continues to flourish; and is found better than any other grass for running amongst the rocks, and standing drought; but its chief excellence is, that not only cattle, horses, and sheep fatten upon it, but every species of poultry are fond of it. It is greatly favourable for making of grass plats, being of a fine texture, and a beautiful verdure in this country throughout the year. The following experiments were made by Mr. Frazer at Chelsea. A few seeds sown Nov. 20, 1788, continued dormant all the winter. The plants made their appearance in the beginning of March. Flowered early in September, when they measured from three to four feet. Each root produced one hundred stems: each stem sending forth branches, some from four to six, others as far as ten or twelve, bearing panicles for seed; each panicle from twelve to eighteen inches long. This shews the multiplication to be infinite. A small quantity was sown March 15, 1789. Seedlings transplanted, by dividing the roots on the 22d of May; began unexpectedly to flower in September, and completed their flowers nearly as early as those sown in November preceding. On the 9th of September, measured two feet five inches. Part of the bed cut close to the ground on the 15th of August, measured, on the 9th of September, from twelve to sixteen inches; and on the 10th of October twenty-two inches. The sward much thicker than what had not been cut down. It then began to flower, from 100 to 200 panicles on each root.

Having cleaned a cask of seed accidentally about the middle of April following, in a little hard gravelly court, about a month afterwards, to my surprise, I found the grass coming up very thick; and it has continued in as flourishing a state as any I have sown in the garden.

Apprehending that the success in the gravelly court was chiefly owing to the seeds not being buried in the ground, on the 15th of May I took a four-inch board, and laid out with it four drills twenty feet long, pressing down the board in the drills so as to render the surface smooth and hard. I then took a gill of the seed and mixed it with a



Agrostis Cornucopiae or
new American grass

peck of mould and foot, and sowed it in the drills, without any other covering. A very fine crop was the consequence. On the 10th of October, it measured twenty-two inches high, and contained plants sufficient to occupy half an acre. Same day sowed four rows in the manner of mustard and cresses, about half an inch deep in the ground, covering it with mould. No plants came up.

From these experiments I concluded, that the proper management of this grass is, that the ground should be in extremely fine tilth, well cleaned, harrowed, and rolled with a heavy roller, before the seed is sowed. A quart of seed to be mixed with a bushel of light earth and foot.

On the 10th of October, I cut down a patch of grass, which had been sowed on the fourth of June. It measured twenty-seven inches. The part so cut down measured, on the first of November, twenty days after it was cut, nine inches. One seedling plant was divided the 22d of May into 200, and which were transplanted out, and cut down the 15th of August, measuring then twenty inches: one of these plants so transplanted was taken up in the presence of a gentleman on the 10th of October, and divided into 201 plants, and planted into a bed; notwithstanding so late in the year, they are flourishing. The above-mentioned seedling has, at this rate, multiplied itself into 4000 plants in five months. It might have been multiplied into double or treble this number, by dividing the joints, as it propagates from them as well as by the root.

The greatest part of the above experiments have been made in a garden, for want of a field to try them in: this, however, is equally conclusive as if it had been in a field, as the garden is a poor gravelly soil.

There is nothing now remains fully to ascertain the great importance of this discovery, but to observe the effects of the winter on it in this country. And as it is now ascertained to be a native of Canada, there can be little doubt that it will not be injured by the frosts in this climate; for the roots strike very deep in the ground; a circumstance which cannot fail to protect it during the severest frost that can happen in winter, as well as the greatest drought in summer.

Mr. Frazer, in Feb. 1790, proceeds to give a farther account of this grass, when he says it looks more like wheat in the month of May, than any thing else I can compare it to; some of the plants sown early in March, measure three feet; one root has produced a hundred stems, from each of which branches, six or seven panicles for seed, some of which panicles measures upwards of eighteen inches long. Part of the above I transplanted the 22d of May, and cut close to the ground the 15th of August, and then measured two feet five inches; that part which was cut is now twenty inches high, and what appears to me extraordinary, there is a shew of about 200 panicles on each root, and forms a thick swarth, and a much finer blade than that which was not cut. On the 10th instant, one of the said roots was taken up in the presence of Mr. Hudson, author of the *Flora Anglica*, which was divided into 201, and was transplanted six inches apart, in order to observe what progress it might make in the course of the winter. See Plate I.

AIR, that thin, dilatable, and compressible body in which we breathe, and which surrounds the earth to a great height.

The air, besides its various other uses, is a principal cause of the vegetation of plants; an instance of which we have from Mr. Ray, in the Philosophical Transactions, of lettuce-seed, that was sown in the glass receiver of the air-pump, which was exhausted, and cleared from all air, which grew not at all in eight days time; whereas some of the same seed, that was sown at the same time in the open air, was risen to the height of an inch and an half in that time; but the air being let into the exhausted receiver, the seed grew up to the height of two or three inches in the space of one week.

Another instance of the usefulness of the air in vegetation, is the sedum, which will push out roots without earth and water, and live for several months: and some sort of aloes, if hung up in a room entirely secured from frosts, will remain fresh for some years, though they will sensibly lose in their weight. Air is capable of penetrating the porous and spongy parts of plants, and being there contracted, of dilating itself again.

The air operates also within the bowels of the earth, and by its subtilty perspiring through the pores, assists in the

rarefaction, of the crudities of the earth, and in the dispelling all superfluous moisture, entering into the very pores and veins of the trees, plants, herbs, &c. carrying along with it those salts contained either in itself, or lodged in the earth: which salts or juices are altered according to the several figures or dimensions of the different strainers or vessels of those several plants which grow upon the same spot of earth, which is so impregnated with these salts: and thence those varieties in taste and smell proceed, notwithstanding they all receive their nourishment from the same stock that is lodged in the earth.

The air also affects the branches, leaves, and flowers of trees, plants, and herbs, entering and perspiring through them, and even through the bark and body of trees: and by the same kind of subtilty it does, by its refreshing breezes, moderate the intenseness of the sun-beams, cooling, clearing, blowing, opening, and extending all the offspring of nature. The air fixes and insinuates its aerial substance into the liquid sap of vegetables: and, as all the agitations in nature proceed from the contrariety of parts inhabiting together, in this aerial and liquid substance, being mixed, cause the agitation and motion in vegetables; or, more properly, set it all into a ferment, whether it be in the roots, or in the stem; and it rises by co-operation of the sun, which is the third agent in vegetation, up to the top of a tree, &c. as liquids rise by fire to the top of the containing vessel.

The air, we find, produces a vibratory motion in several bodies; and, particularly in plants, the air-vessels thereof perform the office of lungs: for the air contained in them sometimes contracting, and sometimes expanding, according as the heat is increased or diminished, presses the vessels, and eases them again by turns; and thus promotes a circulation of their juices, which could scarce be otherwise effected.

Air, says the learned Dr. Hales, is a fine elastic fluid, with particles of very different natures floating in it, whereby it is admirably fitted by the great author of nature, to be the breath or life of vegetables, as well as animals, without which they can no more live nor thrive than animals can. As a proof of the great quantities of air in vegetables, he refers to the third chapter of his excellent Treatise of Vegetable Statics, where he says, in the experiments on vines, the great quantities of air was visible, which was continually ascending through the sap into the tubes: which manifestly shews what plenty of it is taken in by vegetables; and is perspired off with the sap through the leaves.

He adds several experiments, as to an apple-branch, apricot-branch, birch, and other plants, to prove the same thing.

And Dr. Grew has observed, that the pores are so large in the trunks of some plants, as in the better sort of thick walking canes, that they are visible to a good eye without a glass; but, with a glass, the cane seems as if stuck at top full of holes with great pins, so large as very well to resemble the pores of the skin in the ends of the fingers, and ball of the hand.

In the leaves of pines, they likewise, through a glass, make a very elegant shew, standing almost exactly in rank and file, through the length of the leaves. Whence it may be thought probable, that the air freely enters plants, not only with the principal fund of nourishment by the roots, but also through the surface of their trunks and leaves, especially at night, when they are changed from a perspiring, to a strongly imbibing state.

Dr. Hales likewise tells us, that in all those experiments that he tried to this purpose, he found that the air entered very slowly at the bark of young shoots and branches, but much more freely through old bark; and that in different kinds of trees it had different degrees of more or less free entrance.

And likewise, that there is some air both in an elastic and unelastic state, mixed with the earth (which may well enter the roots with the nourishment) he found by several experiments which he gives in the abovementioned treatise.

The excellent Mr. Boyle, in making many experiments on the air, among other discoveries, found, that a good quantity of air was producible from vegetables, by putting grapes, plums, gooseberries, peas, and several other sorts of fruits and grain, into exhausted and unexhausted receivers, where they continued for several days emitting great quantities of air.

This

This put the curious Dr. Hales upon further researches to find out what proportion of air he could obtain out of the vegetables in which it was lodged and incorporated; and, from a vast variety of curious and accurate experiments, concludes, that air abounds in vegetable substances, and bears a considerable part in them: and, that if all parts of matter were only endowed with a strongly attracting power all nature would then become one unactive cohering lump.

Wherefore it was absolutely necessary, in order to the actuating this vast mass of attracting matter, that there should be every where mixed with it a due proportion of strongly repelling elastic particles, which might enliven the whole mass, by the incessant action between them and the attracting particles.

And since these elastic particles are continually in great abundance reduced by the power of the strong attractors, from an elastic to a fixed state, it was therefore necessary that these particles should be endued with a property of resuming their elastic state, whenever they were disengaged from that mass in which they were fixed, that thereby this beautiful frame of things might be maintained in a continual round of the production and dissolution of vegetable as well as animal bodies.

The air is very instrumental in the production and growth of vegetables, both by invigorating their several juices, while in an elastic active state, and also by greatly contributing, in a fixed state, to the union and firm connection of the several constituent parts of those bodies, viz. their water, fire, salt, and earth.

To conclude, by reason of those properties of the air before-mentioned, it is very serviceable to vegetables, in that it collects up and breaks open the clouds, those treasures of rain, which nourish the vegetable tribe.

The air also helps to waft or disperse those foggy humid vapours which arise from the soil, and would otherwise stagnate and poison the whole face of the earth.

The air, by the assistance of the sun, assumes and sublimates those vapours into the upper regions; and these foggy humid vapours are, by this sublimation, and the coercive power of the air and sun, rarefied, and made again useful in vegetation.

On the contrary, the air, which in so many ways is subservient to vegetables, is also, upon some accounts, injurious and pernicious to them; not only to the ligneous, herbageous, and flowery parts above, but also to the roots and fibres below the earth: for as the air penetrates deep into the soil, it is natural to conclude, that a dry, husky, scorching air, may be very prejudicial to the tender fibres of new planted vegetables.

ALDER-TREE, the name of a tree very common in most parts of England. It hath male and female flowers, which are produced at remote distances on the same plant; the male flowers are digested into a long juli or catkin, which is loose, imbricated, and cylindrical. The female flowers are collected into a conical scaly head, and are succeeded by scaly cones.

These trees delight in a moist soil, where few other trees will thrive; they are propagated either by layers, or planting of truncheons about three feet in length. The best time for this is in February, or the beginning of March; these should be sharpened at one end, and the ground loosened with an instrument before they are thrust into it; lest, by the stiffness of the soil, the bark should be torn off, which may occasion their miscarriage. These truncheons should be thrust into the earth two feet at least, to prevent their being blown out of the ground by strong winds, after they have made stout shoots. The plantations should be cleared from all such weeds as grow tall, otherwise they will overbear the young shoots; but when they have made good heads, they will keep down the weeds, and will require no further care.

If you raise them by laying down the branches, it must be performed in October; and by the October following, they will have taken root sufficient to be transplanted out; which must be done by digging a hole, and loosening the earth in the place where each plant is to stand, planting the young trees at least a foot and a half deep, cutting off the top to about nine inches above the surface, which will occasion them to shoot out many branches.

The distance these trees should be placed, if designed for a coppice, is six feet square; and if the small lateral shoots are taken off in the spring, it will very much strengthen your upright poles, provided you leave a few small shoots at distances upon the body thereof, to detain the sap for the encrease of its bulk.

These trees may be also planted by the side of brooks, as is usual for willows, where they will thrive exceedingly, and may be cut for poles every fifth or sixth year. This wood is in great request with the turners, and will endure a long time under ground; or to be laid in water. *Miller's Gard. Dict.*

Alder makes an extraordinary fence against rivers and streams, and preserves the banks from being undermined by the water; because it is always sending suckers from the lowest roots, which makes it very useful, where streams wear away the banks, and are widening their course. *Mortimer's Husbandry.*

Alder has one peculiar and beneficial property, namely, that no beast will crop it, be it young or old, which saves the great charge of fencing it after planting. *Ellis's Timber Tree improved.*

Mr. Marshall, in his Rural Economy of Norfolk, says, the alder is observed to make the ground it grows on still more boggy; and therefore ought for two reasons never to be planted; namely, the injury to the land; and its own trifling value. He again says, it is a great nuisance in meadows, and not only encumbers the spot it grows on, but is allowed on all hands to render moory soils still more rotten. It is a vile inhabitant even in the neighbourhood of a meadow; for its seeds being blown about by the wind, are trodden by cattle into the soil, where, springing up among the herbage, embitter the grass and render it unpalatable to the stock.

ALLEY, in the new husbandry, implies the vacant space between the outermost row of corn on one bed, and the nearest row to it on the next parallel bed. *See BED.*

The practice of the new husbandry has already sufficiently shewn, that too narrow alleys would hardly answer any of the ends for which they are intended; and, on the other hand, the making them too wide is a loss of ground. About four feet, exclusive of the spaces or partitions between the rows of corn in the beds, is a good middling breadth.

It is not indeed necessary to make the alleys quite so wide in good soils: an intelligent husbandman will easily judge what breadth is most proper. But what greatly merits the attention of every one, and ought never to be lost sight of, is, that wide alleys are more easily and much better stirred than those which are narrower: for when an alley is wide, the large furrow in the middle of it may be cut deep, there being then sufficient room to turn the earth over towards the rows; while, on the other hand, the earth, in too narrow alleys, cannot be stirred deep enough, nor can room be found for what is turned over out of the furrows, without danger of burying great part of the rows.

We will, therefore, suppose the general breadth of the alleys to be about four feet; but the whole of that breadth is not to be ploughed or stirred, either with the plough or cultivator, as soon as the field is sown. Neither of these instruments ought to go too near the rows of corn, for fear of rooting up the plants; but a slip of earth about six inches wide should be left untouched on the outside of each bed; by which means the part of the alley that is to be stirred, will be reduced to the breadth of three feet; and even that is lessened in the first ploughing before winter by a deep furrow which is then cut close to, and all along those six inch slips, and the earth taken out of each furrow is thrown into the great furrow in the middle of the alley, which it serves to fill and arch up. These two side furrows make together a breadth of about eighteen inches, and consequently leave, in the middle of the alley, a breadth of about eighteen inches more, on which is heaped up the earth thrown out of the two furrows: and thus the alleys remain all the winter.

The first hoeing in the spring should turn the earth, heaped up in the middle of the alleys, back towards the rows of corn. The two furrows that were opened before winter are then filled up, and a new one is cut in the middle of the alley.

To perform the first hoeing with the common plough, which may be very easily done, two turns of that instrument will be requisite, namely, one on each side of the alley, as near as possible to the beds. But as these two turns will not be always sufficient to form the furrow perfectly, a great deal of earth frequently remaining between it and the bed, a third turn of the plough becomes often necessary; and sometimes a fourth, to hollow the middle furrow as it ought to be.

If this work be performed with the cultivator with two mould-boards, the instrument must be placed in the middle of the alley, and the horses in one of the two furrows. The share

share will easily enter a great depth into the earth, which was laid there by the last hoeing before winter: and as the horses advance, that great ridge of earth will be divided into two parts, which will be turned over into, and fill up the furrows that were made before winter, on each side of the alley, close to the beds. See the article CULTIVATOR.

Thus the great furrow in the middle of the alley will be opened, and the whole operation performed by one turn of the cultivator. The earth thus turned over will be thoroughly stirred, and so much time and labour will be saved by this method, that the farmer may easily afford one or two stirrings more in the summer, which will always be of great service. *M. de Chateaufieux.*

Wheat, in the new husbandry, is usually cultivated upon ridges of about four feet nine inches broad, and upon these ridges are drilled two rows of wheat, ten inches asunder, the distance therefore between these double rows is near four feet; this distance, which *M. de Chateaufieux* here calls the alleys, was, by *Mr. Tull*, called the intervals, and the distances of the two rows of wheat upon the ridges he called partitions.

He at first made his ridges six feet broad, and drilled three or four rows upon each ridge; but upon further experience he found, that two rows upon a ridge of four feet nine inches broad, produced better crops than three or four rows upon six feet ridges, and he recommends these double rows to those who would cultivate wheat with the hoe-plough.

It is likewise observable, that though in his early practice of horse-hoeing wheat, he was cautious of bringing the hoe-plough very near the rows, he found afterwards that there was no danger in hoeing close on the rows of corn, but, on the contrary, the crop was much improved by it, and that the plough in hoeing the earth from the rows, could not be brought too close to them, unless it tore out any of the plants, inasmuch, that he says he could bring the plough within about an inch of the rows when the earth was in right temper for it.

The reason that *M. de Chateaufieux* directs, as above, that the hoe-plough should not come close to the rows by six inches, was because he had not then seen *Mr. Tull's* last Improvements upon the Hoeing Culture, which was not published till several years after the first parts of the horse-hoeing husbandry was translated into French.

The first horse-hoeing of the wheat is performed in the beginning of winter, and the earth is ploughed away from the rows into the intervals, which forms small ridges in the middle between the double rows. The second hoeing is in the spring, which turns the back to the rows. The third hoeing is from the rows after the wheat has blossomed; this turns the earth into the intervals, forming small ridges there as at the first hoeing. The fourth hoeing returns the earth to the ridges, which is performed a month or more after the third hoeing: this commonly finishes the horse-hoeings if the land is in good heart, otherwise one or two more hoeings are necessary. The double mould board plough is useful to clear the furrows, and lay all the earth up in ridges after the last hoeing, but no cultivators should be substituted in room of the hoe-plough.

ALMOND-TREE, is generally cultivated in gardens for the beauty of its flowers. These often appear in February, when the spring is forward; but if frost comes on after the flowers appear, their beauty will be of short duration, and in those seasons few almonds are produced; whereas when the trees do not flower till late in March, they seldom fail to bear plenty of fruit; many of which will be very sweet, and fit for the table when green, but they will not keep long.

Almond trees are propagated by inoculating a bud of these trees into a plum, almond, or peach-stock, in the month of July. The next spring, when the buds shoot, you may train them up, either for standards, or suffer them to grow for half standards, according to your own fancy.

The best season for transplanting these trees, if for dry ground, is in October, as soon as the leaves begin to decay; but for a wet soil, February is much preferable: observe always to bud upon plum-stocks for wet grounds, and on almond or peach-stocks for dry. *Miller's Gard. Diet.*

AMBERVALIA, a ceremony practised by the ancient Romans, in order to procure from the gods a happy harvest.

This ceremony consisted of a procession in which the victims were conducted thrice round the corn fields before

they were sacrificed. Twelve priests walked at the head of the procession, which consisted of all the neighbouring inhabitants, every one being crowned with leaves of oak, and singing hymns in honour of Ceres, the goddess of corn.

AMBLE, a peculiar kind of pace, wherein a horse's two legs of the same side move at the same time.

In this pace the horse's legs move nearer the ground than in the walk, and, at the same time, are more extended: but what is most singular in it is, that the two legs of the same side, for instance, the off hind and fore-leg, move at the same time; and then the two near legs, in making another step, move at once; the motion being performed in this alternate manner, so that the two sides are alternately without support, or any equilibrium between the one and the other, which must necessarily prove very fatiguing to the horse, being obliged to support himself in a forced oscillation, by the rapidity of a motion, in which his feet are scarcely off the ground. For if in the amble he lifted his feet as in the trot, or even in a walk, the oscillation would be such, that he could not avoid falling on his side, and it is only by keeping his feet very near the ground, and by the quick alternate motion that he supports himself in this pace, in which the hind leg is not only to move at the same time with the fore-leg of the same side, but also to gain on it, or touch the ground a foot, or a foot and a half, beyond the spot where the latter grounded. The further the hind-leg extends beyond the place where the fore-leg grounded, the better the horse ambles, and the whole motion is proportionally faster. Thus the whole difference between the amble and the trot consists in this, that the two legs moving together in the latter are in a diagonal position, whereas, in the former, the two legs of the same side move together.

This pace, which is very fatiguing to the horse, is very easy to the rider. It has not the roughness of the trot, which is caused by the resistance of the fore-leg, at the lifting up of the hind; because, in the amble, this fore-leg is lifted up at the same time with the hind-leg of the same side; whereas, in the trot, the fore-leg of the same side is at rest, and resists the impulse during the whole time that the hind leg is in motion.

They who are skilled in horsemanship tell us, that horses which naturally amble, never trot, and that they are a great deal weaker than others. Colts, indeed, very often move in this manner, especially when they exert themselves, and are not strong enough to trot or gallop. Most good horses, which have been over-worked, and on the decline, are also observed voluntarily to amble, when forced to a motion swifter than a walk.

The amble may, therefore, be considered as a defective pace, not being common, and natural only to a very few horses, which, in general, are weaker than others. Add to this, that such amblers as seem the strongest, are spoiled sooner than those which trot or gallop. *Buffon's Histoire Naturel, tom. IV.*

There are various methods of discipline for bringing a young horse to amble: some chuse to toil him in his foot pace through new ploughed fields, which naturally inures him to the stroke required in the amble; but this disorderly toil is very apt to weaken, and sometimes to lame a young horse. Others attempt it by stopping him in a gallop, or trot; so that by losing both, he necessarily stumbles on an amble; but this is apt to spoil a good mouth and rein, and exposes the horse to the danger of an hoof reach, or sinew strain, by over-reaching, &c.—Some prefer ambling by weights as the best way, and in order to do this, either overload the horse with excessive heavy shoes, or fold thick pieces of lead about the fetlock pasterns, without considering that the former are apt to make him interfere, or strike short with his hind-feet; and that the latter, besides that mischief, expose the horse to incurable strains, crushing of the coronet, breeding of ring-bones, &c. Others load the horse with earth, lead, &c. which often occasion a swaying of the back, overstraining of the fillets, &c. Some endeavour to make him amble in hand, before they mount his back, by means of some wall, smooth pale or rail, and by checking him in the mouth with the bridle-hand, and correcting him with a rod on the hinder hoofs, and under the belly, when he treads false; but this is very apt to spoil a spirited horse, even before he can understand what you would have him do.

The best method seems to consist in trying with your hands, by a gentle and deliberate racking and thrusting of the horse forwards, by helping him in the weak part of his

mouth with your snaffle, which must be smooth, big, and full; and correcting him first on one side, then on the other, with the calves of your legs, and sometimes with a spur. If you can by this means make him fall readily into an amble, though in a shuffling and disorderly manner, much labour will be saved; for that aptness to amble will render the tramel more easy to him, and he will find the motion without stumbling, or being frightened. *See the article TRAMMEL. Bradley's Dict. Rust.*

AMEL-CORN, the same with spelt. *See SPELT.*

AMERICAN GRASS. *See AGROSTIS CORNUCOPRIA.*

ANBURY, a kind of wen, or spongy wart growing on any part of a horse's body. *See the article WEN.*

ANGORA goat. *See the article GOAT.*

ANJOU cabbage-shrub, an excellent vegetable both for the kitchen and the food of cattle, cultivated with great success in several provinces of France; and that ingenious husbandman, the marquis of Turbilly lately sent a parcel of the seeds to our society for the encouragement of arts, who very readily distributed them to such gentlemen as applied to them for that purpose, in order to their being cultivated here: so that there is reason to hope, that this useful plant will soon become common in England. The following instructions are given by the marquis de Turbilly, for cultivating the Anjou cabbage.

"The great Anjou cabbage is one of the most useful leguminous plants for country people. It will grow in almost any soil, not excepting even the most indifferent, provided it be sufficiently dunged. It is but little known about Paris, and in many other places, where it might be cultivated to great advantage.

"The seeds of this cabbage are commonly sown in June, in a quarter of good mould, in the kitchen garden, and watered from time to time in case of drought. The plants will rise pretty speedily, and should be thinned soon after, wherever they stand too thick. The next care is to keep them free from weeds whilst they continue, by hoeing the ground between them. About the first of November they should be transplanted into the field where they are to remain. They should be planted there in trenchers dug with a spade, pretty deep, that is, they should be buried almost up to the leaves. The distance between them should be two feet, or two feet and a half every way, according to the goodness of the soil. Particular care should be taken never to plant them with a dibble, as gardeners plant other sorts of cabbages. A layer of dung should be spread along the bottom of the trench, and the roots of the transplanted cabbages covered therewith. The mould taken out should then be returned back upon the dung; and as the trench will then no longer hold it all, there will remain a ridge between each row of cabbages.

"Towards the middle of May ensuing, the ground should be well stirred between the plants, with a spade, or some other proper instrument, and its whole surface laid quite level. After this, nothing more remains to be done, except pulling up the weeds, from time to time, as they appear.

"Many husbandmen sow the seeds of these cabbages with those of hemp; and though this may not be so sure as the former, it often succeeds very well, especially in wet years. When the hemp is pulled up, a multitude of little cabbages are seen, and which having then a free air, grow apace. They are transplanted about the first of November in the manner before directed, and are preferred to those of the kitchen garden, because they are not so apt to run up to seed the next spring; an accident which sometimes happens to a few of these cabbages, in certain years; and it then becomes necessary to replace them by others which have not run up, and which are reserved for this purpose in a separate spot of ground.

"Several farmers use a plough to cut the trench for transplanting these cabbages; but then they do not remove them till the spring, leaving them, in the mean time, in the place where they were sown. They afterwards give the earth a stirring with the spade, and lay it smooth towards the end of May, in the manner before directed. Whole fields of these cabbages may be seen on many farms in Anjou and Poitou, and which prove a very useful resource.

"In the month of June, such of these cabbages as are already large, and do not turn in their leaves for cabbaging, but still continue green, begin to be fit for use, and soon arrive at their full perfection, which they retain till the next spring, when they begin to run up, and afterwards

blossom. Their seeds ripen towards the end of July, and what is intended for sowing should then be gathered.

"In Anjou, when these cabbages are entirely run up, they generally grow to the height of seven or eight feet: sometimes they reach to eight feet and a half, or nine feet; nay, some have even been seen of a greater height.

"From the month of June, when these cabbages begin to be fit for use, their leaves are gathered from time to time, and they shoot out again. They are large, excellent food, and so tender that they are dressed with a moment's boiling. They never occasion any flatulencies or uneasiness in the stomach; and are also very good food for cattle, which eat them greedily. They likewise greatly increase the milk of cows.

"Such are the properties of this kind of cabbage, greatly esteemed in Anjou, Poitou, Brittany, Le Maine, and some other neighbouring provinces. In Anjou, farmers are bound by their leases to plant yearly a certain number of these cabbages, and to leave a certain number of them standing when they quit their farms.

"This cabbage forms a kind of shrub, the great utility of which may be gathered from this, that its leaves afford nourishment to men and cattle; and its stalk, which is about the thickness of one's wrist, is used, when dry, for fuel.

"It sometimes happens in extremely severe winters, that some of these cabbages are frozen; and this, in the above provinces, is considered as a very great loss; but that accident is rare, because this kind of cabbage resists frosts better than most others.

"The ground where these cabbages are planted should be fenced in very carefully by hedges or ditches, to preserve it from the depredations of cattle, which are extremely fond of them. With this precaution I have made several plantations of them, near the houses erected in the midst of the heaths and commons I have broken up and improved; and they have succeeded very well, though the soil is but indifferent in many places.

"I have, near my house in Anjou, two well enclosed fields, destined for this sort of plantation. They are planted alternately every year with young cabbages. When these are pulled up, after they have seeded in the second year, at the time already mentioned, the ground where they stood is dug up, and sowed with pease or beans, the crop of which being taken off before the first of November, makes room for planting new cabbages at the proper season. The soil is loosened and enriched by the pease and beans, and by this means the land is never rested; nor is it ever exhausted, because it is dunged whenever the cabbages are planted.

"These cabbages are of such excellent service to me, that I have often wondered at their not being cultivated in all the different countries of Europe. I believe they would succeed every where, and I advise all husbandmen to make plantations of them.

"I wish that this short memoir, founded on my own experience, may contribute to extend the culture of this useful plant."

ANNO TA is an ingredient made use of to colour cheese, a vegetable production brought from America, and brought to England originally for the use of dyers. It is the produce of *Bixa Orellana* of Linnæus. It is described by Miller in its plant and propagation. It is a tall shrub somewhat in resemblance to the lilac. The colouring material is the pulp of the fruit; among which the seeds are bedded, in the same manner as those of the rose in the pulp of the hip. It has been tried as a colouring of cheese in its genuine state, but without success. The preparation in use is made by the druggist, and sold in the shops. In colour and texture it is not unlike well-burnt red brick. The hardest and closest is esteemed the best. The method of using it is thus: a piece of the preparation is rubbed against a hard smooth even-faced pebble or other stone, the pieces being previously wetted with milk to forward the levigation, and to collect the particles as they are loosened. For this purpose a dish of milk is generally placed upon the cheese-ladder; and as the stone becomes loaded with levigated matter the pieces are dipped in the milk from time to time; until the milk in the dish appear (from daily practice) to be sufficiently coloured.

The stone and the "colouring" being washed clean in the milk, it is stirred briskly about in the dish; and, having stood a few minutes for the unsuspended particles of colouring to settle, is returned into the cheese-cowl; pouring it off

off gently, so as to leave any sediment which may have fallen down, in the bottom of the dish: The grounds are then rubbed with the finger on the bottom of the dish, and fresh milk added; until all the finer particles be *suspended*: and in this the skill in colouring principally consists. If any fragments have broken off in the operation, they remain at the bottom of the dish: hence the superiority of a hard closely textured material, which will not break off or crumble in rubbing.

The price of annots is about ten pence an ounce; which will colour about twenty thin cheeses (10 to 12 pounds each). The colouring therefore costs about a halfpenny a cheese.

ANNUAL plants, such as continue one year only: or such as spring up, ripen their seed, and perish in that space of time. Thus wheat, barley, oats, beans, pease, &c. are annual plants.

ANNUAL meadow-grass, called in some parts of England, Suffolk-grass, a species of very beautiful grass, making the finest turfs, and seems particularly well adapted to dairy farms. See Plate I. fig. 1. which represents this grass in its perfection.

"I have, says Mr. Stillingfleet, seen whole fields of it in High-Suffolk, without any mixture of other grasses, and as some of the best salt butter we have in London comes from that country, it is most likely to be the best grass for the dairy." He adds, that he observed, upon Malvern-hill, a walk made there for the convenience of the water drinkers, which was, in many places, covered over with this grass in less than a year, though he could not find a single plant of it besides in any other part of the hill. This was doubtless owing to the frequent treading which has the greatest tendency to make this grass flourish; and therefore it is very evident, that rolling must be very serviceable to it. As the flowers and stems of this plant do not grow brown so soon as those of other grasses, nor cover the radical leaves so much, because they are considerably shorter, this affords a more pleasing turf than any other grass." *Stillingfleet's Miscel. Tracts.*

Mr. Ray observes of the common meadow grass, that it is a slender and succulent plant, very agreeable to cattle, and a fattener of them; that it delights in a rich soil; and that it is not injured by being trodden under foot, and therefore is commonly found along the sides of paths and roads. It spindles and ears in the spring, and continues to shoot during the whole summer. *Ray's History of Plants.*

As plenty of the seeds of this grass might be very easily procured from Suffolk, it might be propagated and cultivated in all parts of England, where the soil and situation are adapted to its growth.

It is indeed amazing, that amidst the great variety of grasses that grow naturally in England, that so few farmers have had any thoughts about improving their meadows and pastures; they seem to take every thing upon trust, imagining, perhaps, that the grass they find growing naturally in their grounds, is much better, and more adapted to the nature of the soil, than any other they could sow, or adopt in its stead.

But this is surely a very narrow way of thinking; and should it be encouraged, would soon put a stop to all improvements in husbandry. We have been too long influenced by custom: it is time for us to shake off our fetters, and rouse ourselves from the deep lethargy which has prevented us from perceiving, or at least from removing the disadvantages of the old husbandry, which in many respects is highly disadvantageous both to the farmer and his country.

ANTICOR, a disease among horses, consisting of a malignant swelling in the breast; which extends sometimes to the very sheath under the belly; and is attended with a fever, great depression and weakness, and a total want of appetite.

The cure should be first attempted by large and repeated bleedings, to abate the inflammation; emollient clysters should be injected twice or thrice a day, with an ounce of sal prunella in each. The swelling should be bathed with marshmallow ointment, and an opening poultice, with onions boiled in it, should be daily applied over it. If by this method continued four or five days, the inflammation in the throat and gullet be removed, the attention should more particularly turn to encourage the swelling on the breast, and bring it, if possible, to matter: let the poultice therefore be continued, and give the horse two ounces of Venice treacle, dissolved in a pint of beer, every night.

When the swelling is grown soft, it must be opened with a knife, and dressed with turpentine digestive; the danger being then over.

But should it be found impracticable to bring the swelling to matter, and the swelling upwards should increase so as to endanger suffocation, authors have advised to pierce the humour with a hot pointed cautery, and dress part with the turpentine digestive; sharpened with a small quantity of Spanish flies and euphorbium in powder; in order to stimulate and promote a greater discharge; at the same time fomenting and bathing the adjacent parts with ointment of marshmallows.

M. Gueriniere, as well as Soleyfel, have advised opening the skin, when the tumour cannot be brought to matter, in order to introduce a piece of black helebore-root steeped in vinegar; and to confine it there for twenty-four hours; this also is intended as a stimulant, and is said to answer the intention, by occasioning sometimes a swelling as big as a man's head. *Bartlett's Farriery.*

ANTS, or *pismires*; are injurious both to pasture lands and gardens; in the former by throwing up hills, and in the latter, by feeding on the fruit, &c.

The method of keeping them from trees is by encompassing the stem with a circle or roll of wool, newly plucked from the sheep's belly, four fingers in breadth; or by laying saw-dust round the tree. The same will be effected when you anoint the tree with tar; but as tar is prejudicial to trees, human ordure, will, perhaps, do better; because if any of it be put into their hills, it will kill them. *Mortimer's Husbandry.*

ANT-hills, the habitations of the ants, consisting of little eminences, composed of small particles of sand, lightly and artfully laid together.

These hills, or habitations of the ants, though very convenient for themselves and their own societies, are very destructive to the farmer, depriving him of as much land as these hills cover; which may be often computed at a tenth part, or more of his valuable grass lands. Nay, in some places, where negligence has suffered them to multiply, almost half of it has been rendered useless: the hills standing as thick together as grass-cocks in hay time: and what is most surprising, this indolence is defended by affirming, that the area or superficies of their land is thereby increased: whereas it is well known, by the industrious, that very little or no grass ever grows thereon; and therefore if the surface be increased, the produce is proportionably decreased. See the article MOLE-HILL.

It has been a custom in many places at the beginning of winter, and often when the weather was not very cold, to dig up the ant-hills, three or four inches below the surface of the ground; and then to cut them in pieces, and scatter the fragments about: but this only disseminates the insects instead of destroying them; they can hide themselves among the roots of the grass for the present; and then collect themselves together again upon any little eminence, of which there are great numbers ready for their purpose, viz. the circular ridges round the hollows, where the hills stood, as is very soon visible to a curious observer. A much better method seems therefore to be pointed out by a writer in the *Museum Rusticum*, vol. vi. namely, to cut off the hills entire, and even with the surface; and to let them lie whole at a little distance, with their bottom upwards: by this means the ants, which are known to be very tenacious of their nests, will continue in their habitations, while the rains, by running into their holes of communication, assisted afterwards by the frosts, which will now sooner penetrate to their dwellings, will destroy them. Perhaps a little soot sown on the places, and washed in with the rains, would have a better effect. The hills when rendered mellow by the frosts, may be broken and dispersed about the land. This method of cutting the hills even with the surface, has one advantage; it leaves the pasture-land even and fit for mowing; and at the same time the little eminences being taken away, the insects are exposed to the wet, which is disagreeable to them.

In wet weather these insects accumulate cavernous heaps of sandy particles among the grass, called by the labourers sprout-hills; which quickly take off the edge of a scythe. These hills, which are very light and compressible, the above writer assures us from experience, may be readily stamped down, by the feet of the hay-makers, and the insects, together with their eggs and earth, easily pounded to a mortar. This should be repeated a second, and perhaps a third time, after the itinerant foragers have returned from their

their quest of food, and have begun to raise new structures near the old demolished habitations.

Mr. Marshall, in his *Rural Economy of Norfolk*, says, that a tenant had leave to cut and burn ant-hills off a dole belonging to his farm upon a common. His motive was his improvement of his farm by the ashes; and his pretext the improvement of the common: both of which he obtained. He levelled the ground and raked in grass-seeds. His process was to cut them up with a heart-shaped sharp spade or shovel, in irregular lumps of ten to fifteen inches diameter, and from two to five or six inches thick. These he turned the grass downward, until the mould-side was thoroughly dry, and then he set up the grass outward until they were dry enough to burn. He kindled the fire with brush-wood and kept it smothering, by laying the sods or lumps on gradually, as the fire broke out, until ten or fifteen or twenty load of ashes were raised in one heap, which the workmen agreed to complete the process for a shilling each load of ashes. Besides the destruction of the ants, this is a cheap way of raising manure; and no man, having such an opportunity in his power, ought to neglect it. On some soils ashes are found in themselves an excellent manure; and, perhaps generally, ashes raised in this way would be found highly advantageous as bottoming for farm-yards and dunghills.

Mr. Young, in his sixteenth volume of the *Annals of Agriculture*, recommends, as a singular experiment, the rolling down ant-hills, instead of cutting them; says he rode over a large pasture which he should not have known had ever been infested with these hills, if he had not been assured that it was once covered with them. No other method was used but repeated rollings, with a very heavy roller.

APHERNOUSLI, or *arkenoufli*, a species of pine, or pinafter, growing wild on the Alps, where one would think it impossible that any tree could vegetate and prosper; and therefore would probably thrive to great advantage on our bleak, barren, rocky, mountainous tracts of land. See Plate I. fig. 2.

The timber is large, and has many uses, especially within doors, or under cover. The branches resemble those of the pitch-trees, commonly called the spruce fir: but the cones are more round in the middle, being of a purplish colour, shaded with black. The bark of the trunk, or bole of the tree, is not reddish like the bark of the pine, but of a whitish cast, like that of the fir. The husk, or sort of shell, which incloses the kernels, is easily cracked, and the kernels are covered with a brown skin, which peels off; they are about as large as a common pea, triangular like buck-wheat, and white and soft as a blanchéd almond, of an oily agreeable taste, but leaving in the mouth that small degree of asperity, which is peculiar to wild fruits, and is not unpleasing. These kernels make a part sometimes in a Swiss desert; they supply the place of mushroom-buttons in ragouts; and are also recommended in consumptive cases, on account of their balsamic oil.

Wainscoting, flooring, and other joiner's work, made with the planks of apherousli, are of a finer grain, and more beautifully variegated than deal, and the smell of the wood is more agreeable. From this tree is extracted a white odoriferous resin.

The apherousli is of a healthy, vigorous nature, and will bear removing when it is young, even in dry warm weather. The wood makes excellent firing in stoves, ovens, and kilns; but is dangerous to be used on the hearth or in grates, being apt to splinter and fly to a considerable distance.

This tree is the *pinus cembra* of Matthioli and Linnæus, the *pinus foliis quinis* in Haller, the *larix semper-virens* in the German Ephemeris, the *libanus carpathius* of some writers, and the *pina cinque feucilles*, N° 20. in Du Hamel. It grows in great abundance on the most mountainous and coldest parts of the Briançonnois, where it is called by the natives *alviez*. It bears some resemblance to the white Canada pine, which is better known in England by the name of Weymouth-pine. *Essays on Husbandry*.

APIARY, a bee-garden, or place where bees are kept. See the article BEES.

APOPLEXY, or, as the farriers generally call it, the *staggers*, a disease to which the horse is subject, and by which the creature drops down suddenly without sense or motion, except a working of his flanks, proceeding from the motion of the heart and lungs, which never cease while any spark of life remains.

The previous symptoms are drowsiness, watery moist eyes,

somewhat full and inflamed, a disposition to reel, feebleness, a bad appetite, and almost continual hanging of the head, or resting it in his manger, sometimes with little or no fever, and scarce any alteration in the dung or urine. When the apoplexy proceeds from water collected in the sinuses and ventricles of the brain, the horse has generally, besides all the foregoing symptoms, a disposition to rear up, and is apt to fall back, when any one goes to handle him about his head. The reason of his falling backwards seems to be obvious, because when the head is raised with his mouth upwards, the water in the ventricles causes a weight upon the cerebellum, or part lying under the brain, and origin of the nerves, so as to deprive the creature of sense and motion at once: this does not, however, prove suddenly mortal. Young horses are most subject to it, and, with proper helps, and good usage, sometimes get over it; but when the apoplexy proceeds from wounds or blows on the head, or from any other cause producing ruptures in the blood-vessels, or from matter collected in the brain, or its membranes; or if any part of the brain or its membranes be indurated, or grown callous, by long continuance, the horse will not only have most of the symptoms already described, but will be frantic by fits, especially after his feeds, so as to start and fly into motion at every thing that comes near him. These cases are extremely dangerous, and seldom admit of a perfect recovery. But when horses fall down suddenly and work violently at their flank, without any ability to rise, even after plentiful bleeding, such horses seldom recover.

All that can be done in such cases is to strike the veins in several places at once, to raise up the horse's head and shoulders, propping them with plenty of straw; and if he survive the fit, to cut several rowels; though in case of ruptured vessels, or if any kind of extraneous matter be lodged in the brain, or its membranes, all these helps will be of little service.

But if the apoplectic fits happen to be only the effect of a plethora, or fulness of blood, from high feeding, and want of sufficient exercise; or if it be the effect of a sily blood, which is often the case of many young horses, that have been fed for sale, or from catching cold while the blood is in this state, the cure will not be attended with any great difficulty, notwithstanding a horse, in these circumstances, may reel and stagger, and sometimes fall down suddenly.

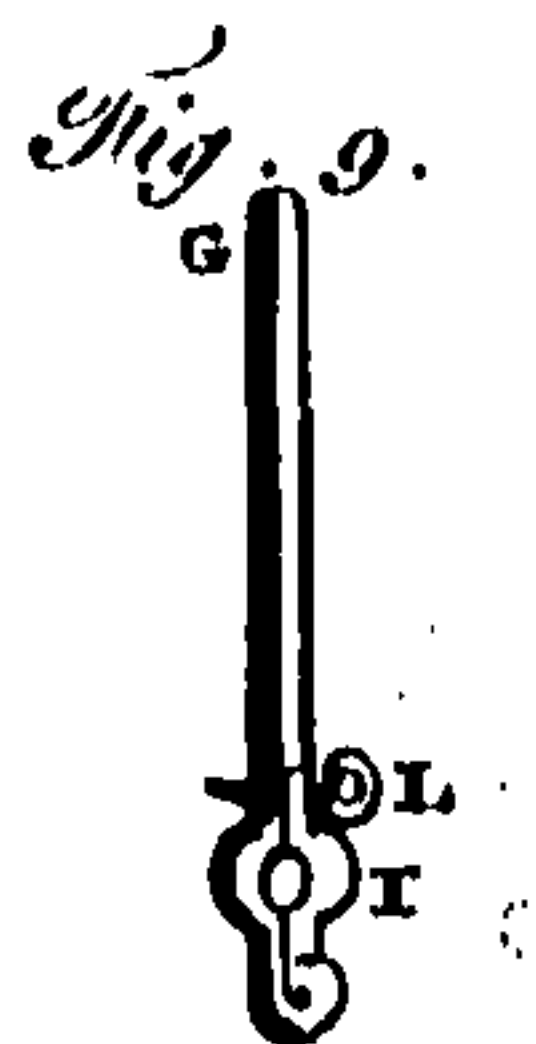
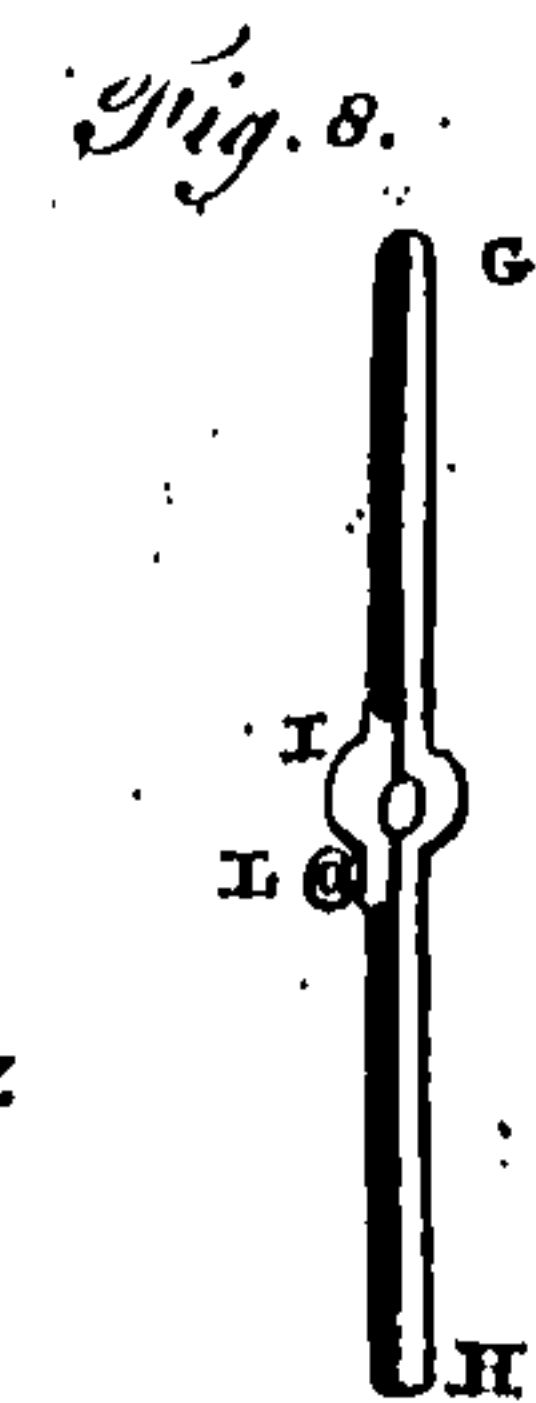
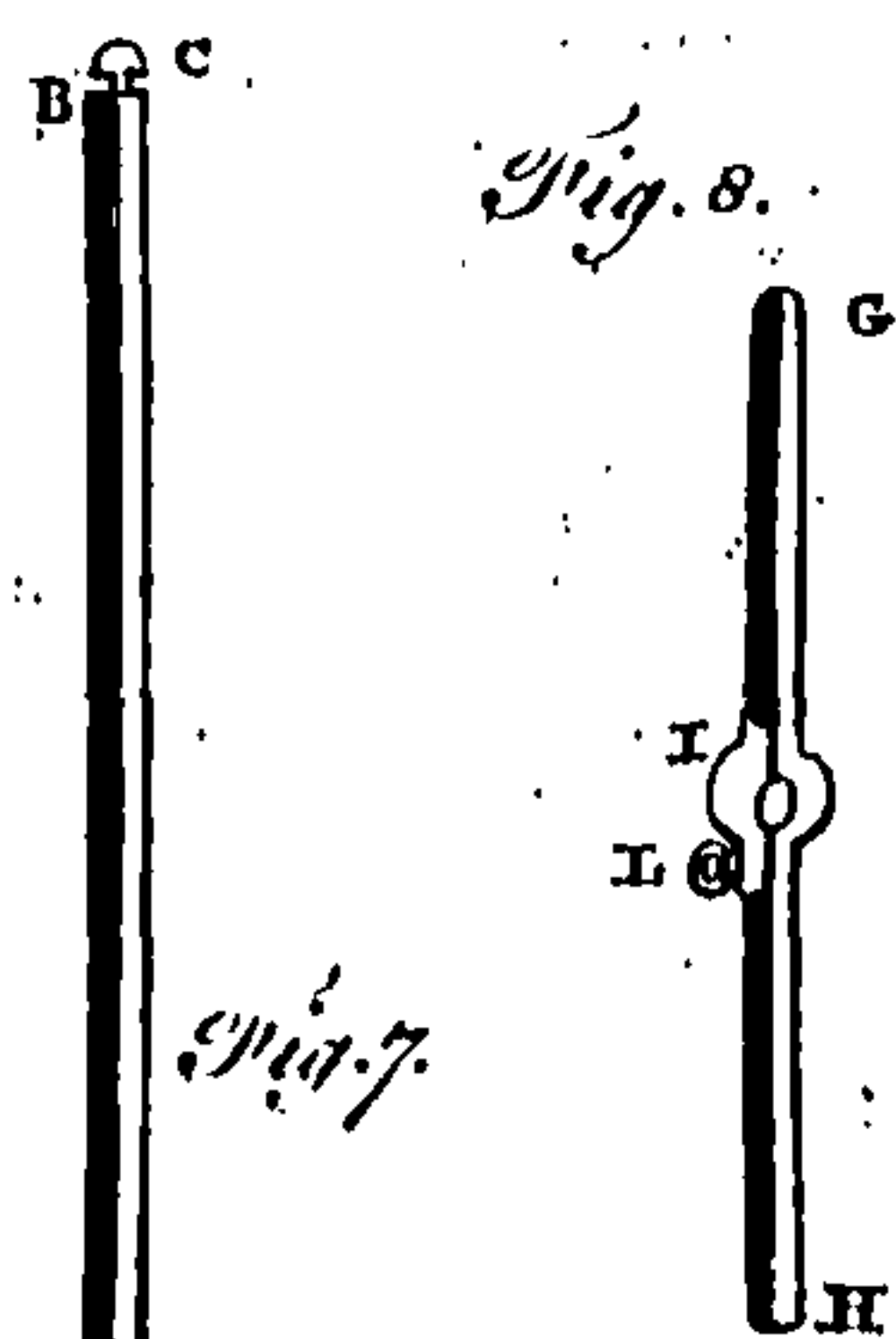
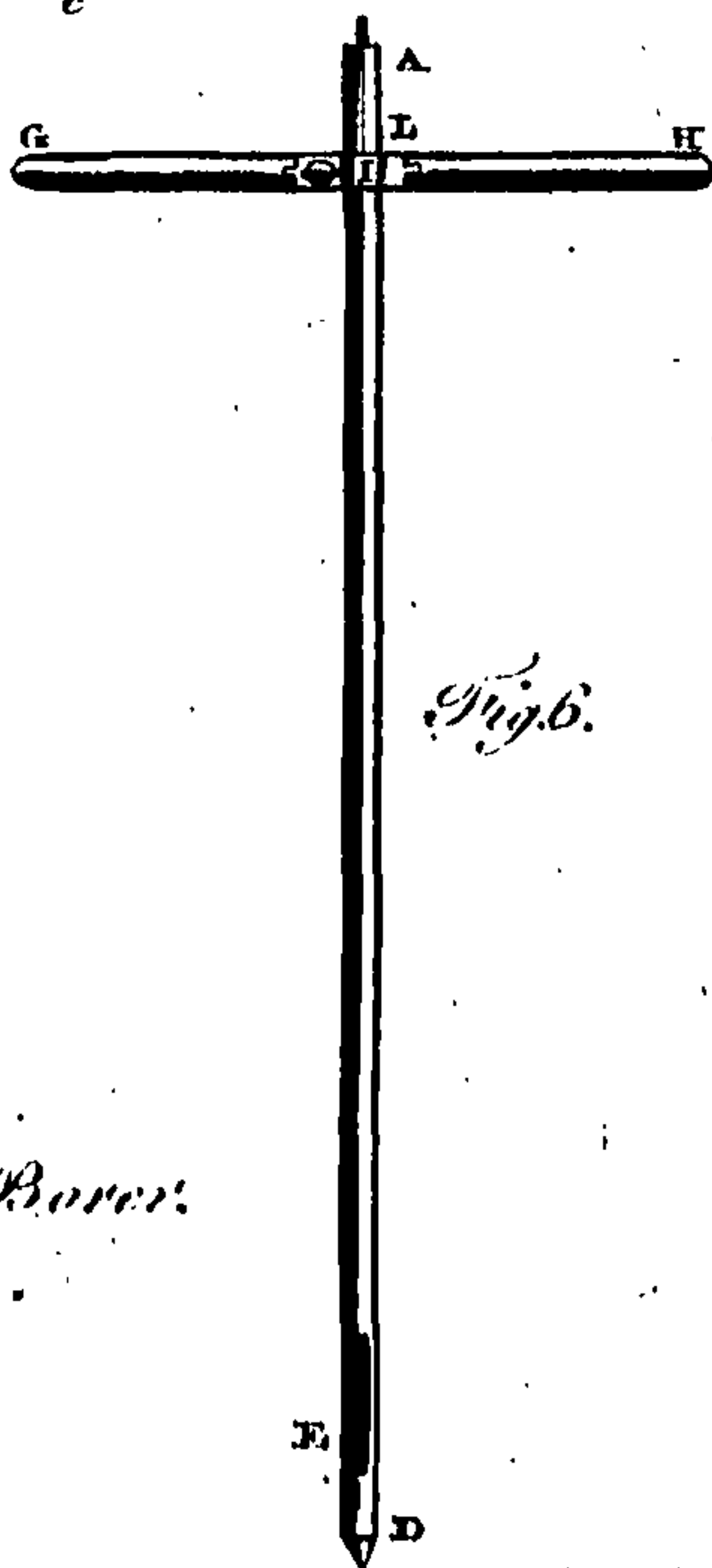
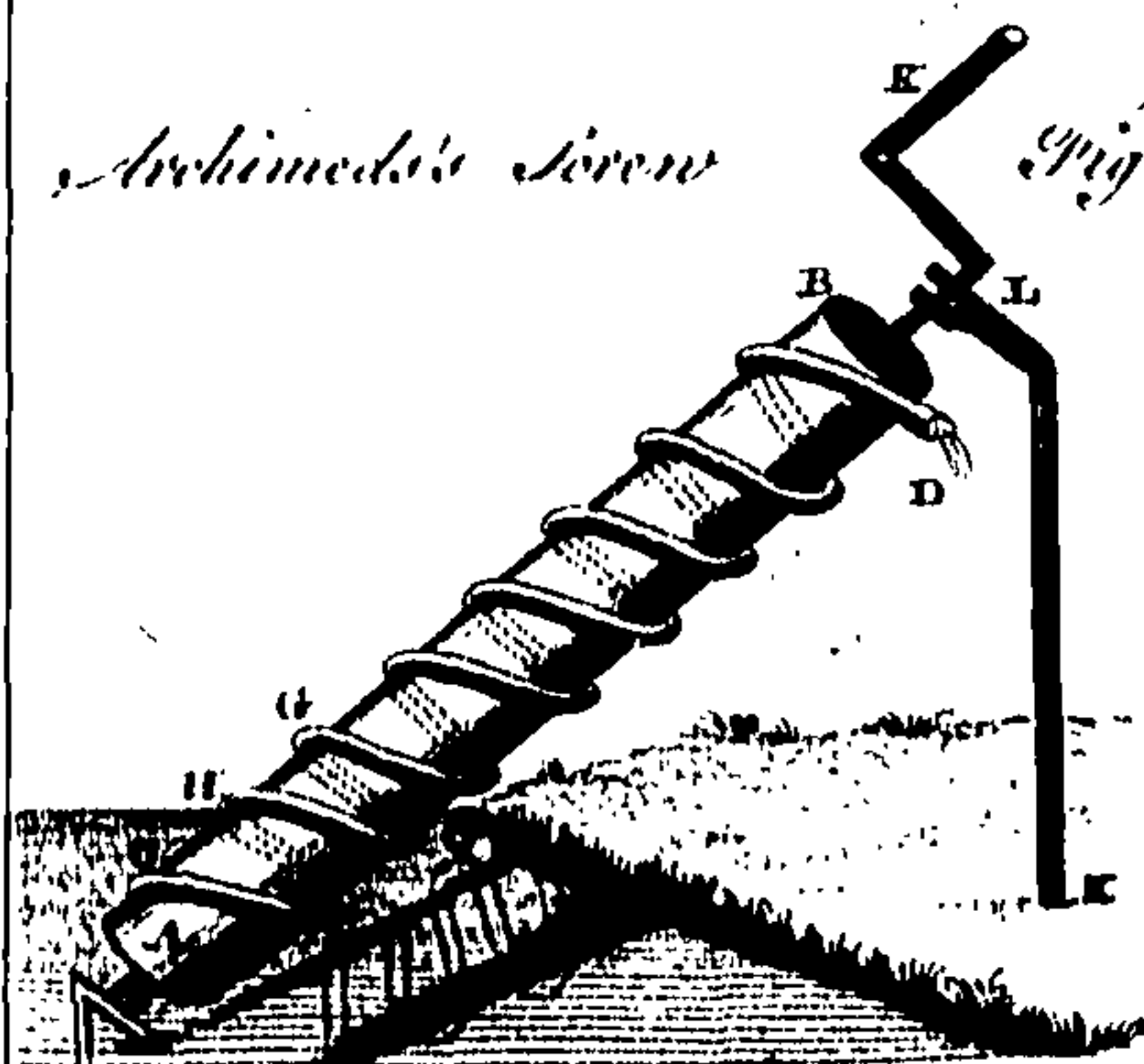
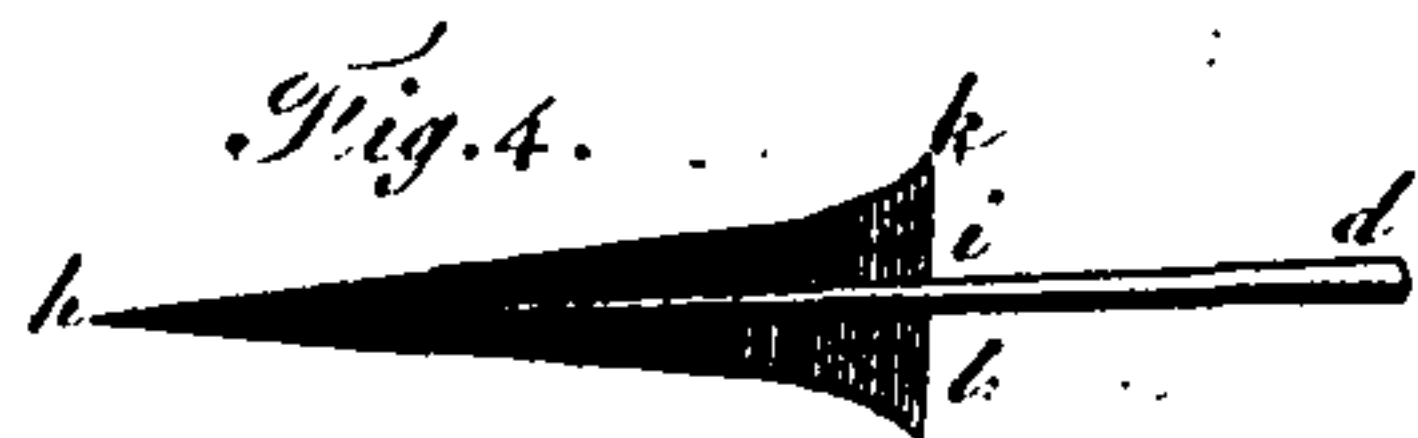
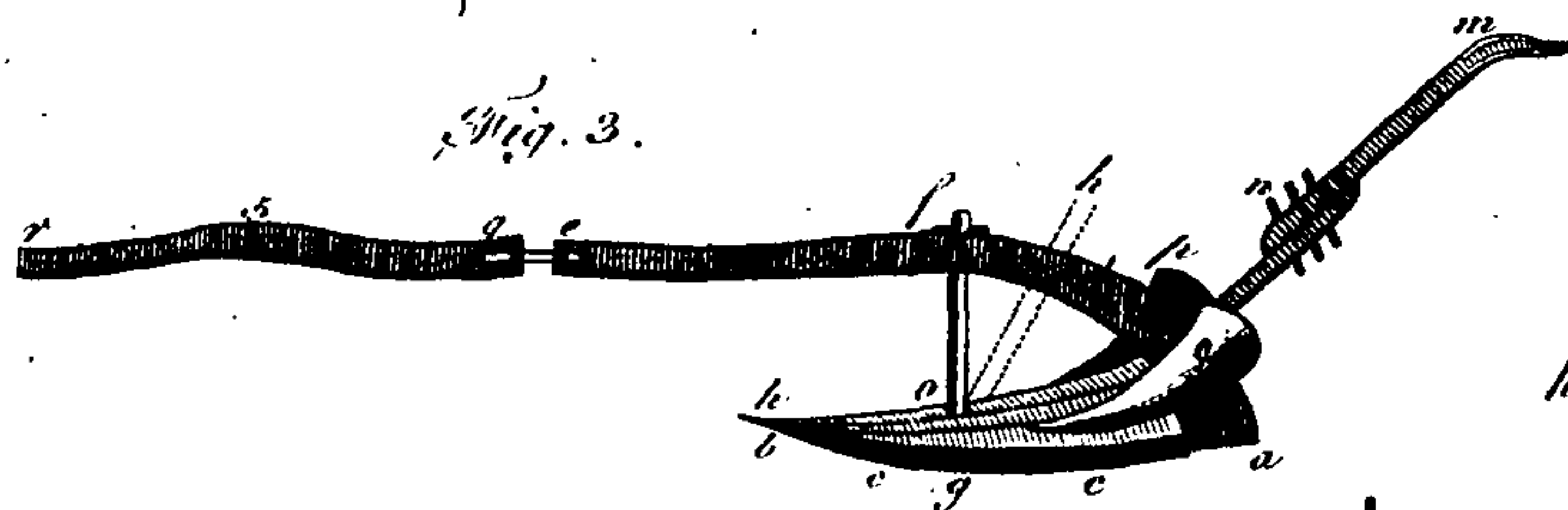
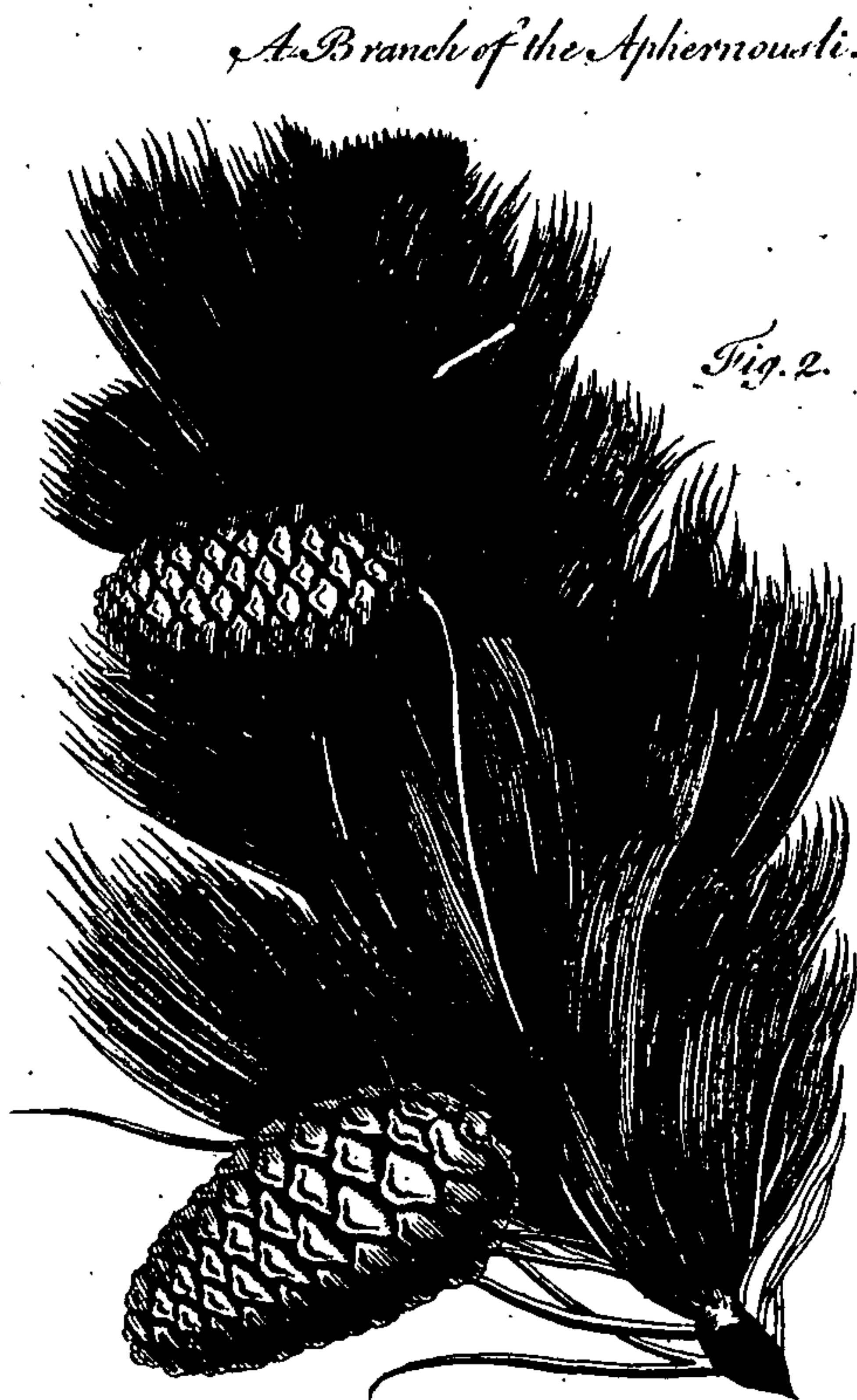
First of all bleed plentifully, and keep the horse for some time to an opening diet of scalded bran, and sometimes scalded barley, lessening the quantity of his hay. After two days repeat the bleeding, but in a smaller degree. If the horse has a cold, it will be proper to give him pectoral drinks, proper for that disorder. See COLD.

But if no symptom of a cold appears it will be necessary, after bleeding and a spare diet, to give him two or three purges, not only to remove the plethora or fulness, but attenuate and thin his blood, for which the following is recommended.

"Take of the finest soccotrine aloes, an ounce and a quarter; fresh jalap, two drams; salt of tartar, three drams; native cinnabar, or the cinnabar of antimony half an ounce; make it into a ball with a sufficient quantity of syrup of roses or marshmallows; adding twenty or thirty drops of chemical oil of aniseeds, making the whole into a ball, rolling it in liquorice-powder."

The purge may be made stronger or weaker by increasing or diminishing the jalap. Let this be repeated two or three times, and the horse will probably recover, without a relapse. Powder of antimony, or its preparations, as the liver, the *cræcus metallorum*, its cinnabar, or the native cinnabar, mixed with equal parts of gum guaiacum, may be also given in ounce doses, for three or four weeks to mend his blood, and take off its siness. Nor should exercise, as soon as the horse is able to bear it, be omitted.

When a horse drops down suddenly with hard riding, or violent driving, it in many respects resembles an apoplexy, and all the organs of the head are affected as in an apoplexy; but as this proceeds only from the extraordinary rarefaction of the blood, and its rapid motion, whereby the small vessels of the brain, heart, and lungs, are so extremely distended as to cause an universal pressure on the origin of the nerves; the horse by this means loses all sense and motion, and generally falls suddenly, especially upon any sudden stop; because when the bodily motion ceases, the circulation of the blood in the veins is not accelerated in proportion to its influx from the arteries, which soon produces a suffocation and



Borer.

and a falling down, without sense or motion: Instances of this kind are not uncommon, especially in very hot weather, when the external heat adds greatly to the blood's motion and rarefaction. But as we suppose, in this case, little or no fault in the blood, except, perhaps, a plethora, or weakness of the vessels, the quickest and readiest remedy is bleeding; and unless the horse dies with the violence of the fall, which sometimes happens, or by bursting the small vessels of the brain or lungs, or happens through polipuses in the heart or principal veins, he will soon rise of himself, or without much help, and may be preserved from such accidents for the future, by better usage. *Gibson on the Diseases of Horses.*

APPETITE, a certain painful or uneasy sensation, always accompanied with a desire to eat or drink.

Horses, more than most other creatures, are subject to diseases of the stomach, particularly to a want of appetite, and a vitiated, or voracious appetite.

Want of APPETITE is when a horse feeds poorly, and is apt to mangle his hay, or leave it in the rack, and at the same time gathers little flesh, and his dung habitually soft, and of a pale colour.

These are evident signs of a relaxed constitution, wherein the weakness of the stomach and guts may have a very great share. This habitual weakness may be either natural and hereditary, or may be caused by some previous ill management; such as too much scalded bran, or too much hot meat of any kind, which relaxes the tone of the stomach or guts, and in the end produces a weak digestion, and consequently a loss of appetite.

The best method to harden and recover such horses, is to give them gentle exercise in the open air, especially in dry weather; never to load their stomachs with large feeds, and to keep them as much as possible to a dry diet, indulging them now and then with a handful of beans among their oats; but in case the horse grows weak, and requires the help of physic, a few laxative purges like the following should be given:

"Take soccotrine aloes, six drams; rhubarb in fine powder, two drams; saffron dried and powdered, one dram: make it into a stiff ball, with a sufficient quantity of syrup of roses, and add two drams of the elixir proprietatis, prepared with oil of sulphur by the bell."

This purge will work very gently, and bring the horse to a better appetite, and strengthen his digestion. It may be repeated once a week, or once in ten days: and, after the operation of each purge,

"Take a large handful of the raspings or shavings of guaiacum, pomegranate bark, and balauftines bruised, of each an ounce; galangals and liquorice root sliced, of each half an ounce: let these be boiled in six quarts of smiths' forge-water, to three pints; and while it is warm, infuse in the decoction two drams of saffron, and half an ounce of diascordium."

Let this be divided into two drinks, and give one after the purge has done working, and the other after two days intermission; in cold weather the drinks should be warmed before they are administered: the same may be complied with after the last purge, and repeated as often as may be necessary, continuing to give the horse constant exercise in the open free air; and this will be the likeliest method to strengthen such horses as are of weak relaxed constitutions.

But where such a habit is contracted by too much feeding, especially on hot scalded diet, which is often the case of young horses kept up for sale, the best way is to bleed and purge such horses, and at the same time to rowel them in the belly; for this sort of feeding easily occasions horses to be lax, that have no natural disposition to it; for when they grow suddenly fat by such management, the secretions from the guts become greasy, which always causes weakness and relaxation in them, and often forms a proper nidus for the breeding of vermin; all which may be easily remedied by purging in the first place, and afterwards by proper exercise, and a clean diet.

As for those horses that are of a hot fiery disposition, and lose their appetites by their heat and fretting, it is a case that cannot easily be remedied, because of the natural inflammatory disposition of their blood; the only method is to keep them to a cool diet while they are young, and, in country places, to let them run abroad, especially where they have stables and warm ranges, to keep them from the inclemency of the weather in winter; for these sort of horses are always tender, being, for the most part, extremely thin skinned, and their blood of a thin texture, and easily put in

motion. For the same reason, the best way, in summer, is to bring them up in the day time, and only let them run abroad in the night, they being more hunted with the flies than any other, which keeps them continually upon the fret, and hinders them from thriving. When such horses live till they are full aged, their heat and fieriness often abates, so that they grow more useful; but while they are young, they are more subject to inward imposthumations than horses of a cooler temperament; and these often kill them suddenly, or bring them into lingering consumptive maladies, which in some measure may be prevented by the above method. *Gibson on the Diseases of Horses.*

Vitiated, or Voracious APPETITE, is that where the animal is always craving for meat. See FOUL-FEEDING.

APPLES. Nature has furnished us with only one sort of this species of fruit, viz. the crab, common in woods and hedges. Linnæus, who knew all nature, takes no notice of the apple, as he considered it as no other than cultivated varieties of the pyrus malus, or crab; but we require not the assistance of botanic knowledge to convince us, that the numerous sorts of fruit, which are cultivated by orchardmen and gardeners, are not natural species. Nature propagates and continues its own species by seed. But the seeds of a given species, or rather variety of apples, will not produce apples of the same kind, but a number of different kinds, most of them, probably, resembling the wood-crab, rather than the apple which produced them, let its richness and flavour be what they may. Indeed repeatedly sowing the seeds of the seedling in common soil, the common crab would, no doubt, be produced.

The fact seems to be, that fruit is not naturally a permanent specific character; even the native wild crab is subject to infinite variety in colour, shape, and flavour; but by art the qualities of fruit may be identically preserved.

The business, therefore, of the improvers of fruit is to catch at superior accidental varieties, and having raised them by cultivation, to the highest degree of perfection they are capable of, to preserve them in that state by artificial propagation.

The law of Nature, however, though it suffers man to improve the fruits which are given us, appears to have set bounds to his art; and to have numbered the years of his creations. Artificial propagation cannot preserve the varieties in perpetuity. A time arrives, when they can be no longer propagated with success. All the old fruits, which raised the fame of the liquors of this country, are now lost; or are so far on the decline, as to be deemed irrecoverable.

The redstreak is given up; the celebrated fire apple is going off; and the squash pear, which has probably furnished this country with more champaign than was ever imported into it, can no longer be got to flourish: the stocks canker and are unproductive. In Yorkshire, similar circumstances have taken place: several old fruits, which were productive within recollection, are lost: the stocks cankered and the trees would no longer come to bear.

The duration of varieties may, however, depend much upon management. For although Nature wills that the same wood, or the same set of sap-vessels (for the wood which is produced by grafting is, in reality, no more than a protrusion of the graft,—an extension of the original stock) shall, in time, lose its fecundity; yet, it is probable, that the same art which establishes a variety, may shorten or prolong its duration. Much may depend upon the stock, and much upon the health of the tree, and the age of the wood, from which the graft is taken. Or, perhaps, the canker (which seems to be the natural destroyer of varieties) may be checked. But of these in their places.

The popular idea among orchardmen is, that the decline of the old fruits is owing to a want of fresh grafts from abroad—from "Normandy"—under a notion, that the highest-flavoured apples grow there, in a state of Nature, as the crab in this island.

That the first fruits of our ancestors were fetched from the continent is highly probable. But it is equally probable, that the sorts which were originally imported, have long ago been lost; and that the numerous varieties, we are at present possessed of, were raised from the seed, in this country. Miller, whose extensive practice and connexions enabled him to be an adequate judge of this subject, speaks of them as such. After enumerating some French apples, he says,—"the sorts, which are above-mentioned, are what have been introduced from France; but there are not above two or three of them which are much esteemed in England; viz. the French rennette, the rennette-grise, and the violet

violet apple; the other being early fruit, which do not keep long and their flesh is generally mealy, so that they do not deserve to be propagated; as we have many better fruits in England, which I shall next mention:" and in mentioning the golden pippin, one of the first apples we know, either for the table or the cider press, he says "the golden pippin is a fruit peculiar to England. There are few countries abroad where this succeeds well."

The fire apple is generally understood to be a "kernel fruit:" and the Hagloe crab, whose fame as a cider fruit is little inferior to that of the fire, is still traceable to the parent stock. The original tree is still in being.

It is probable, however, that many of our present fruits have not been produced from our own native crab; but from the apples which were originally imported. Nevertheless, it is more than probable, that some of the higher-flavoured, firmer fruits, as the golden pippin, have been raised, by cultivation, from the native species. The process is simple and easy: and a young man of ingenuity and enterprise, and in a proper situation, might be less rationally employed, than in improving this species of his country's produce.

Select, among the native species, individuals of the highest flavour. Sow the seeds in a highly enriched seed-bed, in the manner which will be described. Select, from among the seedlings, the plants whose wood and leaves wear the most apple-like appearance. Transplant these, into a rich deep soil, in a genial situation, and at distances which will be mentioned; letting them remain in this nursery until they begin to bear.

With the seeds of the fairest, richest, and best-flavoured fruit, repeat this process. And, at the same time, or in due season, engraft the wood which produced this fruit, on that of the richest, sweetest, best-flavoured apple: repeating this operation; and transferring the subject, under improvement, from one tree and sort to another, as richness, flavour, or firmness may require. Continuing this double mode of improvement, until the desired fruit be obtained.

There has, no doubt, been a period, when the improvement of the apple and the pear was attended to in this country. And should not the same spirit of improvement revive, it is probable, that the country will, in a course of years, be left destitute of the valuable kinds of these two species of fruit: which, though they may in some degree be deemed objects of luxury, long custom seems to have ranked among the necessities of life.

Having thus endeavoured to convey a general idea of the nature and propagation of varieties, it will be proper to enumerate some of the most celebrated of those which are now in cultivation, in these counties:—to describe, or even enumerate, all the present varieties of orchard fruit would be impossible. They are without number. In Herefordshire, more particularly, a very considerable proportion of the fruit which is grown is "kernel fruit;" produced from trees that have been raised from the seed; and which have never been grafted. Consequently each tree is a separate variety; bearing the name, perhaps, of its planter, or of the "ground" it grows in.

There are, nevertheless, numbers which are universally known; and some of them sufficiently celebrated to be entitled to notice.

Of apples, the fire stands first in estimation. The fruit of this variety is somewhat below the middle size. The form rather flat. The colour a pale yellowish white, with sometimes a faint blush on one side. The flesh tolerably firm. The flavour, when fully ripe, fine. It is deemed, by most people, a tolerably good eating apple. The cider, which is produced from it, in a soil that is adapted to it, is rich, highly flavoured, and of a good body:—its price frequently fourfold that of common sale cider. The thin limestone soils on the margin of the forest of Dean, are said to produce the richest fire cider. The tree which bears this apple is of a singular growth:—remarkably "beefom headed:"—throwing out numerous, straight, luxuriant, upward shoots, from the crown; taking the form of a willow pollard; running much to wood; and, in deep soils, growing to a great size before it become fruitful.

There is an apple called the red fire; but it has no peculiar affinity with the true fire. In Herefordshire, about Marcle, I met with a "yellow fire"—and on the forest there is the "kernel fire:"—both of them probably kernel fruits, which, bearing some likeness of the true fire, have had its name improperly given them.

The Hagloe crab is, at present, next in esteem. It has

already been mentioned, that this variety is traceable to the original seedling. It was produced, about seventy years ago, in a nursery among other stocks raised from the seed, by Mr. Bellamy of Hagloe, in Gloucestershire, grandfather of the present Mr. Bellamy, near Ross in Herefordshire; who draws from it (that is, from trees grafted with scions from this parent stock) a liquor, which, for richness, flavour, and price on the spot, exceeds, perhaps, every other fruit liquor, which nature and art have produced. He has been offered sixty guineas for a hoghead (about 110 gallons) of this liquor. He has likewise been offered bottle for bottle of wine or spirituous liquors, the best to be produced; and this without freight, duty, or even a mile of carriage to enhance its original price.

This fruit, while growing, is nearly white; when fully ripe it has a yellowish cast; sometimes freckled with red on one side, like the common white crab. The size about that of the fire apple; but the form more oblong. The flesh remarkably soft and woolly, but not dry; being furnished with a sheer, but, when fully ripe, sweet juice; which, however, is much smaller in proportion to the quantity of fibrous matter, than that of most other apples. The flavour, when ripe, resembles that of the cashew apple of the West-Indies; and, what is remarkable, the texture of the flesh is not unlike to the pulp of that fruit. The cider, notwithstanding the sheerness of the juice, is, when properly manufactured, singularly rich; and notwithstanding the faint smell of the apple, is highly flavoured: and, what is equally remarkable, the liquor is of the highest colour, notwithstanding the paleness of the fruit.

The golden pippin is in high estimation as a cider apple; and may rank as the third of this district. It is more generally known than the Hagloe crab, and, at public market, its liquor, I believe, is generally next in price to that of the fire apple.

The old red-streak is yet in being. A few old trees are still remaining. The fruit small, roundish, of a pale yellow ground, with numerous faint red-streaks. The flesh firm, full of juice, and, when ripe, finely flavoured; a palatable eating apple. The cider, at present, is not, I believe, in particular estimation: little if any genuine redstreak cider is now made. It never was, I believe, equal to that of either of the preceding apples. The tree of this apple is of a singularly awkward growth; Crooked, reclining, ragged and unsightly.

The woodcock is another favourite old cider fruit. But is now going off: many old trees, however, are still left in the district. The fruit is much larger than any of the preceding sorts: above the middle size. The form somewhat oblong; with a long stalk, set on in a peculiar manner; feigned to resemble the woodcock's beak (hence the name). The colour that of the redstreak, with the addition of some dark blood-red streaks on one side. The flesh remarkably fine; equally fit for culinary purposes and for cider. The tree large and strongly featured; forming large boughs in the pear-tree manner.

Other favourite cider apples, at present, are:

The must:—an old favourite fruit, of which three sorts are enumerated.

The pauson:—a middle-sized, green apple.

The royal wilding:—a large white apple.

The dymmock red:—middle-sized, red.

The coccagee: above the middle size: greenish white, with an orange blush:—well fleshed, and highly flavoured.

Russets, of various kinds, are in good esteem: particularly the Longney russet.

Bromley, foxwhelp, red crab, queening,—all of them large red apples,—are in good estimation for cider. *Marshall's Rural Economy of Gloucestershire.*

Mr. Young in his *Annals of Agriculture*, vol. vii. has a letter from Mr. Gullet of Exeter, which recommends the following method to effectually destroy the insect that prevents the blossoms of apples and other fruit trees from producing fruit. These insects are deposited in their egg-state by a fly, in the bud of the apple, or blossom, at its first opening, and they soon become a maggot, which exhausts the nourishment of the blossom, which with the slightest touch will fall off. It is strongly recommended to set fire to some heaps of wet straw, weeds, or any other like matter on the windward side of the garden or orchard, viz. if the wind is east, let the fumigation be from that point, so that the smoke from the heaps may blow through the tree for some days. The expence attending will be very trifling, considering the beneficial effects of it, as it will not only destroy the

the insects for the present, but prevent them from depositing their eggs. The heat and ashes will likewise contribute to the fertility of the soil, the sweetness of the pasture, and the growth and vigour of the trees for future bearings.

APRIL, the fourth month of the civil year, consisting of thirty days.

This month is the best month, if the weather be dry, to sow barley and white oats, to destroy weeds, and also to fallow land:

Fell the timber you intend to bark, if the spring be forward: cleanse and rid your coppices, and preserve them from cattle: keep geese and swine out of commons and pastures, and water new planted trees, if the weather prove dry.

Pick up stones on the new sown land: sow hemp and flax.

Cleanse ditches, and get in your manure that lies in the streets or lanes, or lay it in heaps.

Set osiers, willows, and other aquatics, before they are too forward, and also slips of rosemary or lavender.

You may throughout this month sow clover grass, saint-foin, and all French and other grasses, or hays: plant madder, and be selling your winter-fed cattle. *Mortimer's Husbandry.*

AQUATICS, or aquatic plants, such plants and trees as grow in water.

Thus, the willow, osier, water-creffes, brook-limes, &c. are aquatics.

Mr. Marshall, in his Rural Economy of the Midland Counties, says, that he dressed lands with the aquatic manure, (raised two or three years before, out of a fish-pool, and afterwards turned up into a heap of digest), the rest of the piece being manured with yard dung; the quantity of each about eight loads an acre. The two lands dressed with the aquatic manure, were obviously the better crop of turnips. The plants were not more numerous, but they were larger and cleaner-skinned; and what is remarkable, while the crop of the piece in general was full of catlock and chickweed, (which arose since the hoeing) the two lands were, in a manner, entirely free from those weeds.

ARABLE land, such land as is tilled, or cultivated for the production of corn.

ARAIRE, the name of a small plough used in Provence and Languedoc, in France.

It consists of a ground wrift, *a, b*, (Plate I. fig. 3.) from three to four feet long, ending in a point towards *b*. The under part of this wrift, instead of being flat, is formed into a ridge, which extends the whole length of it.

This ground wrift, at the end *a*, terminates in a strong tenon fixed in a large mortise, formed at the extremity *d* of the beam *d e*, and is besides fastened to the beam by two iron uprights *f g*, which have a head at *g*, and going through the beam are keyed at *f*: the distance between the under part of the beam about *f*, and the upper part of the ground wrift towards *g*, is about fifteen inches. Instead of these uprights there is sometimes put a piece of sharpened wood or iron, as represented by the pricked line *h g*, which serves instead of a coulter.

On the upper part of the ground wrift is fixed a large iron share *d h* (fig. 4.) the part *d i*, is received into the same mortise of the extremity *d* (fig. 3.) in which the tenon of the ground wrift is fastened; and the wings of the share *k l* (fig. 4.) rest upon the iron uprights *f g* (fig. 3.)

On the hindmost part of this plough is a single lever *m d* (fig. 3.) which serves for a handle: at the end *d*, where it is bent, it enters, as well as the ground wrift and share, into the great mortise *d*, at the end of the beam; and the whole is secured with wedges. The handle sometimes consists of two pieces lapped one over the other, as at *n*, to lengthen or shorten it, according to the height of the ploughman.

By means of the wedges just mentioned, the angle which the ground wrift forms with the beam, may be altered at pleasure, which makes it plough more or less deep. At the hinder parts of the ground wrifts are two earth boards, fastened at *a*, by a strong wooden pin, which passes through both the boards and the ground wrift.

The beam *d, f, e*, which from eight to ten feet long, has an iron bolt at the end *e*, which enters with great ease into a large mortise made at the extremity *g*, of the piece of wood *q 5 r*, intended to pass between the oxen, and to which their harness is to be fastened. When a single horse is used in the plough, a shaft is substituted instead of the

piece of wood *q 5 r*, and fastened to the end of the beam *e*, by an iron ringlet.

It is evident that this plough goes a greater or less depth, according as the draught is more or less raised. The ploughman, as has been already observed, can alter the angle which the ground wrift forms with the beam, by means of the wedges he drives into the mortise of the beam, which receives both the ground wrift and handle. But these directions not being sufficiently exact, it is necessary that the ploughman should lean on the handle *m*, when it cuts too deep, and raise it when it makes too shallow a furrow: this labour is so constant, that were the plough to work in a strong soil, the ploughman could not support it. The two little earth boards *p p*, turn over to the right and left the earth that has been loosened by the share; but this is not done so regularly as when there is but one earth-board, which throws the earth into the furrows before made, as fast as it comes out of that which the plough is forming: it is however certain, that the ground wrift being ridged, the ploughman always rests it on one side, which occasions the greater part of the earth to be thrown one way.

These ploughs having no coulters, the earth is not cut vertically at all: for neither the piece of sharpened wood, nor the sheath which joins the ground wrift to the beam, and which is placed a little before the small iron bars *f, g*, can be esteemed a coulter. The bar represented by the pricked line *h g*, may serve instead of a coulter, but it must then be made of iron; and in this case the coulter would be very improperly situated, for it should by rights be before the share.

These ploughs are very convenient to use among trees, or in vineyards; they may also serve to stir the ground in the intervals between the rows of saint-foin and lucerne; but then should be rather called cultivators, than ploughs: *Du Hamel's Elements d'Agriculture.*

ARCHIMEDES's screw, a kind of spiral pump, for raising water, so called from Archimedes, its inventor.

It consists of a long cylinder, with a hollow pipe, tube, or groove coiled round, as represented on Plate I. fig. 5. where *A B* shews the cylinder, and *C D* the tube open at each end. It is placed in an oblique position to the horizon, with the lower end in the water to be raised, and the other supported by the pivot below the winch *J K*, by which the tube and cylinder are turned round.

As soon as the screw is immersed in the water, it immediately rises therein by the orifice *C*, to the level of the surface of the water *E F*; and if the point of the spiral tube, which in the beginning of the motion is coincident with the surface of the water, happens not to be on the lower side of the cylinder, the water will, upon the motion of the screw, move on the spiral tube, till it comes to the point which is on the other side, and coincident with the surface of the water; when it is arrived at that point, as suppose at *O*, it cannot afterwards possess any part of the spiral, but that which is upon the lowest part of the cylinder; for it cannot move from *O* towards *H* or *G*, because they are situated higher above the horizon; and since this will constantly be the case, after the water in the spiral has obtained the point *O*, it is plain that it must always be on the under part of the cylinder.

But because the cylinder is in motion, every part of the spiral screw from *O* to *D*, will by degrees succeed to every part thereof from *O* to *D*, as it comes on the lower side; that is, it must ascend on the lower part of the cylinder through all the length of the pipe, till it comes to the orifice at *D*, where it will run out, as having nothing farther to support it.

This engine may be very useful in raising water, foul with sand, &c. as the leathers of pumps will be soon destroyed by these particles. And it was principally this reason that induced the ingenious Mr. Smeaton to erect a machine of this kind in the gardens of her royal highness the princess dowager of Wales, at Kew, where it is worked by horses, and supplies all the ponds, &c. in that extensive garden with water. A machine of this kind, turned by a windmill, might be of great use in draining lands in several parts of England, as it is not subject to be out of order, and might be made to raise a very large quantity of water to a small height. We shall describe several other contrivances for this purpose when we come to treat of draining of lands, there being many very curious and useful engines of this kind deposited in the machine room of the society for the encouragement of arts, &c. See the article DRAINING of LANDS.

ARCHIMEDES's screw, is an engine of great use, for raising water a few feet high. The best way of making it is, not with a hollow pipe coiled round the shaft or axis, which would be liable to many accidents, but by cutting a spiral groove about an inch deep, and the same wide, round the axis, and extending near the whole length of it. Narrow boards of oak are fitted to the groove, and made to join very close to each other sideways. They are then sawed off very even, and to the same height above the shaft, and narrow deal boards, close jointed, nailed upon the tops of the oaken boards, forming a hollow cylinder, which is bound with iron hoops. One end of this cylinder being dipped in the water, the other end is raised the intended height, and by turning the cylinder or barrel round, the water is raised, as before explained. If the barrel was raised perpendicular, the engine would have no effect, for no water would be raised. In general, the higher the upper end of the engine is raised, it discharges the less water, and is the easier worked: the best position is to place it obliquely, so that the barrel makes an angle about 45 degrees from the perpendicular.

Sometimes this engine is made with only a single spiral partition or thread; and sometimes with a double one, which is found to raise more water than the single: but when there are three such parallel threads in the barrel, it does not raise so much water as with two.

This engine is liable to few accidents, and if well constructed, pitched within and without, and kept in a house, or under a dry shed when not in use, will last a long time, with very little repairing.

The barrel may be made a little wider at the upper end than at the lower, that goes in the water, which answers two purposes; one is, that if the water is foul, the mud, sand, and gravel, is not apt to stick by the way in rising, as it might do, if the barrel was a cylinder, equal in diameter throughout its whole length. And by making the barrel a little conical, the iron hoops take the better hold, and draw the joints of the covering boards the closer. These boards may be of deal, for lightness.

The quantity of water that a screw engine will raise, depends upon various circumstances, the number of threads in the barrel, its size, elevation, &c. In general, if an engine of two threads, is 18 feet long in the barrel, is elevated to an angle of 45 degrees, it will throw out all the water that springs up in a surface of from two to three thousand square feet; and will keep a pond, or bottom of a lock or sluice, dry enough for men to stand in and repair it: this, however, is to be understood, where the bottom and sides of the pond is of a pretty close soil: for if the soil is very sandy, gravelly, and porous, the water will force through such a soil too fast, for one such engine to keep the pond dry; the 18 feet long is the largest screw engine commonly made.

The engines of this size are worked with horses, proper wheel-work being fixed to the upper end of the shaft for that purpose. Twelve horses are necessary to turn it, four each time; and sometimes sixteen horses are necessary. There are frequently smaller screw engines made, to be turned by men, with a crank or bent handle, at which four or five men can work at once, and the men changed every four hours: these answer very well where the water to be raised is in smaller quantity. These engines raise the water about four, five, and sometimes six feet high, and throw it over a bank or wall.

ARDERS, fallowings, or plowings of land.

AROMATIC, an epithet applied to such plants, and other bodies, as yield a fine fragrant smell, and have a warm spicy taste.

ARPENT, the French name for an acre. See **ACRE**.

We have already observed, under the article *acre*, that the French arpent contains 100 perches of twenty-two French square feet, which is equal to about one acre and three quarters of a rood English measure. But it may be necessary to add here, that the French have three different arpents, distinguished by the epithets *little*, *middle*, and *great* arpent.

The *little* ARPENT contains 100 perches of eighteen feet and a half square; consequently its superficial measure is 32,400 French feet, equal to 34,603 feet, or three roods, seven perches, and twenty-seven feet English measure.

The *middle* ARPENT consists also of 100 perches, twenty feet square, which makes 40,000 French feet superficial measure; equal to 42,720 feet, or three rood, thirty-six perches, and 149 feet English measure.

The *great* ARPENT, contains ten perches of twenty-two square perches. See the article **ACRE**.

ARTIFICIAL GRASSES, such as are introduced into the field with great care, and cultivated afterwards with much diligence. Such as burnet, clover, lucern, saint-foin, ray-grass, spurry, &c. See the method of cultivating each under its proper article.

ARTIFICIAL PASTURE, such lands as are properly cultivated and sown with the above plants, or any other that yield a great deal of fodder for cattle.

ARTIFICIAL PONDS. See **PONDS**.

ASCARIDES, small worms common in horses, resembling needles, some of them white, and some of an azure colour, with flattish heads. They are often called needle-worms by the farriers.

These worms are very troublesome, and hard to be rooted out, and expose horses to frequent gripes, and other fretting uneasy disorders in the guts. They breed at all times of the year, and often when one brood is destroyed, another succeeds. They are not mortal; but when a horse is pestered with this sort of vermin, though he will go through his business tolerably well, and sometimes feed heartily, yet he always looks lean and jaded; his hair stares as if he was surfeited, and nothing he eats makes him thrive; he often strikes his hind-feet against his belly, which shews where his grievance lies, and is sometimes griped, but without the violent symptoms that attend a cholic or straggary; for he never rolls or tumbles, but only shews uneasiness, and generally lays himself down quietly on his belly for a little while, and then gets up and falls a feeding; but the surest sign is when he voids them with his dung.

These small worms sometimes come away in great numbers with a purge, and some horses get clear of them by purges only; but this does not often happen; for the horses that breed ascarides are above all others, subject to slime and wormy matter. They seem to have their lodgment about the beginning of the small guts, near the stomach, among the concocted aliment or chyle, both from their colour, the symptoms of the gripes, and the sudden fits of sickness these horses are often seized with, which sometimes make them abruptly leave off their food, for a few minutes, and fall greedily to it again as soon as the sick fit is over. They are seldom seen, except when a horse has had a purge given, or when he falls into a natural purging, which those horses are often subject to, and then they come away in very great numbers, with much slime and nastiness. They not only make a horse grow lean, and look surfeited, but in opening his mouth, one may perceive a more than ordinary languid whiteness, and a sickly smell, from the want of those due supplies of blood and nourishment, which give a liveliness to the colour that is always perceivable in sound vigorous horses; so that whatever be the primary cause, these worms seem, in a great measure, to proceed from a vitiated appetite, and a weak digestion, which renders them the more difficult to be removed; for which reason recourse must be first had to mercurials, and after these, to such things as are proper to strengthen the stomach, promote digestion, and give a better tone to the solids.

To a horse, therefore, that is troubled with these small, white, or azure coloured worms, the following method may be observed:

“Take of calomel that has been often sublimed and well prepared, two drams; diapente half an ounce; make it into a ball, with a sufficient quantity of conserve of worm-wood, or of rue, and give it in the morning, keeping the horse from meat and water four hours before, and four hours after taking it.”

The next morning administer the following purge, taking great care to keep the horse from wet, or from any thing that may expose him to catch cold:

“Take Barbadoes, or plantation aloes, one ounce; salt of tartar, two drams; fresh ginger grated, a dram and a half; oil of amber a middling spoonful: make the whole into a ball with flour or liquorice powder.”

This purge may be worked off in the stable with warm water, which is much the safest way when mercurials are given. The calomel ball and purge may be repeated in six or eight days; and again in six or eight days more.

When a horse has gone through a course of these mercurial purges, let the following drink be given two or three times a week, and continued till the horse begins to thrive and look healthful:

“Take rue, camomile flowers, and horehound, of each a handful;

a handful; galangals, bruised in a mortar, three drams; liquorice root, sliced, two drams: boil it in a quart or three pints of forge-water five or six minutes, in a covered vessel, and keep it covered till cold: then strain it through a piece of coarse canvas, and give it in the morning upon an empty stomach." *Gibson on the Diseases of Horses.*

ASH, or ASH-TREE. There are several species of the ash-tree cultivated by curious persons for the sake of variety; but what deserves attention in a work of this kind, is the common ash, called by botanists *fraxinus foliolis ferratis, floribus apetalis*; and is so well known as to need no description.

This tree propagates itself in plenty by the seeds which scatter in the autumn; so that when the seeds happen to fall in places where cattle do not come, there will be plenty of plants come up in the spring; but when any person is desirous of raising a quantity of the trees, the seeds should be sown as soon as they are ripe, and then the plants will come up in the following spring; but if the seeds are kept out of the ground till spring, the plants will not come up till the year after; the ground therefore should be kept clean all the summer where they are sown and not disturbed, lest the seeds should be turned out of the ground, or buried too deep to grow.

When the plants are come up, they must be kept clean from weeds during the summer; and, if they make good progress in the seed-bed, they will be fit to transplant by the following autumn; some ground should, therefore, be prepared to receive them; and as soon as their leaves begin to fall, they should be transplanted. In taking of them up, care should be taken not to break or tear off their roots; to prevent which they should be taken up with a spade, and not drawn up, as is frequently practised; for as many of the plants which rise first from seeds will out-strip the others in their growth, so it is frequently practised, to draw up the largest plants, and leave the former to grow a year longer, before they are transplanted: and to avoid hurting those that are left, the others are drawn out by hand, and thereby many of their roots are torn off, or broken. It is, therefore, much the better way to take all up, little or big, together, and transplant them out, placing the large ones together in rows, and the small ones by themselves. The rows should be three feet asunder, and the plants a foot and a half distance in the rows. In this nursery they should remain two years, by which time they will be strong enough to plant where they are to remain, for the younger they are planted out the larger they will grow; so that where they are designed for use, they should be planted very young; nor should the ground where they are raised be better than that where they are designed to grow. For when plants are raised in good land, and afterwards planted into worse, they very rarely thrive; so that it is much the better method to make the nursery upon a part of the same land, where the trees are designed to be planted, and then a sufficient number of the trees may be left standing upon the ground, and these will outstrip those which are removed, and grow to a larger size.

Where people live in the neighbourhood of ash-trees, they may supply themselves with plenty of self-sown plants, provided cattle are not suffered to graze on the land; for if cattle can come at them, they will eat off the young plants, and not suffer them to grow; but where the seeds fall in hedges, and are protected by bushes, the plants will come up and thrive: in these hedges the trees are frequently permitted to grow till they have destroyed the hedge, for there is scarce any tree so hurtful to all kinds of vegetables as the ash, which robs every plant of its nourishment within the reach of its roots, and should therefore never be suffered to grow in hedge-rows; for they not only kill the hedge, but impoverish corn, or whatever is sown near them. Nor should any ash-trees be permitted to grow near pasture grounds, for if any of the cows eat of the leaves or shoots of the ash, all the butter that is made of their milk will be rank, and of little or no value. In all good dairy countries therefore they never suffer any ash-trees to grow.

If the wood of these trees be rightly managed, it will turn greatly to the advantage of its owner; for by the under-wood, which will be fit to cut every eight or ten years, there will be a continual income more than sufficient to pay the rent of the ground, and all other charges; and still there will be a stock preserved for timber, which in a few years will be worth forty or fifty shillings per acre.

The ash delights in a moist soil, and will thrive even in an undrained moory situation. Even those with osiers will

vie with them. It is a thirsty plant. The ground under an ash is observed to be always comparatively dry; and it is probably from this absorbent nature, that it is so great an enemy to the herbaceous tribe. Turneps, a succulent plant, starves under the ash; and corn never thrives in its neighbourhood. Clover, however, seems to be an exception to this theory. It is nevertheless an undoubted fact, that the ash is a destructive enemy on arable land; and it is highly improper to plant it in hedges. It ought to be planted in waste nooks and corners; or, perhaps, for two reasons, on improveable swamps, and on the springy sides of hills: it would be rendering them useful as sites of plantations; and perhaps by its absorbent nature would render them firm. If the tree gets disbarked, though its appearance should be flourishing on its being felled, the roots will be found decayed, and the stem at the bottom a complete shell; and therefore ought not in point of profit to be suffered to stand. This tree, when it stands amongst the firs and larches, if planted close, will grow too tall and slender, but thrive well when planted alone. They are frequently known to have thrived for at least ninety years, as may be observed by their rings. Of the first ten years as well of the last ten the growth has been slow. Intermediate years the different thickness of the rings in different years were striking, as observed by Mr. Marshall in his Rural Economy of the Midland Counties.

This timber is of excellent use to the wheel-wrights and cart-wrights for ploughs, axle-trees, felines of wheels, dairy-utensils, harrows, oars, blocks for pullies, and many other purposes.

The best season for felling these trees is from November to February; for if it be done either too early in the autumn, or too early in the spring, the timber will be subject to be infested with worms, and other insects: but for lopping of pollards the spring is preferable for all soft wood. *Miller's Gard. Diet.*

ASHES, the earthy particles of combustible substances remaining after they have been burnt.

Mr. Young, in his *Annals of Agriculture*, vol. I. by an experiment, approves of charcoal-ashes in preference to powdered charcoal itself. By another experiment, wood-ashes mixed with mud, he says, are superior to ashes alone, and four times better than mud alone, as a manure. In vol. II. he says wood-ashes appear to be a most powerful manure. In a neighbourhood abounding with vitriolic acid, they more than neutralize that salt; they furnish besides the food of plants. In neutralizing it, the fixed vegetable alkali they contain forms with the acid a vitriolated tartar, which is beneficial.

If the ashes are produced from vegetable bodies, they contain a considerable quantity of fixed salt, blended with the earthy particles; and from these particles the alkaline salts, called pot-ash, pearl-ash, &c. are extracted.

Ashes of all sorts contain in them a very rich fertile salt, and are the best manure of any to lay upon cold lands, especially if kept dry, and the rain doth not wash away their salts. One load of dry ashes will go as far as two not kept so. But as rain-water diminishes their salts, so the moistening them with chamber-lie, or soap-suds, will add greatly to their strength. Two loads of these ashes will manure an acre of land better than six loads of those that are exposed to the rain, and that are not ordered so, which is the common allowance for an acre, though some lands require more, and some less. That the ashes of any sort of vegetables are very advantageous to land, is what is experienced in most places of England, by the improvement that is made by burning of fern, stubble, straw, heath, furze, sedge, bean-stalks, &c. *Mortimer's Husbandry.*

Coal-ASHES, from their calcareous quality, are singularly beneficial to stiff and sour land, for which purpose they are successfully used in the neighbourhood of some great cities, where coal is burnt for fuel. They open clayey grounds, and correct their bad qualities. The gardeners and farmers about London know their value, and make a very profitable use of them, particularly to bring into order those grounds which have been dug for brick-earth. After spreading these ashes upon the clay bottom, they either sow horse-beans, or set the early Spanish, and sometimes the Windsor-bean, in those spots; or else they lay such lands down with rye-grass, which generally succeeds very well. Mr. Bradley blaming the people of Staffordshire, and the counties adjoining, where there are coal-pits, for not improving their heavy grounds around those pits, by manuring them with coal-ashes, which might be easily burnt out of the

the waste coals, says, "that wherever there are plenty of coal-pits, there can be no want of good profitable land." *Bradley's Husbandry*.

Mr. Mortimer agrees entirely with Mr. Bradley, esteeming sea-coal ashes as the best manure of any for cold lands, the most lasting, and the fittest to kill worms. Their sharp and drying quality opens the pores of stiff soils, and discharges a great deal of their viscous quality. Mr. Worlidge looks upon them as an excellent compost when mixed with horse-dung; he adds, that they are a great curer of moss and rushes in moist grounds. *Worlidge's Husbandry*.

Kiln-ASHES, made of straw, furze, &c. are a good manure for almost any kind of soil. In the west of England, farmers sift them over their corn and grass; but this must not be done in windy weather, because they are so very light that they would be easily blown away. They succeed best when laid on just before rain or snow. *Mill's Husbandry*, vol. I.

Peat-ASHES are likewise a very good manure. Mr. Miller is of opinion, that they are greatly bettered by being mixed with lime before they are laid on the land.

Mr. Ellis has rightly observed, that there is a considerable difference between the ashes of lean peat, and those produced by the fatter kind. If barley, says he, be sown so late as the beginning of May, lean peat-ashes in particular may be applied over it, or harrowed in with the grain: but ashes burnt from fat black peat, such as is dug at Newbury, are of so sulphureous a nature, that farmers are afraid to lay them on their barley; nor do they dress their wheat with them till the spring is advanced, and then they are sown over it.

The earth of which this rich manure is made, is taken from a black moorish ground, with a narrow wood scoop, which brings it out like a long brick. These pieces of swampy earth are laid on the ground to dry in the summer; after which they sell for eight shillings a waggon load, for fuel. But when they are to be used for manure, after being dried, they are burnt in heaps of ten, twenty, or thirty loads, laying on more peat upon the outides, as the fire increases within, to keep it from having too much vent.

The great use of these ashes was discovered some years ago; but they soon fell into disrepute, owing to the injudicious management of people, who imprudently laid on too great quantities of them at a time, by which means the corn was burnt. Afterwards they found that six, or at most ten bushels, were sufficient to be sown over an acre of wheat, pease, turneps, clover, rape-seed, or saintfoin, as early as could conveniently be done. But still many are afraid to sow them over barley, lest a dry season should ensue, and burn it up: for these ashes are thought to contain three times as much sulphur as there is in coal-ashes. This is reasonably supposed from their very strong sulphureous smell; their sparkling and jumping when stirred while burning, and their drying up corn by their too great heat. These peat-ashes, as likewise those of wood or coal, will help to keep off the flugs from pease and other grains, by the salt and sulphur contained in them, and conduce very much to their preservation in cold wet seasons. But no danger of over-heating need be feared from the ashes of that peat which grows, as turf, over sandy bottoms, as great quantities do on Leighton heath in Bedfordshire; for these are as much too lean, as the others are too rank. *Ellis's Modern Husbandman*, vol. II.

These ashes are produced from land that is black and crumbly at top, under which lies the peat, to the depth of several feet. They do not burn the peat in the field for ashes, by choice, because the peat is burnt for the ashes when it cannot be dried sufficiently for sale: and then it is burnt in large heaps, with a smothering fire: as is likewise the superficial black earth or moory soil, together with the refuse of the peat: the ashes of these are laid up in round or long heaps, rising at top like the ridge of a house, in order to throw off the rain, and keep them dry, till they are sold. Sometimes they are laid under dry sheds, or in-houses, to save them from wet, which they cannot be wholly protected from by laying them up in ridges exposed to the weather, into which the rain penetrates for some inches deep: and these ashes are never so good manure as those that are kept dry.

Near the surface of the peat-earth here, there is sometimes a bed of whitish earth, called maum, which is a composition of earth and very small shells of the periwinkle kind: this is also burnt to ashes for manure, and the quan-

tity of it in some places is so great, that the ashes are of a whitish colour, and those from the peat or moorish earth are reddish. The white ashes are esteemed to be as good manure as the red: and being a kind of shell-marl, would make good manure without being burnt: as indeed they rarely are thoroughly, though they seldom lay them upon land, till they have passed the fire, or are mixed with the ashes of the peat-earth. The ashes of the peat sold for fuel, and burnt in chimneys, are much stronger manure than the ashes burnt in the field; and if care is taken to keep them dry, are sold for about double the price of the field ashes.

We must not here omit the account which the ingenious Mr. Du Hamel has given of a kind of peat-ashes made in France, as the same kind of earth with that from whence they are burnt may be doubtless found in many parts of England, if farmers would give themselves the trouble to search for it.

This peat is a blackish earth, resembling the soil of some meadows. When burnt it emits a thick, disagreeable sulphureous vapour. A certain degree of moisture helps to make it burn, though even then it wastes but slowly. After it has once taken fire it burns of itself, but without producing any flame. It is of so caustic a nature, that it would strip off the skin of the hands and feet of the men who knead it, if they did not take proper precautions against that inconvenience. Its ashes retain this caustic quality; for the hands of those peasants who strew them are often hurt by it, if the air be at all damp. This earth, in its natural position, runs in veins of different sizes; sometimes seven or eight feet thick, and thirty or forty feet long; and sometimes they extend four or five hundred feet; after which the vein often fails at once, and perhaps is not found again till two or three miles off. These veins generally lie pretty near the surface of the earth, seldom deeper than twelve or fifteen feet.

This earth is found only in marshy places, which must sometimes be drained before it can be come at. It shews itself by a slimy skin over the adjacent waters.

Three pounds of this earth being distilled in a retort, produced fifteen ounces of a bituminous oil, resembling that extracted from pit-coal; and the residuum yielded, when washed, about half a pound of vitriol.

The method of preparing this earth, in order to render it fit for fertilizing land, is as follows: water is thrown over it, and two or three men knead it with their feet, till they bring it to the consistence of a paste, which is then made into cakes seven or eight inches in diameter. These cakes are laid by to dry, though not to such a degree but that there still remains a little moisture in them, that being necessary to facilitate their burning.

Their cakes thus prepared are piled up in the form of a pyramid, with sufficient spaces between them for the fire to penetrate; and under this pyramid, which is built upon a kind of hearth, a little straw and brush-wood is laid to set them on fire. Two or three days after their ashes are spread with a rake, that they may cool. Some veins of this earth yield white ashes, but they are not so good as those of a reddish hue.

From fifty to seventy pounds of these ashes are spread upon each acre of land in April or May; and in about a week's time the blades of corn, or grass, if it be pasture ground, assume a new verdure, and appear surprisingly strong, even in the coldest soils.

Some of these bituminous earths are better than others. Care must be taken to begin to rake out the ashes of each pyramid as soon as the greater part of it is burnt: for they would lose a great deal of their virtue, if left on the fire till all that is inflammable be consumed: nor would the fire go out in less than a fortnight or three weeks, if they were not scraped away as they are formed.

It would be needless to mention, that a greater quantity of the ashes of an inferior quality must be used, than those that are stronger, and consequently better; but it may not be amiss to observe, that, in general, wet lands require more than dry soils. The effects of this manure will be manifest for two or three years. It might be dangerous to renew it every year. *Traite de la Culture de Terres*, tom. V. pag. 226.

In Norfolk, ashes are not in estimation as a manure; even those of the hearth are in a degree neglected. The meadows and fens abound with peat-bogs, which in some places would be considered as inestimable sources of manure. The peat in the meadows would no doubt afford an ample supply of ashes. *Marshall's Rural Economy of Norfolk*.

Pot-

Pot-ASHES are the refuse or ashes remaining after the salt, called pot-ashes, is extracted from them.

These ashes are of great service to most sorts of land; but as they have been in a great measure deprived of their salts, it is necessary to lay them on much thicker than other ashes. A bushel and a half of these may be used for a bushel of fresh ashes: but they should always be mixed with some other light ingredient, which may be used in any quantity, if laid on very stiff land. If the land be not over stiff, they may be laid upon it with less mixture. *Bradley's Husbandry*.

Soap-ASHES are a composition of wood-ashes and lime, remaining after the soap-makers have drawn off their lye.

Soap-ashes are likewise a very valuable manure, but there is great difference in the quality and effects of them. Those from wood-ashes are the weakest sort of them; for the wood-ashes being very light and spongy, their salts are soon dissolved, and extracted by the lye; so that there remain but very few salts in the ashes. But when the soap-boilers make use of kelp, which they sometimes do, instead of wood-ashes, the kelp being of a harder consistence than wood-ashes, the parts of it are not so easily separated by the lye, and much more of the salts remain in the ashes. But the soap-boilers use another kind of pot-ash, called barilla, which is imported from Spain in large lumps, which are much harder than common pot-ash; and though the soap-boilers break this sort very small, and sometimes screen or sift it, much more of its salts remain in it than in the pot-ash; so that the ashes from the barilla are stronger than any other; and if the same quantity of them was laid upon land, as is commonly laid of the wood-ashes, they would burn and destroy the crop. Farmers should therefore use soap-boilers' ashes with caution, till they know their quality and strength. Wood-ashes and pot-ash are used in various places for making soap; but in and near London, very little of any but barilla. The ashes from the barilla are a strong rich manure, and sold at 5s. per cart-load. They are not now so good as formerly, the soap-makers having found means to extract more of their salts from them; as they have also the salts from the lye, which were formerly rather superior to the ashes, as a manure, and was to be had for nothing, being all thrown away as useless.

They are an excellent manure, and were first used by the Flemings with very great success. Two loads of these ashes are sufficient for an acre of arable land; and by the assistance of this manure the ground will not only yield a large crop, but may be sown yearly, without leaving it fallow at any time. They should be laid on the ground in the beginning of winter, that the rain may more easily dissolve and wash them in. Sir Hugh Platt tells us, that by manuring a piece of barren land at Bishop's-hall in Middlesex, in the year 1594, he obtained an excellent crop of summer barley; that he measured the stalk and ear of one of these plants, and found it to be an ell and three inches in length, from the ground to the summit of the ear. We have given a figure of this ear of summer barley in its natural size, on plate III. fig. I. *Platt's Jewel-house of Art and Nature*.

A writer in the *Museum Rusticum* declares, that he has for many years past received great benefit by using soap-ashes as a manure, with which he almost constantly dresses his wheat lands; but never uses it alone, on account of its hot burning quality.

"My method, adds he, is to make a large heap of dung and earth, that is, two loads of earth to one of dung, placed in alternate layers to rot. After this has undergone a strong fermentation, I cause the whole heap to be turned and well mixed, leaving it for some time longer to mellow.

"I then procure the soap-ashes, and mix them with the compost, in the proportion of one-load of ashes to ten of the compost, leaving, for some time, the whole to mellow together.

"When wheat seed-time comes, about the latter end of September, I cause about ten cart-loads of this rich compost to be laid in little heaps on each acre of the land I intend to sow with wheat: this manure is immediately spread, and, sowing my wheat broad-cast, I plough it in together with the compost.

"The advantage resulting from this practice, on stiff soils, are many; and particularly, if the farmer is the least careful in preparing his tilth, he will have a clean crop, free from smut or weeds; a matter of no small consequence to him.

"I have tried this manure on lighter lands, and find it answer extremely well, provided it has lain a considerable time in the compost heap, to mellow and abate its natural

heat; but it agrees best by far with clayey soils, and in such is well worthy of being recommended as an excellent dressing for a wheat crop." *Museum Rust. vol. IV. pag. 339.*

Turf-ASHES are a good manure, but much inferior to peat-ashes. Of this I saw once a remarkable instance. A field, whereof the soil was a poor gravel, and had a crop of the broad or red clover growing upon it, was dressed one side of it with peat-ashes, and the other side with turf-ashes; the farmer laid upon this field all the ashes he had of these two sorts, and the middle of the field had no dressing. The clover in the middle part not dressed was a very poor crop, the plants being short, yellow, and stunted. The side dressed with turf-ashes was much better than the middle, the plants being taller, of a better colour, and promised to be double the crop of the undressed: but that side dressed with peat-ashes, produced a crop that appeared to be as much superior to the part dressed with the turf-ashes, as this last was superior to the middle that had no dressing. The ashes were sown upon the clover by hand, and the improvement made upon the clover was so great, that the cast of the sower's hand was extremely plain next to the middle, and appeared like an indenture: and the vigour of the plants there, was so much greater than the undressed plants, that the extent of the peat-ashes might be plainly distinguished almost to an inch. This observation was made in the beginning of summer before the clover had arrived to its full growth.

Turf ASHES, are the ashes procured by burning turfs, or the parings of the surface of heathy and moorish land. See the article BURN-BAKING.

These parings, or turfs, are cut in a dry season, and set up to dry thoroughly, leaning one against another; and, when dry, are piled into small heaps or piles, about a quarter or half a load, in each, carried up exactly square to a certain height, and then drawn up gradually in a pyramidal manner, so as to throw off any accidental showers. In a very dry season even the covering of these piles may be carried home, and stacked or housed indiscriminately with the rest; but in a wetter season it is usual to separate and dry those topmost turfs, if the weather allows, and to stack them separately, to be used on the tops of fires, when large, as dampers. A stout labourer will, in a day, cut two waggon-loads of these turfs. The women and children can set them up to dry, and the women can pile them up.

These ashes, (in the moors of Yorkshire, where, as the Rev. Mr. Comber informs us they are greatly used, the principal firing being turfs) are carried out daily, or once in two or three days, to the dunghill; and the farmer takes the opportunity of his first leisure towards the end of the year, to carry them out to his meadow land, on which he lays them thicker or thinner, as he has more or less land which he apprehends to want them, or more or less of them. The first rains wash them in, and the next summer never fails to shew their good effect.

It will be easily imagined, that as these ashes are much finer, or more pulverised than those of coals, so they insinuate themselves more into the soil, but are in their effects much less lasting. However, as every year brings a considerable supply, the farmer is less concerned that they are not a lasting manure.

In the moors of Yorkshire, the farmer is so sensible of the efficacy of these ashes, that it is become a proverb among them, "The better fire, the richer farmer." In consequence of this principle, the farmer endeavours to procure all the ashes he can from the cottagers who have no land. And hence a happy connection arises; for the poor cottager finding the article of carriage the chief part of the expence of his fuel, is wise enough to bargain with the farmer to bring him home such a quantity of his turfs in consequence of his ashes.

Some farmers lay these ashes on their ground in the spring; and if showers follow, they will have their effect in the summer crop, though not so great as if they had been laid on at the end of the year. It must however be remarked, that he who lays on his ashes in the spring, lays on what has been very lately made in the winter; and he who lays on at the latter end of the year, lays on what has been evaporating during the whole summer; so that it is not easy to say which method is the better. *Museum Rusticum, vol. V. p. 311.*

ASPEN-TREE, a species of the poplar, and called by botanists, *populus foliis subrotundis dentato angulatis utrinque glabris*. Poplar-tree with roundish leaves, having an angular indenture, and smooth on both sides.

The leaves of this tree stand upon long slender foot-stalks,

stalks, so as to be shaken by the least wind, from whence it has been called the trembling poplar, or aspen-tree.

The method of cultivating this tree is the same in every respect as that of the abele-tree. See ABELE-TREE.

ASS, a creature well known in most parts of Europe, and proves very useful in many respects, if taken proper care of.

The horse is trained up, great care is taken of him, he is instructed and exercised; while the poor ass is left to the brutality of the meanest servants, and the wantonness of children, that so far from improving, he must be a loser by his education; and indeed, had he not a large fund of good qualities, the manner in which he is treated is sufficient to exhaust them. He is the sport, the butt, and the drudge of the vulgar; who, without the least thought or concern, drive him along with a cudgel, beating, overloading, and tiring him. We do not remember, that, if there were no horses, the ass would be considered both with regard to himself and us, as the most useful, most beautiful, and most distinguished of animals. Instead of being the first, he is now the second; and from this accident alone he is held in no estimation. It is the comparison that degrades him: he is considered, not in himself, but relatively to the horse. We forget that he is an ass; that he has all the qualities of his nature, all the gifts annexed to his species; and think only on the figure and qualities of the horse which are wanting in him, and which it would be improper for him to have.

By his natural temper he is as humble, as patient, and as quiet, as the horse is proud, fiery, and impetuous; he bears with firmness, and perhaps with courage, blows and chastisements. He is sober both with regard to the quantity and quality of his food, contenting himself with the most harsh and disagreeable herbs, which the horse and other animals will not touch. In water he is very nice, drinking only of that which is perfectly clear, and at brooks with which he is acquainted. *Buffon's Hist. Naturelle, tom. IV.*

The ass, though a contemptible creature, is very serviceable to many that are not able to buy or keep horses; especially where they live near heaths or commons, the barrenest of which will keep them, being contented with any trash, dry leaves, stalks, thistles, briars, chaff, and any sort of straw is excellent food for them; they require very little looking after, and will sustain labour, hunger, and thirst, beyond most creatures. They are seldom or never sick; and endure longer than any other creature. They may be made use of to plough light lands, to carry burdens, to draw in mills, for which they are very excellent, to fetch water, or any other odd things. They are very useful for their milk, which is an excellent restorative in consumptions, and other weaknesses: but they would be of much more advantage were they used, as they are in foreign countries, for the breeding of mules. See the article MULE.

The she-ass, if you have any regard to their breed, should be covered between the months of March and June. The best age to breed from, is from three years old to ten, and you should let the young ass suck two years, and not work them till they are three years old.

Those are reckoned the best shape that are well squared, have large eyes, wide nostrils, long necks, broad breasts, high shoulders, a great back, short tail, the hair sleek and of a blackish colour: their skins make the most durable shoes of any sort of leather. *Mortimer's Husbandry, vol. I. pag. 222.*

ASTHMA. See BROKEN-WINDED.

ATMOSPHERE, the vast body, or collection of air which surrounds the earth to a very considerable height.

Clouds, which are precipitated in drops of rain for the service of mankind, do not consist wholly of watry particles; for besides aqueous vapours and what these contain, there are raised from the surface of the earth into the air, sulphureous and saline particles, which are also carried up into the clouds, and mixed with the aqueous vapours. Here we have a mixture of all such substances, as it were, in their extremely small parts, floating in the air together; and the effects of these sulphureous and saline particles, thus mingled with aqueous vapours, are sometimes very sensible, especially in thunder and lightning; when the sulphureous and nitrous particles taking fire, by the motion arising from heat, break out with the violence of flashes and noise, very much resembling the effects of gunpowder.

Another proof that there are nitrous particles raised into the air, we have in the nourishment which rain, replete with these ingredients, give to plants more than any other

water; and also from the collection of nitre or saltpetre in heaps of earth, out of which these principles derived from rain are known to be extracted, if these heaps of earth be exposed to the air, so as to keep the wet weather from spoiling the operation. It is also a convincing argument, that these nutritive ingredients are of consequence in vegetation, by plants in water refusing to grow in drouthy weather, notwithstanding they have such plenty of moisture; from their being absolutely at a stand when rain has been long a stranger to the earth, they are plainly seen to go forward with the business of vegetation, like those plants which have been deprived of motion or growth, when the fine showers descend, and continue to do so for some time.

Here then, in both cases of the plants in a pond, there is water, but there are only in one these vegetative principles, which give motion to the plants, and consequently those ingredients are absolutely necessary to vegetation; and therefore we may conclude, that water, when properly diluted by fermentation at the roots, is only an assistant to plants, in applying those necessary principles, or helping to conduct them through the tubular interstices of the fibres, or to float the nitrous particles through the whole system of the operation in motion, or growth of vegetables, and not the food itself, or any sort of nourishment, when divested of those principles. Whether, therefore, the system of exceeding fine fibres, or tubes of a plant at a stand in a pond, in a very drouthy season, admits that water undiluted, for want of nutritive or fermenting principles, into its body, during the great want of rain; or whether it absolutely refuses to imbibe, or cannot attract, for want of a finer division of its parts, any of it, as there are in it no nutritive ingredients, does not seem to admit of any doubt in favour of the latter question, which, if true in nature, may possibly be of service in the growth of some sorts of plants, and perhaps save much trouble in attempting to force others forwards with some sort of water.

Since it is plain that there is a vast quantity of nitrous, sulphureous, and bituminous matter all over the surface of the earth, and that plants and animals abound with volatile salts, we need not wonder that the heat of the sun fills the air with such fine particles, and all sorts of unctuous exhalations, by first expanding them, after which they rise till they meet with air and other mixtures of the same specific gravity. What are usually called *ignes fatui*, seem to consist of a more unctuous substance than other exhalations, for we find their oily particles are easily fixed, but not so soon spent as those of sulphur and nitre. Shooting stars are improperly so called, because they are nothing more than exhalations kindled in the air; and if a long train of substances take fire at once, it is commonly termed *a dart*; and if there be many, and they continue in the same place, they are then called *beams*.

Thus we plainly see how full the atmosphere is of these rich ingredients for the business of vegetation; and because they are of such vast consequence to the growth of plants, we will enumerate the sources of them upon the frame of the globe; from whence the sun and wind borrow them, in order to disperse them properly in the air, that they may intimately mix, and descend with the rain-drops, and so be conveyed to the mouths of the fibrous tubes of plants, with the greatest care and skill: from these ingredients first leaving the surface of the earth, through the whole process of their various motions, configurations, and combinations, till they are prepared in the most exquisite manner to be received into the bowels of vegetables, which we plainly see stand in great need of them, as without their friendly assistance, or some compositions of dung to resemble them, they are unable from water and earth alone to go forward to maturity.

Salts are of various kinds, but all have a sharp pungent taste, though not all alike; and of these some are dug out of the earth like stone out of a quarry; others are made by art, by letting the sea-water into shallow pits on the shore, and continue there till the aqueous particles are exhaled by the sun and wind, and then the salt remains at the bottom. The salt is in its nature the same in both cases; for the saline particles are not made by art in the combination of ingredients to imitate it; they are only separated from the watry particles wherein they floated. The qualities of this excellent ingredient in vegetation are, that it easily dissolves and melts readily in the open air, if it be refined from all heterogeneous matter; when the water wherewith it is entangled is any ways drawn off, there remains a gross sediment, but the finer parts are carried away with it: this sediment

ament is the only part the fire cannot melt, but reduces it to a calx.

This facility of the finer parts swimming, as they are specifically lighter than water, contributes to the benefit of plants; or rather these fine saline particles are of the same specific gravity with the water; that they may intimately mix with it, and be carried in those vapours through all the necessary stages, till they return to the earth again. This quality of melting and dissolving in water and air, sets the finer parts at liberty, and prepares them to take wing with the common exhalations. And yet the sediment, or grosser parts, which are left behind, have their excellent uses in helping the embryos of plants to send out their fibrous tubes; in search after more refined particles, which either adhere to the superficies of the particles of earth or air contained in their internal pores.

Nitre, of which there are several sorts, natural and artificial, the former refining itself, and the latter refined by art, is a kind of salt, which easily takes fire, but like sea-salt is easily reducible to a calx. The vapours, or particles of nitre, when they descend for the use of plants, are found to contain abundance of spirits; for the nitre, as a salt, is impregnated with them, which render it volatile, and the fluid extracted from it is very sharp and corrosive. The calx to which nitre is reducible, as well as the calx of common salt, has its excellent use in vegetation; and when it is reduced by fire to this state, it then takes the name of fixed salt, or rather the ashes of salts: the benefit of this calcination to land is manifest from the ashes of burnt vegetables, and other natural bodies reducible to a calx: for the rich principles, or food, if we may call it so, of vegetables, are contained more or less in all bodies whose parts can be thus separated; as is evident from the operations in chemistry, which reduce bodies to their component parts, by the help of fire.

Sulphur is a liquid clammy substance, whose parts are soon separated, and rise up into the air with other vapours, and soon occasions violent motions in the atmosphere, and becomes entombed in the aqueous particles, and is with the rain brought down to the plants. Bitumen is pretty much of the same nature with sulphur, and with it is found in great plenty in most bodies, but in the most remarkable manner, and in the greatest quantities, in pit-coal; yet not in equal quantities, as some coals burn better than others, and consequently may contain more or less of these principles, which are apt to burn. Naptha is a kind of bitumen, and the only difference is, that it takes fire sooner than bitumen is observed to do, and is not so easily quenched; and this facility of admitting the heating particles, which throw these inflammatory bodies into a speedy motion internally, is of great use in the different degrees of the plant's growth.

Maltha seems to be a species of naptha; its properties, as they appear to common observation, are, that if it touches any thing, it sticks so fast to it, as not easily to be separated; and water thrown on it in moderate quantities, does but the more inflame it, and earth alone is able to quench it. This valuable ingredient, when it descends in the drops of rain, adheres very intimately to the internal parts of the soil, both in the superficies and the concave parts of the pores; and other descents of rain increase the motion of the internal parts of the particles of maltha, and thereby promote a fine dilatation in the tubular interstices of the fibres of plants, and duly contribute to the acceleration of that motion in them, which is necessary to the different stages of their growth and nourishment. Before the fine parts of the maltha are in readiness, or duly prepared by moisture, and their well regulated fermentation, and while it is waiting for the descent of more rain, it is divested of all internal motion, and confined as a prisoner, till the other requisites to the plant's welfare are properly assembled, and ready to perform their offices.

These are the chief materials which give motion to plants, and of which the latter are found to consist, when they are analysed, unfolded, or separated into their component parts by chemistry. The professors of that art call the volatile spirits, sulphur, and saline particles, the active principles; because these, when duly prepared, and exactly applied to the mouths of the fibres, become the sole agents, and by their continual motion cause the whole action of the plant.

The vapours thus raised from the surface of the earth, become the original matter of all meteors, or heterogenous substances, fit for the production of the vegetable world; and consequently an instrument in the wise appointment of

Divine Providence, for the preservation of man, and all subordinate animals. When these heterogeneous vapours are thus lifted up above the earth, one degree of cold condenses them into larger globules, which then becoming specifically heavier than the atmosphere, fall in drops of rain, and bring down all those treasures intombed in them. A greater degree of cold produces a coagulation of the heterogeneous vapours, which shoot like salts into various forms, united into certain angles; and make the flakes of snow, which still contain the nutritive principles.

A third, or still greater degree of cold, combines the vapours into a harder substance, wherein the valuable ingredients are intombed, and they descend in what we call hail; but if the cold condenses the vapours before they rise high above the surface of the earth, they will be unable to ascend, but will hover about, and fill the lower part of the atmosphere with what is usually called a fog or mist; and if the cold be still more intense, the mist is frozen to every twig and blade of grass in form of a white incrustation, which is called rime. When the air in the day-time is warm, and the vapours buoyed up in it are too fine to be then visible, they will be condensed by the coolness of the evening, and descend on the vegetables in the form of dew; and if the evening of such a fine day be cold enough to freeze, then, instead of a dew, the surface of the ground will be covered with what is commonly called a white frost. These are the various ways appointed to bring down again upon the earth the treasures that were taken from it, in order to be prepared and properly spread over the globe, by methods and contrivances equally beautiful and surprising; and all this for the supply of needy man, who is, when these blessings are for a considerable time withheld from him, turned to destruction.

But among the riches of the atmosphere for the production of vegetables, we must not forget the consequences which the air itself is of to them; as we have already observed under the article air. See AIR. *Randall's Semi-Virgilian Husbandry.*

AVENUE, a walk planted on each side with trees, leading to an house, wood, &c.

The English elm will do in all grounds, except such as are very wet and shallow; and this is preferred to all other trees, because it will bear cutting, heading, or lopping in any manner, better than most others. The rough or smooth Dutch elm is approved by some, because of its quick growth: this is a tree that will bear removing very well; it is also green almost as soon as any plant whatever in spring, and continues so as long as any, and it makes an incomparable hedge, and is preferable to all other trees for lofty espaliers. The lime is valued for its regular growth, and fine shade: the horse-chestnut is proper for all places that are not too much exposed to rough winds. The common chestnut will do very well in a good soil, and rises to a considerable height; when planted somewhat close, though, when it stands single; it is rather inclined to spread than grow tall. The beech is a beautiful tree, and naturally grows well with us in its wild state, but it is less to be chosen for avenues than the before-mentioned, because it does not bear transplanting well, but is very subject to miscarry. Lastly, the ash is fit for any soil, and is the quickest grower of any forest-tree. It seldom fails in transplanting, and succeeds very well in wet soils, in which the others are apt to fail. The oak is but little used for avenues, because of its slow growth.

The old method of planting avenues was with regular rows of trees, and this has been always kept till of late; but we have now a much more magnificent way of planting avenues: this is, by setting the trees in clumps or platoons, making the opening much wider than before, and placing the clumps of trees about three hundred feet distant from one another. In each of these clumps there should be planted either seven or nine trees; but it is to be observed, that this is only to be practised where the avenue is to be of some considerable length, for, in short walks, this will not appear so slightly as single rows of trees. The avenues made by clumps are fittest of all for parks. The trees in each clump should be planted thirty feet asunder, and a trench should be thrown up round the whole clump, to prevent the deer from coming to the trees to bark them. *Miller's Gard. Dict.*

AVER, a general name for a labouring beast of any kind.

AVERAGE, a term used by the farmers of many parts of England for the breaking up of corn-fields; otherwise called oddish, or roughings.

AVER-LAND, the land ploughed by the tenants for the use of their lord.

AUGUST, the eighth month of the civil year.

This month returns the countryman's expences into his pockets, and encourages him to another year's adventure. If it proves dry, warm, and free from high winds, it saves a great deal of the husbandman's expence.

You may yet twifallow, also lay on your compost or soil, on your lands intended either for barley or wheat.

Carry wood, or other fuel home, before winter approaches and renders the roads deep and heavy.

Provide good seed, and well picked, against seed-time.

Put up your ewes and cows you do not like, to fatten.

This is generally the principal harvest-month for all sorts of grain, therefore make the best use of good weather while you have it.

About the end of this month you may mow your after-grass, and also clover, faintfoin, and other French grass. Geld lambs, and make the second return of your fat sheep and cattle. *Mortimer's Husbandry, vol. II.*

AUGRE, an instrument much used by carpenters, wheelwrights, &c. for boring large round holes. It consists of a wooden handle and an iron blade, terminated with a steel bit.

A common augre may be very usefully applied to try the nature of the under soil, and layers of earth, in order to know what may be expected from them, with regard to the vegetation of plants. In order to this, three augres will be necessary; the first of them about three feet long; the second six; and the third ten. Their diameters should be near an inch, and their bits large, and capable of bringing up part of the soil they pierce. An iron handle should be fixed cross-ways to wring it into the earth; from whence the instrument must be drawn up, as often as it has pierced a new depth of about six inches, in order to cleanse the bit, and examine the soil. But the borer, an instrument invented by the marquis de Tourbilli, is much better adapted to this operation. *See the article BORER.*

AVIARY, a place set apart for the feeding and propagating birds. An aviary should be sufficiently large as to allow the birds a considerable freedom of flight; and turfed, to avoid the appearance of foulness on the floor.

AWMS, the beard of wheat or barley. The word is, in some parts of England, pronounced *ails*.

AXIS, or *axle-tree*, of a waggon, cart, &c. is the strong piece of wood or iron which supports the carriage, and round the extremities of which the wheel turns. *See the articles CART and WAGGON.*

B

BAC

BACK-SINEW, in a horse, is that strong sinew extending along the hinder part of the flank from the knee to the heel, into which it is inserted.

The back-sinew is so very subject to be hurt or strained, that it is considered as one of the most common and usual accidents that happens to a horse; it generally proceeds from hard riding upon dry grounds, and from other causes, where the roads are stony and hard, and sometimes where they are poachy.

It is easily perceived by the swelling of the sinew, which sometimes extend from the knee down to the heel; and when it is so, a horse does not care to set his foot even upon the ground; but, for the most part, in his standing, sets it before the other.

The usual way of curing this malady is with cold charges, which often succeed very well, if frequently renewed; some use curriers shavings bound round the knee with a bandage, and this also answers very well in some cases; but there is nothing either so ready or efficacious as vinegar or verjuice mixed with bole, being often in a day soaked well into the sinew warm; and if any thing of the lameness or swelling remains after this, and after the heat and inflammation is gone off, a mild blister, that has nothing corrosive in it besides the caustic salt of the flies, will, generally speaking, effectuate a cure, and bring the sinew fine.

When hot and relaxing oils mixed together are used to the back sinew, which many practitioners are fond of, because they sometimes succeed in horses that have their sinews strong and rigid, yet they are apt to engender windgalls of a bad kind, or make the veins on each side the sinew to be full and gorged; and horses have been known to be lame for two or three years together with these varixes in the veins. Blistering in this case has very little or no effect, firing through the vein till the blood comes being only sufficient to remove that weakness. After the firing, the whole leg from the knee down to the heel, and all the hollow places on both sides, must be charged with a good strengthening plaister, which will perfect a cure, especially if the horse be turned to grass for a month or five weeks, or, in

BAG

the winter, if he runs a little while in a smooth yard, where he has good dry litter. *Gibson on the Diseases of Horses.*

BACON, the flesh of a hog dried in the smoke.

A writer in the *Museum Rusticum*, vol. III. pag. 234, has given us the following method of making bacon in Somersetshire:

The season for killing hogs for bacon is between September and Christmas. When you kill a large hog for bacon, lay the sides in the salting-troughs, and sprinkle them pretty heavily with bay-salt: then leave them twenty-four hours to drain away the blood, and some of the overabounding juices.

After this take them out, wipe them very dry, and throw away the draining. Then take some fresh bay-salt, and heating it well in a large iron frying-pan, rub the meat very well with it; repeating this work every day for four days, and turning the sides every other day.

If the hog be large, keep the sides in brine, (turning them ten times) for three weeks; after which take them out, and let them be thoroughly well dried in the usual manner: if they are not fully dried, they will neither keep so well, nor eat so fine.

BADGER, the name of an animal, common in many parts of England; and called by several names, as a gray, a brock, a boreson, or a bauson.

Badgers are almost as pernicious a creature to the husbandman as a fox, though not so subtle, nor can they so easily catch their prey; but for what they can catch, as new fallen lambs, young pigs, and poultry, they are as bad. The way to catch them is with a springe, or a steel-trap, or to dig a pit across their path five feet deep, and about four feet long, making it narrow at the top and bottom, and wide in the middle. This must be covered with some small sticks and leaves, so as that the badger may fall in when he comes upon it. Some hunt them into their holes in a moon-shine night, and then dig them out. *Mortimer's Husbandry, vol. I. pag. 314.*

BAG, a name given by farriers to a medicine for recovering a horse's appetite when lost. It is done in this manner:

manner : they take an ounce of assa-fœtida, and an equal quantity of the powder of favin ; these ingredients they put into a bag, which they fasten to the horse's bits, keeping him bridled for two hours, two or three times a day : as soon as the bag is taken off, he will immediately eat. The same bag will serve a long time.

BAKING of land. If some sorts of stiff and binding land be sown dry, and a scud of rain falls before the earth has time to settle, it is observed that the crust of such land will bake, so that the corn cannot come through, to the great damage of the crop : this evil does not happen if such a scud of rain be followed by cool cloudy weather, and not hot sun-shine ; for then the earth will not be so hollow as to be baked. The best way to prevent this is, to roll it immediately after sowing, which fastens the earth together, whereby the sun has not that power of piercing into it, and consequently not of baking it.

Land of this kind should, therefore, be sown as often as possible with winter corn, such as wheat and vetches ; for if wet follows the sowing, the sun is not strong enough at that time of the year to scorch the ground up, and bind it ; and it is observed, that this sort of ground has been always lucky for vetches, probably for the above reason. *Lisle's Observations in Husbandry, vol. I. pag. 26.*

BALK, a piece of land which has been either casually overslipped, or not turned up in ploughing ; or carefully left untouched by the plough, for a boundary between lands, or some other use.

BANDS, a small parcel of the longest wheat taken from the grips, and twisted together at the ear-ends, for binding the wheat into sheaves.

The bands should be laid in the morning, that they may not crack ; for the straw will not twist after the sun is up, but will be brittle, and break off below the ears. The turning of three or four of the stubble or bottom ends of the straw to the ears of the band, helps greatly to add to its strength and toughness.

The bands for binding up the sheaves should not be spread but in fair weather, because being pressed down by the grip or two which it is necessary to lay upon them to keep them in their places, and prevent their being untwisted by the sun, they will grow sooner than any other part of the corn, if rain should come ; for they cannot dry on account of their lying undermost. But though the bands must always be made while the morning dew is upon them, the sheaves ought by no means to be bound up wet : if they are, they will certainly grow mouldy.

Farmers do not always attend sufficiently to the binding up of their sheaves, but suffer the reapers, for dispatch, to tie the bands just underneath their ears, instead of binding them at the other end ; the consequence of which is, that they will hardly hold together to be slung into the cart, and will certainly be in great danger of falling to pieces before they are thrashed.

If a little rain be foreseen in harvest time, it is best to bind the grips into sheaves as fast as they are made ; because small showers will wet the single grips so much, that they cannot be bound up, and these showers may be the forerunners of greater rains. The sheaves being bound will soon dry after such wet. But if a hard rain is foreseen, the best method is not to bind the wheat into sheaves, because they will then be wet to the bands, and must be opened again. Mr. Lisle tells us, that one of his neighbours to whom this happened, unsheafed some of his wheat to dry it, and opened it and turned it so often, that the ears broke off, whereby he lost half his corn ; caution therefore ought to be used in this case, lest by curing one evil we create a worse. *Lisle's Observations in Husbandry, vol. I. pag. 333.*

BANDS of a saddle are two pieces of iron, flat, and three fingers broad, nailed upon the bows of a saddle, one on each side, contrived to hold the bows in the situation that makes the form of a saddle.

BANE, in sheep, the same as rot. See the article ROT.

BANGLE-EARS, an imperfection in a horse, which may be remedied in the following manner : place his ears as you would have them stand, and then with two little boards, or pieces of trenchers, three fingers broad, having two long strings fastened to them, bind the ears so fast in the places where they stand, that they cannot stir ; then behind the head, and the root of the ears, you will see a great deal of empty, wrinkled skin, which you must pull up with your finger and thumb, and clip away with a pair of sharp scissars all the empty skin close by the head ; then

with a needle and red silk, stitch the two outsides of the skin together, and heal the wound with a mixture of honey and turpentine : when this is done, take away the splints that hold up the ears, and in a little time they will keep the place where you fixed them, without alteration.

BANK, a heap of earth piled up to keep out the water of a river, lake, or the sea.

Sloping banks are the best security against the encroachments of the sea, of rivers, or of lakes ; making proper allowance for the weight of water, and violence of the waves. These banks should be raised about two feet above the level of the water at the highest tides, and their strength should be proportioned to the force of the water intended to be fenced off. When a river is too much confined, it swells considerably upon a flood, and consequently requires banks of greater height and strength than would otherwise be necessary : though it will sometimes break even these, and carry all before it, if a sufficient space be not allowed for the increase of its water : but when such a space is left, the waters spread, and seldom rise more than two or three feet above their usual level. In some cases a breadth of fifteen or eighteen feet on each side may do ; but in others, fifty, eighty, or an hundred feet, or perhaps so many yards, according to the largeness of the river, must be left open for that purpose. It is best to err on the safe side ; especially as the ground that is left between the banks and the river will be far from being lost ; for it will afford good grazing in the dry seasons of the year, and may be planted with osiers, and willows, and other trees of that kind ; but these should never be planted upon the banks, lest the winds spoil and tear them, by shaking the trees, and loosening their roots.

In the isle of Ely, it is common to see great banks distant one or two hundred yards on each side from the channel of the river ; and when they are so made, they are always safe : but where the distance between the banks is narrow, there, and there only, the banks are in danger of being broken down, and the country of being overflowed.

If a considerable body of water is to be guarded against, dig a trench ten or twelve feet wide, and two or three deep, or more, according to the height of the bank required. Lay all the soil that is taken out of this trench, on that side of it which lies towards the water, and leave a space of two or three feet between the trench and the foot of the bank. Let the bank be made with an easy slope of fifteen or eighteen feet in length towards the water, allowing the slope two and a half, or three feet fall to one in height ; but the inside slope need not be more than eight or nine feet, which is a foot and a half slope to one foot perpendicular. The bank thus raised five or six feet high, according as the floods require, will be two feet wide at the top, where it should be well flatted, that people may walk upon it. Let it then be covered with gravel dug out of the channel of the water, by which means the river will be deepened, and the bank rendered stronger ; and to add to the latter, sow it very thick with grass-seed. This will be found much better than turving it with the sods taken from off the trench, or some neighbouring ground ; because the sods are apt to shrink, open, and part from one another in dry weather, and are then liable to be washed away with the next flood ; whereas in thus much cheaper way, a close covering of grass, even long enough to mow, will be formed in a month or two ; far fitter than sods to break the surface of the bank ; for any tolerable soil may be very soon brought to have a coat of grass, by only raking it fine, and sowing it with grass-seeds. In a week or ten days in the spring, or summer, the grass will be up, and grow to such a height in a month or six weeks, as to be fit for mowing.

Some have attempted to guard against inundations by building walls of stone and lime, where the materials are in plenty. The great danger here is their being undermined, and that chiefly by the waters striking with force against the bottom, upon meeting with resistance from the wall. But this may be easily guarded against by laying a row of flat stones lower than the bottom of the river ; for the water striking against these stones, turns off without any danger to the foundation.

The broad trench within the bank, besides affording materials for making the bank and slopes, is attended with the farther advantage of serving for a drain to the inland ground. These trenches should always be carried as far as the banks, particularly when these are intended to fence off a rising tide ; and in the lowest part of the ground a sluice with a valve, flap-door, or flood-gate, should be placed in the

the bank, where it will both discharge the inland water, when the tide is out, and prevent its flowing in. The season of the year freest from floods should be chosen for making these banks, that the bank may have time to settle and grow firm before the heavy rains come on. It is also advisable to be as expeditious as possible in this work. For if it be begun in a dry summer, and finished in a month or two, there will be little danger of being interrupted by extraordinary floods or violent storms, either of which might do more harm in one day than could be repaired in a fortnight.

The exact dimensions of the bank, and of the ditch within it, cannot be precisely ascertained by any general rule; because both tides and floods rise to different heights, and have different force in different places and circumstances. The strength above-mentioned may be sufficient for banks in common cases; but in others, where a great body of water, or a powerful tide is to be opposed, they may be, as the memoirs of the Berne Society (*tom. II. part II. pag. 262.*) advise, four feet or more wide at the top, with a basis proportioned to their height, as three and a half are to one; or, if it be desired to make them still more solid, as four to one; so that if the bank be four feet and a half high, its basis in the former case will be fourteen feet wide, and in the latter eighteen.

The Dublin Society for the advancement of agriculture informs us (*Numb. XVII. for April 1737*) that "Lord Limerick has recovered between four and five hundred acres of very rich salt-marsh, at Dundalk in Ireland, and effectually secured them from the sea, by such banks as are above described; and by the same method many hundred thousand acres have been recovered from the sea in Cambridgeshire, Lincolnshire, and other parts of England; not to mention the low lands of Holland, which are indeed secured against the violence of the sea by no other means.

"If there be a necessity for making banks on a strand where nothing but sand can be met with, those banks should be large, and the slope very broad and extended; and if grass seed will not grow on them, let sea-weeds be planted. These with sticking furze, straw, or lopping of trees, will help to keep the banks together."

But a better method, and more effectual, is given by Dr. Hales in the Philosophical Transactions, from the experience of Dr. Wark, a clergyman in Scotland. The method consists in fixing to the bottom of the channel, a breadth of furze proportioned to the force it is to resist. The sand or slime, as either abounds, will soon settle among the branches of the furze; and when the first bed of the furze is thus interwoven or covered, another bed of furze is to be laid on as before, and so on, till the bank is raised to a sufficient height. Dr. Wark assures us, that by this simple method a bank was made near Holy-island so strong, that it became a bar against the sea itself.

"It sometimes happens, that the sea flows in through a narrow gut or passage, by which the inland waters are discharged, and then extends itself, and covers a great deal of ground. When this happens, if the inland waters cannot be diverted into another course, since a passage must be left for their discharge; let a strong sluice be fixed in the lowest part of the channel, with large piers of stone, running out for its support, and a strong foundation of wood or broad stones for the water to run over. When this is done, let the banks of sand, or other soil near at hand, be made in the manner already mentioned, on each side of the sluice.

"The reason why it is advised, in places where a sluice is to be made, to begin the work by this rather than by the bank, is, that while the tides have liberty to flow in and out at a great breadth, the sluice may be made in any part of the channel, without being much incommoded by the tide; whereas if it be deferred till the banks on each side are made, the force of the tide, when confined to a narrow passage, will tear up all before it, and render the building of the sluice impracticable: and upon the same account, the banks should be begun at the lowest part of the channel, and carried on from thence to the upper grounds.

"If, by any accident, the waters should swell so high as to overflow and tear the banks, farther mischief may be prevented by fixing with all expedition, a sail-cloth, or sheet of linen at the bottom of the bank, where the flood breaks in; for if this be done in time, the water will flow over the cloth, without washing away the bank.

"In every improvement, the expence should be particularly considered. That of making banks in this method is small. In low grounds the soil is soft, and dug with

ease, and all the work may be done with the spade and shovel, without pick-axes, which must be used in upland ground; and the materials are on the spot. All the charge will be often more than repaid by the first year's improved crop of grass; and the safety of the meadows. The produce of succeeding years will amount much higher, and the husbandman will be out of all danger for the future of having his lands overflowed and spoiled. Farmers have frequently sustained more damage from the hay destroyed in one season by floods, than the whole value of what it would have cost them to inclose and bank their meadows, and free them from all hazards."

BANQUET, is that small part of the branch of the bridle that is under the eye, which being rounded like a small rod, gathers and joins the extremities of the bit to the branch, and that in such a manner, that the banquet is not seen, but covered by the cap, or that part of the bit which is next the branch.

To BAR a vein, implies an operation in farriery performed in the following manner: they open the skin above and below the place where the operation is to be performed, and after freeing the vein from the surrounding parts, they tie it at those openings with two ligatures; after which they open the vein between the ligatures in order to discharge the blood. This operation is performed upon the veins of a horse's leg, and other parts of his body, in order to stop the course, and lessen the quantity of malignant humours that prevail there.

BARB, a general name for horses imported from Barbary.

The chest of the barb is long and slender, rises beautifully from the withers, his mane little, his head well shaped, small, and lean; his shoulders flat and slender; his withers narrow and plump; his back straight and short; and his flanks and sides round, and not bellying out; his haunches firm and well shaped; his croop generally somewhat long, and his tail placed pretty high; his thigh well shaped, and seldom flat; his leg handsome, well-shaped, and without long hair at the pastern joint; his foot well made, but his pastern often long.

Barbs are of all colours, but generally brown. They are something negligent in their goings; but, properly encouraged, shew an amazing swiftness and vigour; they are very light and fit for running; and seem of all others the fittest to breed from. It were, however, to be wished, that they were a little taller, the largest barely exceeding fourteen hands; and one of fourteen hands and an inch is very extraordinary. Experience has, however, shewn, that in England, France, &c. they get colts larger than themselves. Among the barbs, those from the king of Morocco are accounted the best, except the mountain barbs. Those of the rest of Mauritania are inferior to them, as are also those of Turkey, Persia, and Armenia. All horses from a hot climate have a smoother coat than others. *Buffon's Histoire Naturelle, tom. IV.*

BARBELS, or barbs, are excrescences or knots of superfluous flesh, growing under the tongue, and may be seen by drawing it aside.

They are cured by cutting them close off, and washing the wounded part with brandy, or salt and water. *Bartlett's Farriery, pag. 262.*

BARBERY. This shrub is in general supposed to cause the mildew in wheat, if it is growing within a short distance of the crop. Mr. Young, in his 7th volume of his Annals of Agriculture, gives the following instance in a letter from Mr. Macro: "Having heard by several farmers, that wheat would mildew where a barbery bush grew, I concluded it was only because the soil on which they naturally grew, was likewise the most natural to that distemper; I therefore sent for a plant at the distance of a mile or two, (not having any of them on my farm) and planted it on a rich soil, with a clay bottom. The bush grew well, and I, three years following, planted wheat round it. The first year, in the month of October; the second in the month of August; and the third in September; and all were so completely mildewed, that the best of the little grain it produced was only about the size of their rye, and that without any flour." This was in his garden, and more likely to mildew than on old wheat land. However he planted some on the opposite side of the garden, one of the years, which produced very good grain, although the straw was a little mildewed.

Mr. Marshall, in his Rural Economy of Norfolk, on the same subject, says, "It has long been considered as one of the first of vulgar errors among husbandmen, that the barbery plant

plant has a pernicious quality of blighting the wheat which grows near it.

This idea, whether it be erroneous or founded on fact, is no where more strongly rooted than among the Norfolk farmers; one of whom, mentioning with a serious countenance an instance of this malady, I very fashionably laughed at him. He, however, stood firm, and persisted in his being in the right; intimating, that so far from being led from the cause to the effect, he was, in the reverse, led from the effect to the cause: for observing a stripe of blasted wheat across his close, he traced it back to the hedge, thinking there to have found the enemy; but being disappointed, he crossed the lane into a garden on the opposite side of it, where he found a large barbery-bush in the direction in which he had looked for it. The mischief, according to his description, stretched away from this point across the field of wheat, growing broader and fainter (like the tail of a comet), the farther it proceeded from its source. The effect was carried to a greater distance than he had ever observed it before; owing, as he believed, to an opening in the orchard behind it to the south-west, forming a gut or channel for the wind.

Being desirous of ascertaining the fact, be it what it may, I enquired further among intelligent farmers concerning this subject.—They are, to a man, decided in their opinion as to the fact; which appears to have been so long established in the minds of principal farmers, that it is now difficult to ascertain it from observations; barbery plants having (of late years more particularly) been extirpated from farm-hedges with the utmost care and assiduity: one instance, however, of mischief, I had related to me, and another I was myself eye-witness to. Mr. William Barnard, of Bradfield, says, that seeing a patch of his wheat very much blighted, he looked round for a barbery bush; but seeing none conspicuous in the hedge, which was thick, he with some difficulty got into it, and there found the enemy. He was clearly decided as to the fact. Mr. William Gibbs, of Rowton, telling me that a patch of his wheat was blighted in the same manner, and that he believed it to proceed from some sprigs of barbery which remained in the neighbouring hedge (which a few years ago was weeded from it) I went to inspect the place; and true it was, that near it we found three small plants of barberry, one of which was particularly full of berries. The straw of the wheat is black; and the grain, if it may be so called, a mere husk of bran; while the rest of the piece was of a much superior quality. To endeavour to ascertain the truth of this opinion, I had a small bush of the barbery plant set in February or March last, in the middle of a large piece of wheat.

I neglected to make any observations upon it until a little before harvest; when a neighbour (Mr. John Baker, of South-Reps) came to tell me of the effect it had produced.

The wheat was then changing, and the rest of the piece (about twenty acres) had acquired a considerable degree of whiteness (white wheat); while about the barbery bush there appeared a long, but somewhat oval-shaped, stripe, of a dark livid colour, obvious to a person riding on the road at a considerable distance.

The part affected resembled the tail of a comet, the bush itself representing the nucleus; on one side of which the sensible effect reached about twelve yards; but on the other, not more than two yards; the tail pointing towards the south-west: so that probably the effect took place during a north-east wind.

At harvest, the ears near the bush stood erect, handling soft and chaffy; the grains slender, shrivelled and light.—As the distance from the bush increased, the effect was less discernible, until it vanished imperceptibly.

The rest of the piece was a tolerable crop; and the straw clean, except on a part which was lodged; where the straw nearly resembled that round the barbery; but the grain on that part, though lodged, was much heavier than it was on this, where the crop stood erect.

The grain of the crop, in general, was thin-bodied; nevertheless, ten grains, chosen impartially out of the ordinary corn of the piece, took twenty-four of the barbered grains, chosen equally impartially, to balance it; so that, supposing the crop in general to be worth five pounds an acre, the part injured by the barbery would barely be worth forty shillings; the quality, as well as the quantity, being much inferior.

BARKING of trees. See the article **ABLAQUEATION**.

BARK, the exterior part of trees, serving them for a skin or covering

Dr. Agricola says, that the bark of a tree may be compared to the skin of an animal, which is designed for the preservation of the inward parts. It is generally of a spongy texture, and communicates with the pith, by a multiplicity of small fibres passing between the capillary tubes, of which the wood consists; so that the roots having imbibed the proper nutriment of the tree, it is carried up by the warmth of the sun, through the fine arterial vessels of the tree to the top of it; and being there condensed by the cold, it returns by its own gravity down by the vessels which lie between the wood and the inner bark, which perform the office of veins; and as it passes by, leaves such part of its juices as the texture of the bark will receive, and requires for its support.

Some are of opinion, that the soft whitish rind, or substance which lies between the inner bark and the wood, performs the office of veins; and some call this a third bark, supposing it to differ from the other only in having its fibres closer; adding, that this is the part which contains the liquid sap, gums, &c. found in plants during the spring and summer months, and which hardening by degrees, is imperceptibly conveyed into the woody part of the tree, forming every year a new circle of wood between the bark and the trunk. These circles are not equally thick, that circumstance depending on the fertility of the year.

The bark of trees in general, and especially that of the oak, contains a very rich salt, extremely useful in vegetation. One load of oak bark laid in a heap and rotted, after the tanners have used it for dressing their leather, will do more service to stiff cold land, and its effects will last longer, than two loads of the richest dung. Mr. Miller says it is much better for cold strong land, than for light hot ground, if it be used alone, as taken from the tan-yard; because it is of a warm nature, and will loosen and separate the earth so effectually, that, by only using it two or three times, a strong soil, not easy to be wrought, will be rendered perfectly light and loose: but by mixing it with earth of a nature contrary to that which it is intended to correct, and in a proportion suited to the nature of the soil it is to be laid on, it will prove a fine manure for almost any land; its salts being such as will always fertilize the ground. Mr. Mortimer asserts, that it will alter and change the very nature of the soil, and turn it into a very rich black mould. *Mortimer's Husbandry*, vol. I. p. 121.

It necessarily abounds in vegetable parts, derived from the tree to which it once belonged; and cannot but be strongly impregnated with animal juices, as it lies a long time in the tan vats, with the skins and hides of animals; circumstances which must render it singularly beneficial to all poor lands.

If laid on grass, it should be spread soon after Michaelmas, that the winter rains may wash it into the ground: for if it be laid on in the spring, it will be apt to burn the grass, and, instead of improving, will do it a considerable injury for that season. When used for corn land it should be spread before the last ploughing, that it may be turned down for the fibres of the corn to reach it in the spring; for if it lies too near the surface it will forward the growth of the corn in winter; and in the spring, when the nourishment is chiefly wanted to encourage the growth of the plants, it will be so nearly consumed, that the corn will receive very little advantage from it.

Mr. Bradley tells us, that he advised a gentleman, to whom a considerable quantity of bark was left upon the expiration of the lease of a tan-yard, to lay some of it upon a piece of stubborn sour land, which he did with such success, that his product was admired by all the gardeners and farmers in the neighbourhood. For such ground, he thinks it should be mixed with a sandy soil; and that one third of bark to two thirds of sand, will be a very sufficient proportion for clays; laying on about one hundred and fifty cart loads upon an acre. *Bradley's Husbandry*, p. 90.

All barks or rinds of trees, though not of so high a value as that of the oak, which is the sort principally used by tanners, must of necessity enrich either corn or pasture ground, if broken into small pieces, and laid upon it. They must needs be much richer than the mould or earth, usually found in the bodies of old, large, hollow, willow-trees, though this is justly esteemed very efficacious. *Forlidge's Husbandry*, p. 84.

For the manner of making hot-beds with tanner's bark, see the article TAN.

BARK-BOUND, a disease common to fruit-trees, and may be cured by making a slit through the bark, from the top of the tree to the bottom, in February or March; and if the gaping be pretty considerable, fill up the rift with cow-dung. *Mortimer's Husbandry*, vol. II. p. 85.

BARKING of trees, the operation of stripping off the bark or rind, particularly that of the oak, for the use of tanners.

It is necessary in our climate to perform this operation in the month of May, because at that season only, the bark is, by the great quantity of sap, easily separated from the wood. This also renders it necessary to fell the trees in that month; but by this method the timber is much less valuable than it would be, if felled after the fall of the leaf.

Mr. Marshall, in his *Rural Economy of Yorkshire*, says, the peeling of oak timber in that county is generally done by the day; the labourers being, I believe, invariably employed by the timber-merchant, not by the tanner; practices which are productive of a considerable saving of bark. Men working by the ton or the quarter, or tanners paying by weight or measure, will not peel the boughs sufficiently near; it is against their interest to do it. But it is the interest of the timber-merchant, or of the tanner, if he purchase by the gross, or by the ton of timber, to peel so long as the bark will pay for the labour. This accounts for the smallness of the twigs which are peeled in this country: if the bark run freely, twigs not much thicker than the finger are frequently stripped.

The tool commonly made use of, in some counties, is of bone. The thigh or shin-bone of an ass are preferred, formed into a two-handed instrument for the stem and larger boughs, with an handle of wood fixed at the end. The edge once given by the grinding-stone, or a rasp, keeps itself sharp by wear.

The method of drying bark in this country is generally the common one of seating it in a leaning posture against poles lying horizontally, on forked stakes. But in a wet season, or when the ground is naturally moist, it is laid across a line of topwood, formed into a kind of banklet, raising the bark about a foot from the ground. By this practice no part of the bark is suffered to touch the ground: and it is, perhaps, upon the whole, the best practice, in all seasons and situations. He then stacks or houses it; and generally shaves and chops it ready for the tan-pit; selling it to the tanner at so much a quarter.

This custom appears to be founded on a false basis: the tanner is, or ought to be, the best judge of the mode of preparation, and the operation ought to pass under his eye.

The practice of grinding bark does not seem to have yet got footing in this district: whenever it does, it will of course bring the preparation of bark into its proper channel.

The medium price of chopt bark, is 10s. 6d. a quarter.

BARLEY, a species of grain well known in England, and of which Mr. Miller has enumerated four species.

1. The spring barley, which has a double row of beards or awns standing erect. This is the sort principally cultivated in England, and of which the farmers make two sorts, viz. the common, and the rath-ripe barley: but these two sorts are in reality the same; for the rath-ripe is only an alteration of the common barley, occasioned by being long cultivated upon warm gravelly lands. The seeds of this, when sown in cold or strong land, will, the first year, ripen near a fortnight earlier than the seeds taken from strong land, and therefore the farmers in the vales generally purchase their seed barley from the warm lands; for if sown in the vales two or three years, it will become full as late in ripening as the common barley of their own product: on the other hand, the farmers on the warm land are also obliged to procure their seed barley from the strong land, otherwise their grain would degenerate in bulk or fullness, which, by this change, is prevented. This sort of barley is easily distinguished by the two orders of beards or awns, which stand erect; the rind is also much thinner, and therefore esteemed better for making malt.

2. The long-eared barley, which is cultivated in many parts of England, and is an exceeding good sort; but some farmers object to this barley, because they say the ears being long and heavy, it is more apt to lodge. This sort of barley hath its grains regularly ranged in a double row, lying over each other, like the tiles on a house, or the scales of fish. It has no beards or awns; but its rind is very thin, and therefore esteemed for making malt.

3. The sprat barley, called also Battledore, Fulham, and Putney barley, from the great quantities cultivated in the neighbourhoods of those places, has shorter and broader ears than either of the former sorts; the awns or beards are longer, which tend greatly to preserve it from the birds, and the grains placed closer together. This seldom grows so tall as the other species; the straw is also coarser, and therefore not so good fodder for cattle.

4. The winter barley, called also square-barley, bear-barley, or big, is seldom cultivated in the southern parts of England; but in the northern counties, and in Scotland, it is the general sort sown, as being much hardier than the other species. There are two sorts of this barley, the one with four rows of grains, and the other with six, the latter of which is commonly distinguished by the name of barley-big. The grain is large and plump, but the rind or chaff of it being thicker than that of either of the preceding sorts, it is less esteemed for making malt, and therefore not cultivated in the southern parts of England, where the sorts which are so much better for that purpose thrive so well.

Both the four and six rowed barley are generally sown in the autumn, nearly at the same time with wheat, not only in temperate climates, but also in very cold countries; their hardiness being such as to bear the winter's frosts, even in the mountainous parts of the northern regions. In hot countries they are sown in January, February, and March.

All the other sorts are sown in the spring of the year in a dry time: in some very light land, barley is sown early in March, but, in strong clay soils, not till April, and sometimes not till the beginning of May; but when it is sown so late, if the season does not prove very favourable, it is very late in autumn before it is fit to mow, unless it be the rath-ripe sort, which is often ripe in nine weeks from the time of sowing: though Mr. Lisle is of opinion, that this, in particular, ought to be sown early, for otherwise it will grow very thin. He likewise thinks that it should be sown on better ground than the other barley, because as it ripens in a shorter time, it may be naturally supposed to exhaust the nutritive juices of the earth faster than other corn. But it is said by others, that these nutritive juices in almost any tolerable soil, will probably hold out long enough to feed a crop of so short a standing as this is, though they might not suffice for corn which should remain longer upon the ground; and it is added, that about Putney in Wiltshire, they sow the poorest sandy ground with rath-ripe barley. *Lisle's Husbandry*, vol. I. p. 271.

Mr. Lisle adds, that he himself, in the year 1707, sowed in Hampshire, rath-ripe barley in very poor white ground, and some of the same corn in good strong clay land. No rain fell to bring it up till June; after which there were frequent showers, and plenty of rain till harvest. His rath-ripe barley in the poor land was miserably bent, broken in the straw, and harled, or fallen down. In the strong clay land, the same corn suffered the same injuries, though in a less degree: but the straw and leaves of the rath-ripe barley in both places blighted, and were full of black specks; their ears were thin, and their colour was lost; while the plants of late-ripe barley in an adjacent field were free from these spots, and stood upright with good strength. From this experiment he infers, that since the clay land in the hilly country of Hampshire, though in good heart, cannot, even in a moist year, sufficiently feed the straw of rath-ripe barley, so as to enable it to stand upright, but suffers it to be languid and withering, this sort of corn is not proper for such places, and that it is better to sow late-ripe barley, even though three or four horses extraordinary be provided against sowing time, in order to get the corn into the ground a week before May begins. *Lisle's Husbandry*, vol. I. p. 272.

Another important observation made on the same occasion, by the same judicious farmer, was, that one half of the seed which fell deep came up without rain, while the rest did not sprout till after the rain came. The half which came up first, could not, by reason of the weakness of the stems, wait for the ripening of the latter edge-grown corn, in the same field; but its straw bent, broke, and was entangled, and the ears buried themselves among the broad clover sown with the barley, so that he was forced to cut it, not being able to stay a week or ten days longer for the edge-grown corn to ripen: whereas the late-ripe barley stood so upright in its straw, that the corn which came up first would stay ten days for the edge-grown corn.

The same gentleman had another evident proof, in the year 1706, that the straw of the rath-ripe barley is thinner and

and weaker than that of the late-ripe. All his rath-ripe barley, of which he sowed fifty acres in different sorts of ground, are some of it side by side with late-ripe barley, crumpled down in the straw, while the late-ripe barley of the same forwardness and growth stood upright.

Upon the whole, Mr. Lisle, after observing farther, that, if the ground be good, and the year a feeding one, rath-ripe barley is apt to run rank, and to fall while very green in the ear, which occasions the grain not to fill; concludes, in regard to this sort of corn, that it should always be sown early, that the land should not have a north exposure, and that the soil in which it is planted should be pretty good, either naturally such, or rendered so by art; "for we know," says he, that the poorer the ground is, the weaker and poorer the straw will be in all sorts of corn; and if the rath-ripe barley has by nature a weaker and thinner straw than the late-ripe barley, and on that account is apter to crumple, to bend down, and to break in the straw before it is ripe, much more will it be apt to do so, when the straw is made much thinner and weaker than naturally it would be by the poverty of the ground it is sown in. It is very evident to me, that rath-ripe barley ought not to be sown on poor ground, and much less so in case it lies declivous from the sun towards the north." *Lisle's Husbandry*, vol. I. p. 273, 274.

"Common barley sown once in the burning sand at Patney in Wiltshire, will, for many years after, if sown on indifferent warm ground, be ripe two or three weeks sooner than any other, which has never been impregnated at Patney: but if sown a degree farther north, on cold clayey land, will, in two or three years, lose this quality, and become as late-ripe as any other. Indeed, Patney is far from improving the species of barley, except we think it improved by becoming more weak and tender, and shorter lived; which last mentioned quality fits it for such countries, where the summers are too short for other barley to ripen.

"Barley is far from being improved by becoming rath-ripe; for it loses more good qualities than it gets by being sown at Patney. It is so tender, that if it be sown early, the frost is apt to kill it: or if it be sown late in May, on the same day, and in the same soil, with the same sort of barley that is not rath-ripe, it will be much thinner bodied than the late-ripe. And besides, if it happens to have any check, by cold or drought, it never recovers it, as the other doth, at what time soever it is sown. It is now, as I am informed, gone out of fashion, and very few farmers have sown it of late years.

"I know a little parish, that I believe formerly lost about two hundred pounds a year, by sowing rath-ripe barley. But long and dear experience hath now convinced them of their error, and obliged them totally to disuse it." *Tull's Husbandry*, p. 115, 233, 234.

The middle-ripe barley, as Mr. Lisle calls it, meaning the common spring barley, bears late sowing, even upon ground declivous from the sun, better than the rath-ripe sort; but not near so well as the late-ripe, or common long eared barley; nor will its stalk stand so long. Mr. Lisle was convinced from experience, that late-ripe barley will endure being sowed when the ground is wetter than will do for the rath-ripe sort, and that a bottom ground, or vale pent in between two hills, though shaded by one of them from the sun, will, by means of the warmth and closeness of the air, often ripen corn as fast as the ground that lies declivous to the sun. In a field which he sowed with the common spring barley, the lowest part of which laid on a flat, ripened regularly, and even sooner than another part of the same field which lay upon the side of a hill declivous to the sun: but on that side of the same hill which sloped from the sun, the corn was more edge-grown, lay backward, and neither looked so white, nor was it so ripe. *Lisle's Husbandry*, vol. I. p. 275.

The land which lies both very dry and healthy, and in which both mellowness and lightness are joined to a proper strength of soil, is that which produces the best body, and thinnest rinded barley; qualities which always recommend this grain, especially to the maltsters. Such generally is the barley of the growth of the hilly countries. But poverty of soil is by no means requisite in land, in order to its producing a plump and thin rinded barley; though it is allowed, that poor land which lies dry and warm, will bear better corn of this kind, than rich land in a cold and wet situation; for barley does not stand so much in need of strength in the land, as of the healthiness and warmth of the soil;

though both are best where they can be had. *Lisle's Husbandry*, vol. I. p. 281.

With regard to the choice of seed barley, it is necessary to observe, that the best grain for sowing is that which is not blackish at the tail, nor has a deep redness, but is of a pale lively yellow colour, intermixed with a bright whitish cast, and if the rind be a little shrivelled, it will be so much the better; for that slight shrivelling occasioned by its having sweated in the mow, is a sure indication that its coat is thin. The husk of thick rind barley being too stiff to shrink, will lie smooth and hollow, even when the inside flour has shrunk from it.

The necessity of a change of seed from time to time, by sowing that of the growth of a different soil, is no where more evident than in the culture of this grain, which otherwise becomes coarser and coarser every year. But at all times in this, as well as in all other grain, the utmost care should be taken that the seed be full bodied.

Mr. Lisle tells us, that in order to be satisfied of this, he took out of a heap of barley sixty grains, of different sizes, viz. twenty of the biggest, twenty of the middle size, and twenty of the smallest corns. Twenty of each sort of these grains he planted in three pots, each filled with the same sort of mould, which was very rich. In eight or nine days time thirteen of the fullest bodied grains were come up, nine of the middle sized, and only five of the smallest, and the plants of the plumpest corn exceeded those of the others, both in colour and breadth of blade. In three days after, he found nineteen blades of the largest sort come up, seventeen of the middle size, and thirteen of the smallest; and in three days more, the blades of the best and of the middle sort were all come up, while only seventeen of the worst had sprouted, with such manifest disadvantage in colour and strength in these last as plainly shewed that many of them would not have come up at all in poor ground. *Lisle's Husbandry*, vol. I. p. 283.

It is natural to suppose that barley will, like wheat, be benefited by being steeped before it be sown; for as rain cannot be depended upon soon after the sowing of spring corn, there is surely an equal reason for extending the practice of these sorts of grain, as well as to those which are sown in autumn. Liming indeed may hurt barley, if hot wheather should soon follow after the sowing, but a little sprinkling of soot bids fair for improving it, at least it will prevent the insects from preying upon the seed. The rev. Mr. Elliot informs us, that a farmer who was obliged to attend other business in the course of the morning, sowed oats at break of day, and harrowed them in before sun-rising. The consequence was, that the corn thus early sown, out-stripped the other oats sown on the same day after the sun was up, had larger ears, and appeared every way better, though the spot in which they grew was the worst part of the field. If the dew, when buried with the corn, had this effect, it is reasonable to suppose that a much greater would have been produced, had the seed been sown in the evening, left all night to have been softened with the dew, and then harrowed-in in the morning. *Elliot's Essay on Field Husbandry*, p. 29.

Mr. Lisle also tells us, that a maltster in Hampshire having taken lands in the beginning of May, and no barley being to be had, he, by the persuasion of his malting-servant, made use of barley he had wetted, and was just well chitted or sprouted; this corn came up well, and produced as good a crop as any sown that year. *Lisle's Husbandry*, vol. I. p. 284.

Barley is generally sown either after a fallow, or on an ersth or second crop. If after a fallow, the land must be ploughed at least three times; and at the first ploughing, it should be laid in small ridges, and in that manner remain during the winter for the frost to mellow it: but if another ploughing can be given it in January, or in the beginning of February, the ground will be still much better broken and prepared. In March these ridges are split, the ground is well harrowed, and laid as smooth as can be, and, if possible it is plowed again the same day, in order to sow. But in strong wet lands, the best way is to lay it round, and make deep furrows to receive the water.

Some at the time of twifallowing in June, make the land very fine, and sow it with turneps, which they feed sheep with in the winter: and in March they plough it up, and order it as before; but others who take this method of sowing turneps, give it only one ploughing in March, just before they sow.

Those who sow barley upon an ersth, after wheat, plough

up the wheat stubble in as dry weather as they can, as soon as the time of sowing wheat is over, which is generally about the beginning of October, and lay three ridges into one, if they have dung to spread upon it : but if they have not, they plough it in small ridges, as before directed, that it may be the drier, and be the better mellowed by the frost : they then plough it up again in March, and order it as before. Some farmers injudiciously sow their barley after oats, in which case, neither of these three ploughings ought by any means to be neglected ; and the land will be in much better order if the first of them be given in October : or, if the harvest be early, the weather dry, and the husbandman can possibly find time to do it, he will improve his ground still more, by ploughing it up before he sows his wheat, just as harvest is in : this will be half as good as a summer's fallow. But all years will not admit of this practice. *Mortimer's Husbandry, vol. I. p. 131.*

Some sow their barley on small ridges, and others on broad lands ; the latter cannot be laid too round.

Mr. Mortimer relates, that a farmer in Essex, who lived near a market-town, from whence he had good quantities of dung, used to sow his land with barley and clover ; reaped the corn at harvest, fed the clover all the winter, and from spring till the middle of July, when he fallowed his ground. In the next spring he sowed it again with barley and clover, and repeated every year this method, by which he had large crops. His land was a rich light mould, somewhat inclining to a gravelly bottom. *Mortimer's Husbandry, vol. I. p. 132.*

A correspondent of the editors of the *Museum Rusticum*, observes, that a few years ago he sowed twenty-five acres of land, in fine tilth, with broad clover and barley ; but the spring being backward and cold, and the summer wet, the clover got too forward, and overpowered the barley. At harvest they were both cut together ; and the clover being full of juice, occasioned its being a tedious time before the barley could be housed. When he got it into the barn, the men complained much of its threshing so badly, that they could not undertake to do it unless he would double the price to them : as this could not be afforded, he ordered them to give it only a light beating, leaving the under corn in the straw, together with the clover, for the cattle.

By this means he lost half his crop by the clover ; and what barley could be obtained was lean, and thin-bodied, fetching but a very indifferent price at market.

As this was not the first loss of the same kind he had experienced, he was determined, if possible, to find out some remedy ; and accordingly applied to a very intelligent farmer in the neighbourhood, who advised him to sow his clover, for the future, a month after the barley, by which means it would not prove too rank. This advice he accordingly followed, and found it answer extremely well ; and has therefore, to his great advantage, continued the practice ever since. He adds, that there is no danger of the clover failing, though the season should prove dry ; and that the seed is to be scattered on the ground without any farther care, there being no occasion to harrow or roll it ; for the small blades of the barley will keep moisture enough in the land to supply the small wants of the clover during its infant growth, and when the barley is off, it thrives surprizingly. *Museum Rusticum, vol. III. p. 315.*

Mr. Marshall, in his *Minutes of Agriculture*, says, that in a dry summer early-sown barley has a great advantage ; but, perhaps, except the soil be very clean indeed, the opportunity of an April fallow ought not to be missed.

It has been already observed, that the usual time of sowing is in March, April, or the beginning of May. It is generally thought most advisable to sow light lands the earliest, and to embrace the first dry season that offers for doing it ; dry weather being best for most summer corn. Clayey grounds, and lands subject to weeds, are thought to produce the best crops when sowed late. Mr. Mortimer says, that barley will do well when sown even about the middle of May, if the seed has been properly steeped. *Mortimer's Husbandry, vol. I. p. 132.*

The common method is to sow the barley seed with a broad-cast at two sowings ; the first being harrowed in once, the second is harrowed until the seed is buried ; the common allowance of seed is four bushels to an acre : but if the farmers could be prevailed upon to alter this practice, they would soon find their account in it ; for if a third part of that quantity ye sown, there will be a much greater pro-

duce, and the corn will be much less liable to lodge, as I (says Mr. Miller) have many times experienced ; for when corn, or any other vegetables, stand very close, the stalks are drawn up weak, and thence incapable of resisting the force of the winds, or supporting themselves under heavy rains : but when they are at a proper distance, their stalks will be more than twice the size of the other, and therefore are seldom laid. I have frequently observed in fields where there has been a foot-path through their middle, that the corn, which has stood thin on each side of the path, hath stood upright, when all the rest on both sides has been laid flat on the ground ; and whoever will give himself the trouble to examine these roots near the path, will find them tiller out (*i. e.* have a greater number of stalks) to more than four times the quantity of the other parts of the field. I have seen experiments made by sowing barley in rows across divers parts of the same field, and the grains sown thin in the rows, so that the roots were three or four inches asunder in the rows, and the rows a foot distant ; the intermediate spaces of the same field were at the same time sown broad-cast in the usual way ; the success was this : the roots which stood thin in the rows tillered out from ten or twelve, to upwards of thirty stalks on each root, the stalks were stronger, the ears longer, and the grains larger than any of those sown in the common way ; and when those parts of the field, where the corn was sown in the usual way, has been lodged, these parts sown thin have supported their upright position against wind and rain, though the rows have been made not only lengthways, but across the lands, in several positions ; so that there could be no alteration in regard to the goodness of the land, or the situation of the corn : where therefore such experiments have been made, and always attended with equal success, there can be no room to doubt which of the two methods is most eligible, since if the crops were only supposed to be equal in both, the saving two thirds of the corn sown is a very great advantage, and deserves a national consideration ; as such as a saving, in scarce times, might be of very great benefit to the public. This saving of seed-corn must be understood to regard such as is sown broad-cast ; for if it be sown in drills, an eighth part of the seed usually sown will be sufficient for an acre of land, and the produce will be greater ; for all sorts of corn are naturally inclined to send out several stalks from each root, which they rarely fail to do where the roots are at a proper distance, and have room ; nor do stalks grow in this case near so tall, but are much stronger than when they are near together, when they rarely have more than two or three stalks ; whereas those roots which have proper room, seldom have less than ten or twelve. I have had eighty stalks upon one root of barley, which were strong, produced long ears, and the grain was better filled than any I ever saw grow in the common method of husbandry, and the land on which this grew was not very rich ; but I have frequently observed on the sides of hot-beds in the kitchen gardens, where barley straw has been used for covering the beds, that some of the grains left in the ears have dropped out and grown, the roots have produced from thirty to sixty stalks each, and those have been four or five times larger than the stalks ever arrive at in the common way ; but to this I know it will be objected, that although upon rich ground in a garden, these roots of corn may probably have so many stalks, yet in poor land they will not have such produce ; therefore unless a greater quantity of seeds be sown, the crop will not be worth standing, which is one of the greatest fallacies that can be imagined ; for to suppose that poor land can nourish more than twice the number of roots in the same space as rich land, is such an absurdity, as one could hardly suppose any person of common understanding guilty of ; and yet so it is : for the general practice is to allow a greater quantity of seed to poor land, than for richer ground, not considering that where the roots stand so close, they will deprive each other of their nourishment, and consequently starve themselves, which is always the case when the roots stand close, which any person may at first sight observe in any part of the fields where the corn happens to scatter when they are sowing it ; or in places where by harrowing, the seed is drawn in heaps, those patches will starve, and never grow to a third part of the size as the other parts of the same field ; and yet, common as this is, it is little noticed by farmers, otherwise they surely would not continue their old custom of sowing. I have made many experiments for several years in the poorest land, and have always found that all crops, which were sown or planted

planted at a greater distance than usual, have succeeded best upon such land; and I am convinced if farmers could be prevailed upon to quit their prejudices, and make trial of this method of sowing their corn thin, they would soon see the advantage of this husbandry. *Miller's Gard. Dic.*

It is a common practice in some parts to scatter the dung of pigeons, poultry, &c. over barley and other corn, after the corn is sown; but if this method be pursued, care should be taken to scatter the dung immediately; because then the shoot will easily make its way through: but when laid on later, it burns up, and eats the blades of the young plants. *Mortimer's Husbandry, vol. I. p. 133.*

It too often happens from unfavourable weather, and an extremely dry spring, that it is impossible by the common method to break the clods, and prepare the ground sufficiently for sowing barley; in which case it has been the usual method to break the clods with a large beetle called, from its use, a clotting-beetle. But this being a very chargeable and tedious method of preparing land, induced the ingenious Mr. Randall of York, to construct an instrument, which he calls a spiky roller, by the assistance of which a large quantity of land may, in such a dry season, be soon reduced to an exceeding fine tilth, with very little trouble. The reader will find a full account of this useful instrument, the manner of making and using it, together with a figure of the roller, under the article SPIKY ROLLER.

After the barley is sown and harrowed-in, the ground should be rolled after the first shower of rain, to break the clods and lay the earth smooth; which will render it better to mow the barley, and also cause the earth to be closer to the roots of the corn, which will be of great service to it in dry weather.

And also when the barley has been up three weeks or a month, it will be a very good method to roll it over with a weighty roller, which will again pass the earth close to the roots of the corn, and thereby prevent the sun and air from penetrating the ground, which will be of singular service in dry seasons; and this rolling of it before it stalks, will cause it to tiller out into a greater number of stalks, so that if the plants should be thin, this will cause them to spread so as to fill the ground, and likewise strengthen the stalks. *Miller's Gard. Dic.*

If the corn grows too rank, as it is sometimes thought to do in a wet spring, mowing is then much better than feeding it; because the scythe takes off only the rank tops, but the sheep feed upon all indifferently; nor should they even in any case be left upon it too long, because being particularly fond of the sweet end of the stalk next the root, they will bite so close as to injure the future growth of the plant.

Barley is ripe when the red roan, as the farmers call it, meaning a reddish colour on the ear, is gone off, when the ears droop and fall, as it were, double against the straw, and the stalks have lost their verdure. If it be full of weeds it must lie in the swarth till they are dry. It is not apt to shed; but in wet weather it will be apt to sprout or grow musty; and therefore every fair day after rain it should be shook up and turned; and when it is tolerably dry, let it be made up into cocks; but be sure never to house it till thoroughly dry, lest it mow-burn, which will make it malt worse than if it had spired in the field. The common produce of barley is two or three quarters upon an acre. *Mortimer's Husbandry, vol. I. p. 133.*

Mr. Lisle says, that poor thin barley and oats should be cut a little sooner than if the same plants were strong and vigorous; for that the straw, when the plants are full ripe, will not stand against the scythe. In this case the barley, in particular, must lie in swarth till it is thoroughly dry. Some of his barley, which lay out in swarth five or six days in very fine weather, though both blighted and edge-grown, grew plump, and acquired very near as good a colour as the best. He reckons short scythes the best for mowing lodged or crumpled corn, because they miss the fewest plants; and observes that a bow upon the scythe which carries away the swarth before it, is preferable to a cradle, the fingers of which would be pulled to pieces by the intangled corn, in drawing back the scythe. *Lisle's Husbandry, vol. I. p. 335.*

Mr. Du Hamel tells us, that a farmer at Acon, observing that the chief hopes of more than common success by means of the New Husbandry, were founded on the frequent

stirring of the ground while the corn was in it, and on allowing each plant sufficient space to extend its roots, and thereby collect the more nourishment, tried an experiment which appeared to him very proper to discover whether the effect would answer. He carefully cultivated a grain of barley, which grew by chance in his vineyard. This plant, said he, stands distant from any other: it can extend its roots every way; it is in a rich soil, and cannot want for food: by joining frequent culture to these advantages, this plant of barley, according to these principles of the New Husbandry, ought to yield a surprising increase. His reasoning was just, and the experiment confirmed it; for this single grain of barley produced two hundred ears, and about thirty stalks which had no ears. Some of the stalks were four feet high, and most of them three. Mr. Du Hamel counted twenty-four grains in a middling ear. Thus one grain, planted in a good soil, and well cultivated, produced 4800 grains; and the straw of this single plant of barley made of itself a sheaf. *Translation of Du Hamel's Husb. p. 113.*

We have already observed, under the article SOAP ASHES, that sir Hugh Platt, by spreading that manure over his land, had a surprising crop of barley, the plants of which were of a prodigious size. An ear of this barley is delineated in its natural size, Plate III. fig. 1.

Mr. Young, in his Annals of Agriculture, vol. VII. gives the following experiments by Mr. Macro on early and late sowing of barley: on Nov. 16, 1785, "I began this experiment by sowing two bushels of barley, which I harrowed-in, on clover land that had been folded the same as for the wheat; this first sowing, therefore had only one earth. The barley came up about a week sooner than the wheat, by the side of it, which was sown the same day, and was exceedingly flourishing till the first sharp frost set in, which damaged the blade, but did not seem to affect the root. As near the middle of December as the weather would permit, I sowed two bushels more, on exactly the same quantity of ground, and so on about the middle of every month, till the month of May, 1786. This, and every sowing after had two earths, one cast, or half the seed, was ploughed-in, and the other half harrowed-in; all the land was folded alike in the month of November. The second sharp frost, killed some of this sowing, (I should think most likely of the harrowed-in cast) and a good deal of that sown in November, but they both, with that sown in January, seemed to suffer still more, by the sharp cutting winds in the month of March, when there was no snow to cover the blade; and it was injured by the frost, the sowings in February and March, lost few, if any of their plants, and what was somewhat remarkable, were both forward enough to be harvested on the same day, with the three preceding sowings. That sown in April, was full a fortnight later, and that sown in May, there not being any so late sown in the neighbourhood, was entirely destroyed by vermin.

As I some years before intended trying the same experiment, but was disappointed of knowing the event by the stupidity of my workmen, I determined this time to prevent any mistakes by mixing the different parcels in the barn, to thresh enough of the different sowings in the field, to satisfy me, which was the most profitable crop, and accordingly attended the thresher the whole day myself.

As it was not at all necessary for the experiment, to thrash the whole crop, I took three swaths of each sowing, twelve yards in length, on the lowest part of the land, where I thought the soil was the most equal through the whole of the experiment, which I should have said before, were by the side of each other, on the same piece of land. I had every parcel dressed and put into a sack by itself as soon as threshed, and the account stands thus:

From that sown in November, 72 sq. yds.	Pecks.		Qrs. P.	Pints.		or, per acre.	Ccombs.		Bushels.	Pecks.	Quarts.
	3	1					12	2			
December	3	1	1				12	3	1	1	1
January	3	1	1				13				
February	2	3	2				11	2	2		
March	2	2	2				10	3	3	1	
April	2	1	2				8	3	2	1	
May	0	0	0				0	0	0		

This sowing, as I observed above, was entirely destroyed by the rooks, I believe it had not been sown more than three days before they began to scrape and pick it up, and compleatly devoured it.

It was the same with the very early sowings, but that I expected, and was guarded against. This, however, may serve as a lesson to young farmers, that although early sowing may in most cases be profitable, yet, it will not answer in large open fields, where lands are intermixed, unless neighbours sow at the same time, for if only one farmer sows early, he had need have as many keepers as he has pieces of land.

The barley of all the sowings was of the Zealand stock. On the same piece of land that I tried the above experiments, which is a deep sand, value about 6 or 7 shillings per acre, I tried two others, one about ten years since, with chalk from different pits, some of them a dry chalk, and others greasy: I carried only one load of each sort, and laid it about the thickness of 70 loads to an acre. Not one of them did the least good, for I could not tell by any of the crops since, without looking at the soil where they were laid. The other was by deep ploughing, in the autumn of 1785 (when I sowed part of the piece with wheat) by going with a second plough after the first for one scratch only) and raising about three or four inches of soil that had never been turned up before; and on viewing it about Midsummer, I could not find where it was; by any difference in the crop, nor could see that the barley sown in January was the best crop. By the same rule, when I began to try the experiment before, that sown in February was the best, as it appeared so on view, I remember, all the summer.

Mr. Marshall, in his Rural Economy of the Midland Counties, says the long-eared barley, and the sprat barley are the chief cultivated in those parts. The latter is the old stock of the country, the former of late introduction, of not more than fifty years standing. The sprat is deemed more hardy, and requires to be sown more early; the long-eared to be the better yielder. The sprat is thought by maltsters to make the best keeping beer; the long-eared to be freer, to operate quicker, both in the malt-house and the cellar. In ordinary practice barley succeeds wheat. Where turneps are grown, it precedes that crop: of late years it has been sown with success on turf. The time of sowing, if the weather permits, the latter end of April or beginning of May. The quantity of seed, two bushels and a half or three bushels an acre. The method broadcast, mostly above, but sometimes, if the land is got very fine, the seed is plowed under. If the harrow, in adjusting, leaves any clods unreduced on the surface, they are broken with the clotting beetle by women, &c. and if any twitch be pulled up in harrowing, it is shook out loose, with forks, and left on the surface to wither. The produce is generally extraordinary large, seven quarters an acre is no unusual crop; eight have been grown.

In his Rural Economy of Gloucestershire, he says, in the Cotswold hills the common long-eared barley is the only species, which is sown the latter end of March or beginning of April. The quantity of seed, three bushels an acre, produce generally from twenty bushels to four quarters an acre. In the vale of Gloucestershire it is made use of on every years lands as a clearing crop. It is harvested loose, mown with the naked scythe, lies in swath till the day of carrying, and is cocked with common hay-forks. The quantity of the vale barley is such as recommends it to the maltster, in preference to hill barley, that affords a more tightly sample. But there seems to be a quality in the soils of these vales which gives strength and richness to every article of their produce.

In his Rural Economy of Norfolk, he says the most prevailing and almost only species of barley sown in that district, is the common long-eared barley, for which the soil is peculiarly well adapted, and whose barley is coveted for seed throughout the kingdom. In the grand routine barley succeeds wheat and turneps, and in some very light land farms it is sown instead of wheat after the second year's lay after wheat; the stubble having been trampled down with bullocks at turneps, and wheat-seed being finished, the farmer begins to "scale in his wheat stubbles" for a winter fallow for barley. If the land lie in narrow work, the ridgelets are split; if in warps, the ground is likewise plowed clean, but very fleet. The beginning of March, the land is harrowed, and presently after the farmer "takes up his wheat stubbles" by a full-pitch cross-plowing;

or, if the season be wet and the soil heavy, he reverses the ridges. In April he harrows, and begins "stirring for barley," with another full-pitch plowing, lengthway; generally gathering the soil by this plowing, either into five-pace, or into ten-pace warps; in which it lies until seed-time, when it is harrowed, rolled, sown, plowed fleet, reversing the warps, and "sliding down" the furrows, so as to render the entire surface as even and level as may be.

After turneps, the soil is generally broken up as fast as the turneps are got off; if early in winter, by rice-balking; if late, by a plain plowing. The general practice, if time will permit, is to plow three times; the first fleet, the second full-pitch, the last a mean depth; with which last the seed is plowed in.

The Norfolk farmers, in general, are masters of the art of cultivating barley. They seem fully aware of the tenderness of this grain in its infant state; and of its rootlings being unable to make the proper progress in a compact or cold soil: they therefore strive by every means to render the soil open and-pulverous.

Nor is this caution confined to "turnep-barley," but is extended more or less to "stubble-barley;" which, however, does not require so great a degree of care; the soil in this case being kept open, in some measure, by the undigested stubble, and the roots of grasses and other weeds, which a turnep-fallow is or ought to be free from. Barley is seldom manured for, except when sown after lay, when it is treated as wheat. After turneps, no manure can be requisite; nor after wheat, if this has been manured for: if not, the turnep crop following immediately, the barley is left to take its chance; unless the opportunity be embraced for winter marling.

Notwithstanding the dryness of the Norfolk soil, barley may be said to be sown late in this district. There is little sown before the middle of April, and the seed-time seldom closes until towards the middle of May. The time of sowing, however, depends in some measure on the season; which, with respect to sowing barley, is more attended to in Norfolk than perhaps in all the world beside. Until Linnæus hit upon the idea of sowing by the foliation of trees, the republic of agriculture never heard of any other guide to the time of sowing than the almanack, which is still followed implicitly in every district in this kingdom, except Norfolk.

No instance either of fortifying it against disease, or of steeping it to forward its vegetation in a dry season, or a backward seed-time. This is strong evidence, though not a proof, that steeping seed-barley with intent to promote its vegetation, has no beneficial effect.

In this county, barley is all sown broadcast, and almost all under-furrow; that is, the surface having been smoothed by the harrow and roller, the seed is sown and plowed under with a shallow furrow: a circumstance this, which, until observed in Norfolk, had never occurred to many, either in practice or theory, though admirably adapted to a light dry soil; and, indeed, to any soil which is light enough to produce good barley; provided it be rendered sufficiently fine, and the seed be not buried too deep.

Barley, like wheat, is generally suffered to stand until it be very ripe. It is universally mown into swaths, with a small bow fixed at the heel of the scythe. Cradles are not in use; and the north country method of setting it up in singlets is unknown. Three bushels an acre may be taken as the nearest medium quantity of seed-barley. If barley receive wet in the swath, it is treated in a singular method in Norfolk. It is not turned, but "lifted:"—that is, the heads or ears are raised from the ground, either with a fork or the teeth of a rake; thereby admitting the air underneath the swath. This method of lifting is thought to stop the ears from vegetating nearly equal to that of turning, which requires more labour, besides breaking and ruffling the swaths, which, by repeated turnings, lose their stiffness, becoming weak and flabby, and liable to fall into close contact with the ground; in which state the corn presently begins to sprout.

Mr. Marshall, in his Rural Economy of Yorkshire, says that the long-eared barley and the big or four-rowed barley, generally called the winter-barley, are the species used in that county. The first in the vale when the season of sowing is driven very late. The winter barley is new to the district; and it does not seem to be yet generally understood that it ought to be sown in autumn.

One circumstance respecting the ancient husbandry of this crop deserves to be registered, as it serves to shew the alteration

alteration which time has the power of making, even in the business of husbandmen.

Less than a century ago, I believe, barley was not saleable until it was malted. Public malt-houses, and the business of a maltster were equally unknown: every farmer malted his own barley, or sold it to a neighbour who had a malt kiln.

Now, even public malt houses are unknown, the entire business of malting being in the hands of professional maltsters, who buy the barley of the farmer, and sell him the malt he may want for his own private use.

BARN, a covered place or house for laying up any sort of grain, hay, or straw.

Every farm should be furnished with barns proportioned to the quantity of corn it produces, which will be a great advantage to the farmer. The barns should have a dry situation, and be properly placed in the farm-yard, but not quite contiguous to the house, for fear of fire.

A barn is usually made of wooden frames covered with planks of oak, or built of brick or stone, which ever the country affords in the greater plenty; and in either case there should be such vent-holes, or openings, in its sides or walls, as to afford free admittance to the air, in order to prevent the mouldiness that would otherwise, from the least dampness lodge in the corn. The gable ends may be always of brick or stone, for the sake of greater solidity, and the whole may be roofed with thatch or tiles, as is most convenient. The size of the barn should be proportioned to the crop usually produced by the land to which it belongs. Two large folding doors should face each other, one in each side of the building, for the convenience of carrying in or out a waggon-load of corn in sheaves; and these doors should be of the same breadth with the threshing floor to afford the more light and air; the former for the threshers, and the latter for winnowing. Over the threshing floor, and a little above the reach of the flail, poles are often laid across from one beam to another, to form a kind of upper-floor, upon which the thresher may throw the straw or haulm, to make an immediate clearing, till he has time to stow it properly elsewhere: and on the outside, over the great doors, it will be right to form a large penthouse, made to project sufficiently to cover a load of corn, in case a sudden storm should come on before it can be housed; and also to shelter the poultry in the farm-yard, in great heat, or bad weather.

It is most advisable, and indeed most commonly practised in countries that abound in corn, to have a separate barn for wheat, another for spring-corn, such as barley and oats, and a third for peas, tares, lintels, clover, saint-foin, &c.

Some art, which must be the result of practice, is necessary in placing and piling up the sheaves in barns. But it may not be useless to observe, that it is always necessary to press them as close to the walls of the barn as possible, so as not to afford the least room for rats, or other vermin to creep in between them: for if they once get admittance they will soon penetrate further, lodge themselves in the mow, and do prodigious damage to the corn. Where this misfortune happens, the only remedy is to take down the mow, kill the vermin, and pile it up anew.

But the floor or threshing place, is the principal part of every barn, and therefore the greatest care ought to be taken in making it. In order to this, the surface of the intended threshing place is dug away to the depth of about six inches, and the earth thus taken out, after being well cleared of stones, is mixed with the strongest clay that can be procured, and with the dung of cows and oxen. This mixture is then worked together with water, till it is of the consistence of stiff mortar, and the compost thus made is spread as smooth as possible with a trowel, upon the spot from whence the earth was taken. As it cracks in drying, it must be beaten down with great force; or rolled with a heavy roller till all the crevices are filled up: and this must be continued till it is quite solid, hard, and firm.

The best barn-floor, both for threshing and for keeping corn, is that which is driest, smoothest, most completely solid, and consequently freest from cracks and holes, in which insects and vermin may shelter themselves, and even breed. The ancients were remarkably careful in this respect, as we learn from Cato, Varro, and Columella, the last of which excellent husbandmen relates particularly the great pains they took, first to dig up the ground to some depth, in order to moisten it with fresh lees of oil, but not with any that had salt in them; then to mix it thoroughly with chaff,

and ram it down as close as possible; afterwards as it dried, to stop all the cracks and crevices that appeared, to continue beating it down with great force, to render it quite level; and lastly, to strew it again with chaff, which they trod in, and then left it to be completely dried by the sun. All these writers agree, that the lees of oil, thus used, prevent the growth of weeds in these floors, and contribute to preserve the corn from being plundered by the mice and ants. Their barns were always seated high, and as dry as possible.

A floor made in the above manner must be greatly preferable to either stone, or the earthen floors, too common in many parts of England, and from which such dampness has been communicated to the corn, as has rendered wheat, for example, sixpence a bushel worse, either for keeping or exporting.

Boarded threshing-floors, made of sound, thick, well seasoned planks of oak, are excellent for service, will last a long time, and may be converted into good floorings for rooms, by planing them down, after they are become too uneven for the purpose originally intended.

Mr. Young, in his *Annals of Agriculture*, vol. XVI. gives two plans for the construction of barns; the first of which was sent him by his correspondent the reverend Mr. Roger Kedington, of Rougham in Norfolk; who says, "The mode of executing the work, I should recommend as follows: let the underpinning be of brick or stone, two feet high above ground, and let the sides be boarded: the roof of the barn will be best covered with reed or straw, and those of the stables with slate, or glazed tile; because they must be more flat, and the water which runs from the roof of the barn, would injure most other coverings. At each end of the barn, and over the back door, small doors four feet square, should be fixed, at the height of twelve feet from the ground; the two former for putting corn in at the ends, and the latter for filling the middle of the barn after the bays are full. All the bays should have a floor of clay or marl, and the threshing-floor be made with hard bricks, which will be sufficient for all sorts of grain, except wheat and rye; and for threshing them it will be good economy to have planks of oak or red deal, well fitted together and numbered, to be laid down occasionally, and confined by a frame at their ends. A barn built on such a plan would hold a great deal of corn, and be filled most conveniently: and if stacks of corn were built at each end, they might be taken in without any carting. If more buildings are requisite, two may be added on the backside like the stables in front; otherwise, if doors are made under the eaves on the backside, as directed at the ends, and stacks be placed opposite to them (just far enough to avoid the eaves dropping), by placing a waggon between them and the barn by way of a stage, those stacks may be taken in without carting; which method spares a great waste of corn and much trouble. The spars of the roofs of the stables rest upon the upper sills of the sides of the barn, and the outside wall of the stable is eight feet high; the barn supplying the highest side and one end of each stable; and the stables in return are buttresses to the barn, and strengthen it greatly.

A barn built of the dimensions of the inclosed plan, with two stables, might, in this country, be built for the following sum. The underpinning of the barn, three feet and a half high from the foundation, and a brick and half thick, will contain six hundred and fifty-two feet of brick work nearly. The underpinning of the stables, one brick thick and three feet high from the foundation, will contain one hundred and forty-four feet, the whole amounting nearly to three rods of brick work; which, at 8l. per rod, amount to 24l. The threshing floor contains fifty-six yards; and may be paved with hard white bricks, laid edge-ways, for 8l. 8s. It will be proper to make an underpinning on each side of the threshing-floor two feet in depth and one brick thick, to prevent vermin from burrowing under it; and this, added to the underpinnings first mentioned, will not exceed three rods of brick-work; so the total expence of the threshing floor and the underpinning will be 32l. 8s. The frame of the barn, with two stables complete (allowing the beams, posts, sills, studs, and principal spars to be of oak, and the sides to be covered with featheredge boards, of red-wood deal), would cost 200l.; and 50l. more would be required for the reed and slating of the roofs. The iron work for hinges, cramps, nails, &c. would amount to another 10l. and a small additional expence would be highly proper for paint, or some cheaper composition, to preserve all the wood,

that

that is exposed to the weather. The workmanship is included in the whole of the above estimate, which you may observe is altogether very near 300l. See Plate II*.

Mr. Young has given a plan for another barn as follows :

"The mere ideas of theory in making propositions to assist others (even the youngest of beginners) I have a very poor opinion of, and I would not venture to recommend the idea I have of a good barn to the reader's eye, if I had not for some time experienced the great convenience resulting from this arrangement ; it is true, that my barn having been built many years, and in some respects very awkwardly placed, I had it not in my power to convert it into such a regular design as is in the power of those who build all new ; but I have in my additions all the circumstances of the sheds and their connection with the barn as here represented.

To arrange buildings of this nature conveniently is of prodigious importance to cattle, sheep, and hogs ; and also to saving expences in labour and in waste of hay, straw, &c.

It is proper to note, respecting the size of this barn, that the plan was sketched in consequence of a request from general Washington, that I would send him my idea of a good barn, and the necessary adjuncts, proportioned to a farm of 500 acres. The threshing floor of this barn is large enough for three men to work in, who can in a winter thresh corn of such a farm ; and all summer threshing is to be condemned when from any other motive than that of having straw for litter.

The new invented machines for threshing would alter very much the plan of a barn ; where they are used, they should be built in the center, and the corn stacks so disposed around as to supply the machine without the use of cart or horse : than which nothing is more easy to contrive. The barn in such case is a mere receptacle for straw, and should be contrived with a view to its distribution.

I have seen very expensive barns in Ireland, which the owners have boasted would confine a mouse ;—so much the worse : there cannot be too much air all around : the sides, for this reason, should be neither of brick nor stone, unless (which would be very difficult) the whole was a system of arches for being perfectly pierced with apertures of the form of a small segment of a large circle : tunnel brick, which I have seen let into the walls, are always far too few to do good, and the common air holes are nothing. The best barns (for corn) are of boards ; and the more air those boards admit, the better will the straw be for the cattle ; and the brighter the sample of corn in a ticklish season.

Combine this fact with Hendon farmers, where the best hay perhaps in England is made, never putting it in any sort of building, always in stacks.

It will be remarked, that there is no provision for water ; I am much in doubt whether there ought to be, fattening cattle on dry food alone excepted. But for all young cattle, of whatever age, cows, &c. I much prefer their being unchained twice a day and walked or led to the mouth of a neighbouring pond ; the reason is, the cattle are by this means brought up in habits of being constantly gentle and quiet ; and not apt to be frightened or skittish when put to fattening or the dairy, which is an object of much more consequence than the value of the labour. Water conducted in pipes or troughs freezes during much of the winter, and is then a nuisance ; and for all beasts on turneps or cabbages none is wanting. The expence also of making these conduits is a very great addition to the building ; and the labour of pumping not to be forgotten.

In this opinion I go against the Herefordshire vaunted practice ; but their system does not at all meet my ideas ; and the expence of giving every bullock room enough to turn around to go and drink adds so greatly to the extent of building as puts it out of the question for any persons but gentlemen on their own farms.

No notice is here taken of a hogger, which is an important object ; but I am apt to think, after much experience (for I once built a most complete one, the plan of which I have inserted in this work), and much reflection since, that it should be in a distant part of the farm, the carriage of food, more especially for fattening, is nothing to that of dung ; and having all the dung of a farm of 300 to 500 acres accumulated at one place (very rarely the centre) is a most expensive circumstance. In a large, or in a breeding system, a small cottage for a trusty servant must be added, to watch sows and pigs, but the expence would not be large.

The same observation is applicable to a standing sheep

fold or yard ; in this case it is essential that the shepherd's dwelling should be close, and even looking into it, but not the door opening into it. The way should be circuitous, to keep women and children from disturbing the flock.

All these points must vary according to peculiar views or circumstances of a farmer and his farm, and even neighbourhood : but they are very important and much deserve attentive consideration.

EXPLANATION. 1, 2, 3, 4, 5, 6. The barn.

1, 2, 7, 8. The porch of ditto with a small door, at 9, 10, 11. The great door in at which the carts enter with corn.

12. The threshing floor which extends the space of 1, 2, 10, 11.

13, 13. Bays, in which the corn is stowed.

14, 14, 14, 14. Sheds, for cattle, oxen, and horses.

15, 15, 15, 15. Mangers, two feet broad, out of which the cattle eat their straw and chaff, and turneps, carrots, cabbages, potatoes, &c.

16, 16, 16, 16. Passages, between two and three feet wide, for carrying straw from the threshing floor to feed the cattle.

17, 17, 17, 17. Doors into the passage.

18, 18, 18, 18. Principal posts on which the sheds rest.

19, 19, 19. Gutters for conveying the urine of the cattle to.

20, 20. Cisterns, out of which it is every day thrown on to dunghills, placed regularly within reach.

From the mangers 15 to the gutters 19, there is a pavement of bricks upon a slope, so laid as to finish six inches perpendicular above the gutter, and which pavement is six feet broad from that edge to the manger. The gutters are from 18 to 20 inches broad.

21, 21, 21, 21. Are sheds for various uses. If a dairy is kept, and one or two of the sheds, 14, appropriated to cows, one of these sheds will do for calves, also for chaff, turneps, roots, &c. in case of frosts, &c.

22, 22. Two yards each, with a shed for shelter, to be applied to any purpose wanted ; one for sheep, surrounded with low racks, and the other divided for a horse or two loose, if wanted ; the other half for yearling calves, which do better in a farm-yard than stalled.

23, 23. Inclosure of walling or pales.

If one of the yards be applied for hogs, then one of the sheds, 21, will be useful for their appurtenances.

1, 2, 8, 3, 4, 5, 6, 7. The main body of the barn which rises 14, 16, or 20 feet to the eaves.

All the rest are sheds placed against it, being the cheapest way of covering cattle that has yet been discovered.

I should add, that I have this general idea executed in my own farm, though not so complete as here sketched, because not built at once, and that I find it perfectly convenient.

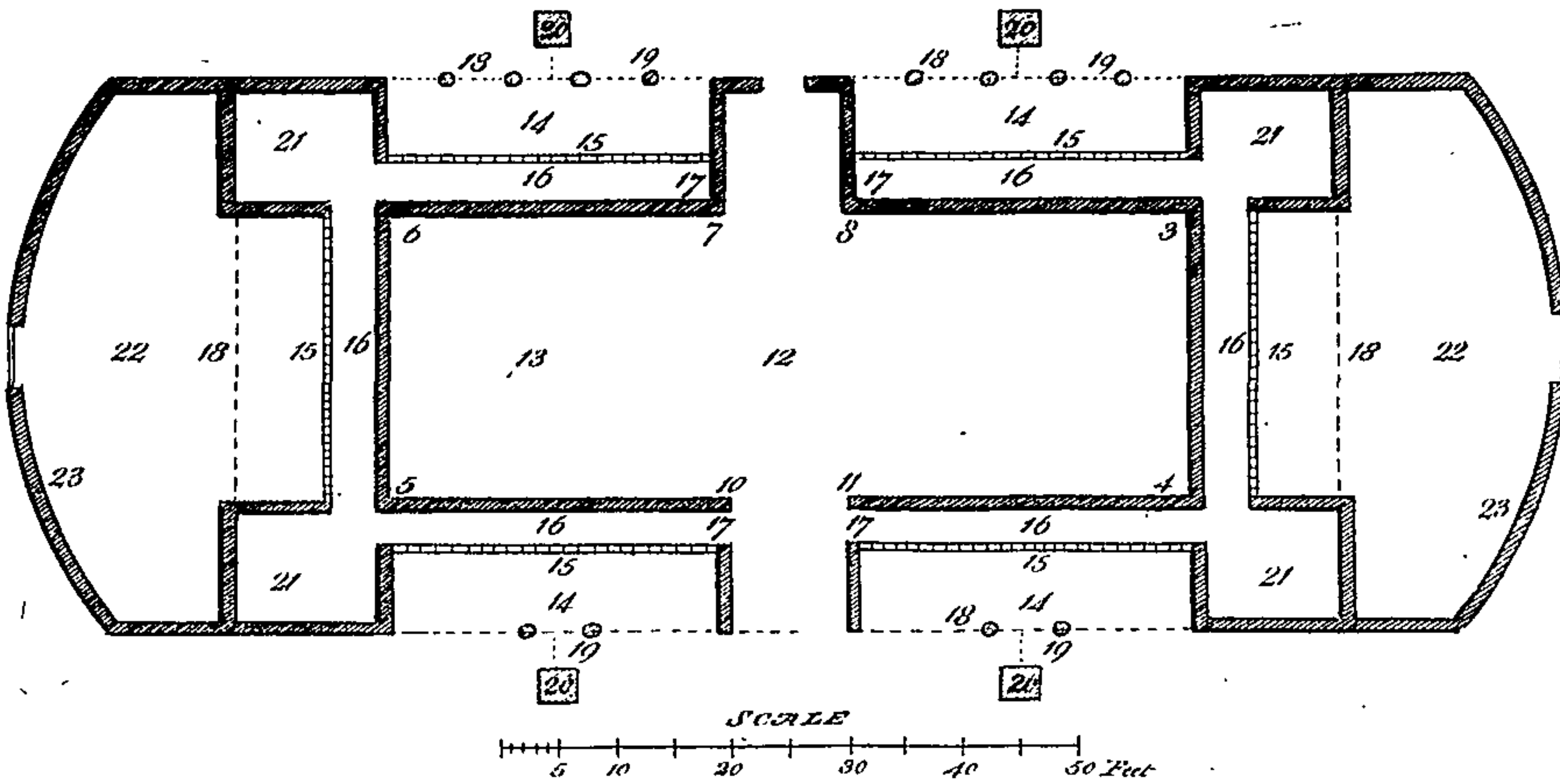
Should the quantity of cattle to be kept be greater than here admitted, a circular shed should be erected fronting the door 9, and the hay stacks must be disposed conveniently near those sheds appropriated for cows, horses, or fat cattle. Corn stacks must be built on the contrary side of the barn if other circumstances allow.

Mr. Marshall, in his Rural Economy of Norfolk, says, the barns of Norfolk are superior to those of every other county ; numerous and spacious. No farm has less than three threshing-floors ; some farms five or six, and these of unusual dimensions. Twenty-four feet by eighteen is considered as a well-sized floor ; twenty by fifteen, a small one. Indeed, a floor of less dimensions is ill adapted to the Norfolk method of cleaning corn ; which is universally effected by casting it with shovels from one end of the floor to the other. To obtain this necessary length of floor, a porch, on one or both sides of the barn, is almost universal. A lean-to porch, with double doors to let out an empty waggon, and with a range of lean-to sheds or hovels on either side, continuing the roof of the barn, without a break to the eaves of the porch and sheds, is at present, deservedly, in good estimation.

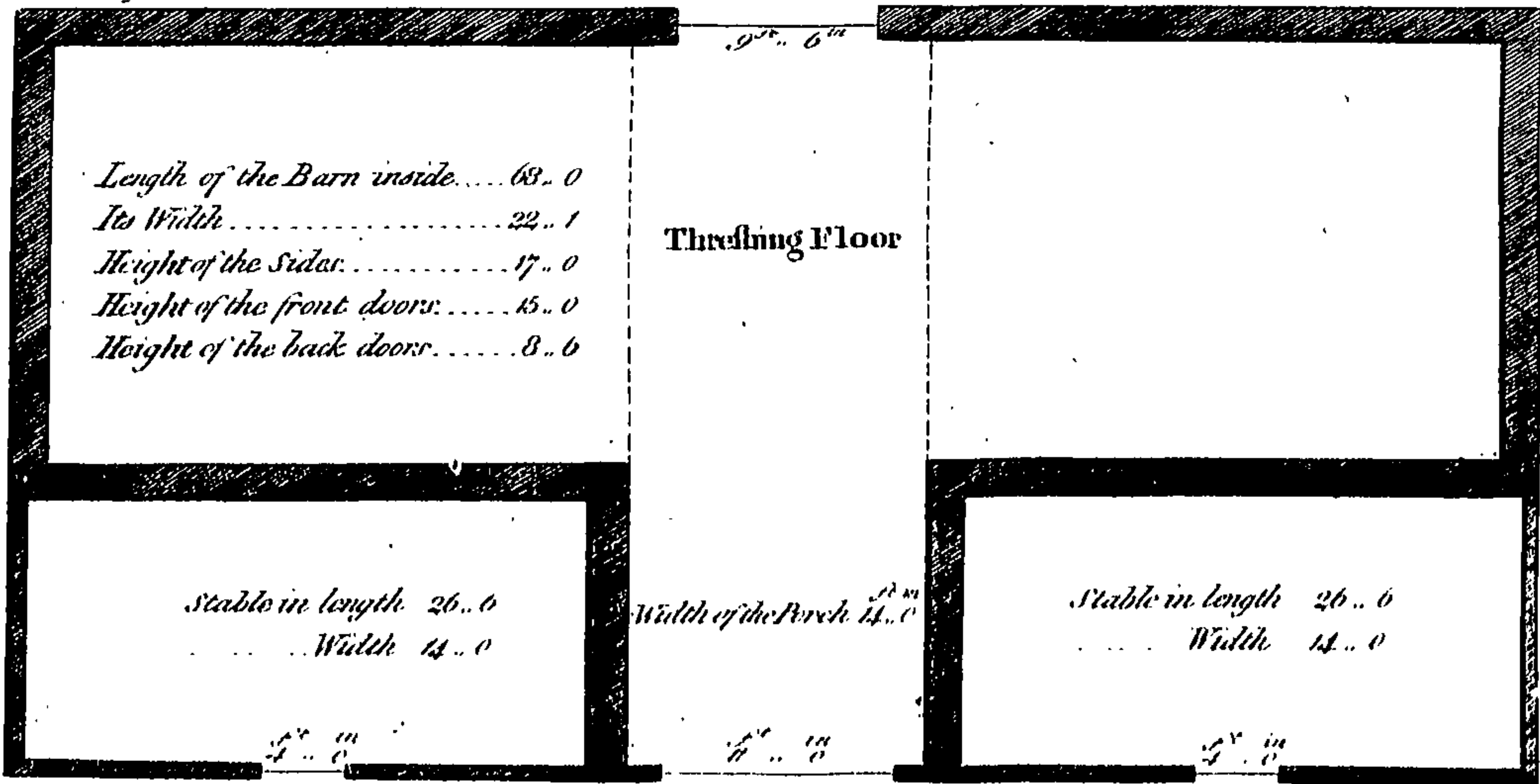
Barn-floors are of plank, "lumps" (a kind of bricks), or clay : the last are most prevalent ; and although they be considered as inferior to the first, they are in better esteem in Norfolk than in most other places.

It is observable, that notwithstanding the spaciousness of the Norfolk barn-floor, the labourers in general object to their threshing two in a barn : rather choosing to work singly :—this, perhaps, is principally owing to the particular method of threshing with two on a floor ; which is, to turn their backs on each other ; working as separately as if they

PLAN of a BARN and CATTLE-SHEDS.



A BARN and STABLES



they threshed on separate floors: the method of standing face to face, and giving stroke for stroke, being seldom if ever used.

In his Rural Economy of the Midland Counties, he says, "The only thing noticeable in the barn of this district, is an improvement, lately introduced I believe, in the means of supporting the roof. Instead of beams and principals, partial partition walls are raised, on either side the floor and between the bays, to take the purlines; leaving an opening, or large doorway, in the middle of the building, to admit the corn.

In a capital barn where two pair of purlines were necessary, the cheeks of walling are narrow; not more than five feet wide; receiving the lower purlines only; with short beams and principals, resting on the tops of the cheeks or partial partition walls, to support the upper ones.

This mode of construction is cheaper than oak beams; takes the weight of the roof in a great measure off the side walls; and frees the body of the barn from beams (well known nuisances in filling a barn); yet stiffens the building. On each side the floor, these partial partitions are evidently eligible, on these and various other accounts; without any evident disadvantage.

Barn floors. In this district, a peculiar method of laying wooden barn floors is in practice. Instead of the planks being nailed down to sleepers, in the ordinary way, the floor is first laid with bricks, and the planks spread over these, with no other confinement than that of being "dowled" together (that is ploughed and tongued) and their ends let into fills or walls, placed in the usual way, on each side the floor.

By this method of putting down the planks; provided the brickwork be left truly level; vermin cannot have a hiding place beneath them; and a communication of damp air being effectually prevented, floors thus laid are found to wear better, than those laid upon sleepers. It is observable, that the planks, for this method of laying, ought to be thoroughly seasoned.

The same author, in his Rural Economy of Yorkshire, says, "I observed here an entire farmery under one roof. One end occupied a small dwelling, the ground floor of the remainder by a stable and beast-house; over which are a barn and hay-chamber; with a chamber-barn-floor: a thing I had not seen, nor conceived an idea of, before I observed it, in more instances than one, in this district.

The above-mentioned is the only one I have seen in a new erection: I have however had full opportunity of observing the use of another thrown over a cow-house; in a large old building which had long been used as a barn, stable, and beast-house.

The advantages of a chamber-barn-floor are dryness, cleanness from dirt carried in with the feet, and security against pigs, poultry, and other accidents to which ground-floors are more liable: for threshing wheat upon, chamber-floors are obviously preferable to ground-floors; most especially in low dirty situations.

No essential disadvantage has yet struck me respecting a chamber-threshing floor; but with respect to a chamber-barn, there is one which is obvious; namely, that of having the corn at harvest, a busy season, to raise one story higher than ordinary.

Another idea in rural architecture, new to me as that of a chamber-threshing-floor, I have seen executed in a substantial manner by two of the first occupiers in the vale; namely, a granary over a barn-floor.

In all other barns I have seen, the space over the floor, whether this be large or small, and whether the building be low or lofty, remains entirely useless except in one instance, in which a very spacious building having been converted into a barn, joists were thrown across out of the reach of the flail, and the mows continued over the floor. The idea of occupying the lower part of this space with a cattle-house, as well as that of filling the upper part of it with a granary, have perhaps been originally and recently struck out in this country.

In the two instances in which I have seen granaries over barn-floors, the joists are supported by two beams thrown across the building, and the flooring of the granary let into the walls at the ends; so that notwithstanding the granaries may be surrounded with vermin, they are proof against them.

In the floor is a trap-door with tackle over it, to raise and lower the corn from and to the barn-floor.

The height between the floors thirteen feet. This in

my opinion is too great a height. Ten feet high is the most the flail requires; and every inch above that height renders the granary in many respects less commodious.

Confining the dust, which always rises more or less in threshing, appears to be the only objection to a barn-floor-granary: I mean in a barn with pitching-holes to house the corn at. But if ventilators were made immediately under the granary-floor, with valves to open or shut as the wind should change, the health of the thresher would in all probability be less injured than it generally is by this laborious and unhealthful employment.

Indeed, in this country, where tall, wide folding barn-doors are grown into disuse, vent-holes of this kind are in some degrees necessary to every barn-floor. Even upon the Wolds, a corn country, the use of large doors is declining: some good barns have lately been built with common-sized doors; one at each end of the floor: opening however in two parts, one above the other; so that the lower half can be shut to keep out pigs and poultry, while the upper one is opened to let in light and air.

This is a fortunate circumstance for the owners of landed estates: folding-doors large enough to admit a load of corn are expensive in the first instance, and frequently require repairs; besides the threshing-floor, be it of what material it may, being liable to great injury in the act of drawing loaded waggons upon it.

Indeed, throughout, the Yorkshire-barn is characterised by economy. In Norfolk, barns of one hundred and fifty to two hundred pounds cost are not unfrequently built: here a very convenient one, and such a one as will satisfy a good tenant, may be built for forty or fifty pounds. What a saving is this upon a large estate!

In his Rural Economy of Gloucestershire, he observes that in that county, he also met with a granary over a barn-floor: the height about ten feet (just out of the reach of the flail); and with two instances of granaries over pitch-roof porches; a new idea, and a very good one. The corn is hoisted up by tackle; and shot down through canvas tunnels into bags placed below.

"The size of barns, in this country, is above par. In height, above any I have observed. Fifty-two by twenty feet in the clear, and sixteen to twenty feet high to the plate, is esteemed a good barn. This size admits of four bays of ten feet each, with a floor in the middle. Three are some remains of old monastery barns, of great size, in this district.—The height of modern barns may have arisen from observing in those that "one foot below the beams is worth two above."

Barn-floors are of a good size: 12 to 14 by 18 to 20 feet. The best of oak: some of stone: but a species of earthen floor which is made, here, is thought to be superior to floors of stone, or any other material, except sound oak plank. The superior excellency of these floors is owing in part to the materials of which they are made; and in part to the method of making.

BARNACLES, horse-twitchers, or brakes, are a sort of instruments used by farriers to put upon horses noses, when they will not stand quietly, to be shod, blooded, or dressed.

There are several sorts of barnacles, the common sort are rollers of wood bound together, to hold the horse's nose between. Another sort have handles, and are therefore termed pincers, to distinguish them from the foregoing. And a third sort are held together at the top by a ring inclosing buttons, having the top buttons held by an iron pin rivetting through them.

BARREN CORN, a name given to a distemper in corn, by M. Aimen, who first observed it. The ears of wheat or rye, the species most subject to this distemper, which are thus affected, are long, lean, and white; in some the stamina, or small threads in the middle of the flower, are dry, transparent and horned; the female organs are small, whiter, and less velvety, than in healthy ears: in others, the filaments are swelled, the apices, or knobs on the tops of the stamina, void of dust or farina, and the stigmata badly unfolded. The stigmata of all the blossoms of an ear are sometimes dried and parched; at other times the apices are swelled.

BARREN EARTH, a name given by some to the under stratum of earth, or that which lies below the stratum frequently turned up, and cultivated for the nourishment of plants.

This notion of the under stratum of earth being dead or barren, and will destroy every vegetable planted in it, seems to be founded on a mistake: for every kind of earth, whether it be upon or under the surface, is certainly capable of

giving nourishment to plants, provided it be for some time exposed to the influence of the air, frosts, &c. in order to enable it to dispense its nutritive qualities. An earth seemingly barren dug out of a deep pit, will, if spread on the surface, and properly stirred and exposed, be soon in a condition of bearing plants, and even much more so than the earth, which having been long at the surface is almost exhausted, by the number of vegetables it has successively nourished. The notion of any earth being barren, merely because it is placed at a distance from the surface, is by the most intelligent naturalists exploded; its particles may perhaps want a proper arrangement, but it always possesses the vegetative quality. This opinion has been confirmed by repeated experiments; and a very remarkable one of this kind is related by a correspondent of the editors of the *Museum Rusticum*, vol. I. p. 100, &c. where the writer tells us that he planted a quantity of potatoes in a piece of what they called dead barren earth, the upper bed having been taken away and spread on the adjacent land. Yet in this spot of ground dug two spits deep by the help of spades and mattocks, and the earth broke as fine as possible, he had a prodigious crop of remarkable fine potatoes; though the earth had not been exposed to the influence of the atmosphere above two months, it being dug in February, and the potatoes planted the latter end of March.

BARREN SPRINGS, a name given by husbandmen to such springs whose waters are injurious to land.

Most waters that flow from coal-mines, or through beds of sulphureous minerals, have this pernicious quality, destroying vegetables, instead of nourishing them. They have a harsh and brackish taste, are generally of a reddish colour, and deposit a reddish sediment in the channel through which they flow. They are much better when they have run some distance, than at their first breaking out on the surface of the earth. *Mortimer's Husbandry*, vol. I. p. 20.

BARBS, the fleshy rows that run across a horse's mouth, reaching almost to the palate. They are very distinguishable in young horses.

BARTH, a warm place, or pasture for calves and lambs.

BARTON, or **BARKEN**, the yard of a house.

BASTARD *Alkanet*, called also *bastard gromill*, or *sal-farn*, a weed common among corn, especially rye. It may be easily known by its red roots, which yield a red tincture, and are used by the young girls in Sweden to colour their cheeks. From the root usually rises a single stem about a foot high, rough and branching out at the top. The flowers are small and white, surrounded with five long, narrow, hairy leaves, forming what the botanists call the empalement of the flower cup, and succeeded by four white rough seeds. See the figure of this plant on Plate III fig 2.

BAVINS, brush-faggots, or faggots made with the brush-wood at length.

BAUSON, the same with badger. See **BADGER**.

BAY, a colour in horses, so called from its resembling the colour of a dried bay-leaf.

There are various degrees of this colour from the lightest bay to the dark, which approaches nearly to the brown, but is always more gay and shining. The bright bay is an exceeding beautiful colour, because a bright bay horse has generally a reddish dash, with a gilded aspect, his main and tail black, with a black or dark list down his back. The middle colours of bay have also frequently the black list, with black main and tail. And the dark bays have almost always their knees and pasterns black; and we meet with several sorts of bays, that have their whole limbs black from their knees and hocks downwards. The bays that have no list on their backs, are, for the most part, black over their reins, which goes off by an imperceptible gradation from dark to light towards the belly and flanks. Some of these incline to a brown, and are more or less dappled. The bay is one of the best colours, and horses of all the different kinds of bays are commonly good, unless when accidents happen to spoil them while they are colts. *Gibson on Horses*, vol. I. p. 44.

BAY of a barn, that part where the mow is placed. Hence such barns as have the threshing floor in the middle, and a space for a mow on each side, are called barns of two bays, &c.

BAYARD, a bay horse.

BEANS, a sort of pulse well known, and of which there are two species, distinguished by the name of the garden-bean, and the horse-bean.

Some few trials have been lately made in France to raise

garden beans in open fields, on the principles of the new husbandry: and the result of these experiments sufficiently indicated that very large crops may be procured by that method if properly practised. M. du Hamel tells us, that M. Eyma planted, in December 1755, in a field near Bourdeaux, the common sort of garden beans, in a middling soil not dunged, but thoroughly ploughed a foot deep. The rows were two feet asunder, and the plants a foot distant from one another. These beans, which every one thought too thinly sown, being assisted by frequent hoeings, yielded a greater crop than any in the common way. When they began to ripen, M. Eyma gave the spaces between them a good plowing, and on the twenty-third of June sowed in each of them a row of red kidney beans, which came up very well. In a fortnight after he plucked up the garden beans, and gave the ground on which they stood a slight hoeing. These kidney-beans proved the finest he ever saw. He repeated the same experiment in 1756, and was rewarded with such success as surpassed his warmest expectations. *Traité de la Culture des Terres*, tom. V. p. 81.

Purple BEANS, a kind originally brought from the Cape of Good Hope, had an experiment made on their prolificness in January 1775 by Mr. Marshall, who had made it a piece of parlour furniture since the preceding harvest. It had, when drawn, upwards of ninety pods, but some of them immature.

	2 of the pods had	5 each	10 beans.
12	- - -	4 - -	48
37	- - -	3 - -	111
27	- - -	2 - -	54
7	- - -	1 - -	1
85 pods.			230 vegetative beans.

He put the fives and fours in a paper by themselves; as he did the threes in a second paper; and the twos and ones in a third paper, to try whether the seed which springs from the root was specially fructuous, or was not, in itself peculiarly prolific, and whether the particular circumstances of its production influenced its produce. In July, 1777, these beans were drilled indiscriminately, in a patch of the same species; when the particular produce of the pods of different sizes were identified by labelled stumps, and the experiments rigidly attended to: but at harvest not the smallest disparity could be discovered; for the bean brought forth singly was equally prolific with that brought forth in a pod of 4 or 5.

Mr. Marshall recommends the pulling beans, for he says the benefit the soil receives will more than pay for the extra labour in clearing. Indeed they were liable to have lumps of dirt to adhere too large to be sifted out, and too heavy to be blown out, nor did casting them from one end of the barn floor to the other with a shovel remove it; but after several experiments, he put about half a bushel into a sack and threshed them for a few seconds; they were then shook in a wheat-riddle, and came out perfectly clean. The flail breaks the clods, and the wheat-riddle lets the dust and small refuse beans through it. In another experiment he approves of their being trod by a man as more expeditious. Another advantage arises from their being pulled, is, the stubbornness of the roots keeps the mow open, and admits a circulation of air. The quantity to be put into the sack to be trod out should be about two bushels in a four bushel sack, and the expence about 7d. or 8d. a quarter. The same gentleman says in another place, that by experience he found that by pulling up by hand, is far preferable to cutting with sickles: they may be pulled up faster and much cleaner from weeds and grass than when cut, besides leaving the land in a state greatly superior. The waste is less, as to lose scarcely a bean; and the bean stalks are immediately ready to bind and set up; and by the roots lifting the earth from the ground, gives the air a free circulation. The work is also easier to the labourer, who stands more upright, and the power required is much less, especially in dry weather. By striking the roots of each handful against the foot, the mould is almost wholly disengaged from the fibres. The soil in the drills, instead of being bound by the roots, and cumbered by the stubble, is left as loose as a garden, and the surface free from obstructions; and if thoroughly hoed is as fit as a fallow to be sowed with wheat on one plowing.

Horse BEANS, delight in a strong moist soil, and an open exposure, for they never thrive well on dry warm land, or in small inclosures, where they must, and are frequently

attacked by the black dolphin fly: these insects are often in such quantities as to cover the stems of the beans entirely; especially all the upper part of them; and whenever this happens, the beans seldom come to good; but in open fields where the soil is strong, and the plants have room, this rarely happens.

These beans are usually sown in land which is fresh broken up, because they are of use to break and pulverise the ground, as also to destroy weeds; so that the land is rendered much better for corn, after a crop of beans, than it would have been before, especially if they are sown and managed according to the new husbandry, with a drill plough, and the horse-hoe used to stir the ground between the rows of beans; which will prevent the growth of weeds, and pulverise the ground, whereby a much greater crop of beans may, with more certainty, be expected; and the land will be better prepared for whatever crop it is designed for after.

The season for sowing beans is from the middle of February to the end of March, according to the nature of the soil; the strongest wet soil should always be last sown. The usual quantity of beans sown on an acre of land, is about three bushels, though this is double the quantity that need be sown, especially according to the new husbandry; but it will be necessary first to set down the practice according to the old husbandry, and then give directions for their management according to the new. The method of sowing is after the plough, in the bottom of the furrows; but then the furrows should not be more than five, or at most more than six inches deep. If the land be newly broken up, it is usual to plough it early in the autumn, and let it lie in ridges till after Christmas, then to plow it in small furrows, and lay the ground very smooth. These two ploughings will break the ground fine enough for beans, and the third ploughing is to sow the beans, when the furrows should be made shallow, as before mentioned.

Most people set their beans too close; for as some lay the beans in the furrows after the plough, and others lay them before the plough, and plough them in; so by both methods the beans are as close as the furrows are made, which is much too near: for when they are on strong good land, they are generally drawn up to a very great height, and are not so apt to pod as when they have more room, and are of a lower growth. The better way, therefore, is to make the furrows three feet asunder or more, which will cause them to branch out into many stalks, and bear in greater plenty than when they are closer; by this method less than half the quantity of beans will be sufficient for an acre of land, and the air being admitted between the rows, the beans will ripen much earlier, and more equally than in the common way. *Miller's Gard. Diet.*

It has been already observed, that the black dolphin fly often destroys a crop of beans, and to prevent which a correspondent of the editors of the *Museum Rusticum* proposes, that when these destructive insects are first seen on the tops of the beans, one or more persons, provided each with a scymetar or hanger, should be sent in the field, and strike off the heads of the beans. He adds, that by this means a crop has been often saved, this fly being seldom known to rise again when it once falls with the bean top to the ground. *Museum Rusticum*, vol. III. p. 233.

Another correspondent in the above work says, that as soon as the beans have got six leaves, the sheep should be turned in to feed among them; for they will eat up all the young weeds, even the melilot, without touching the beans. He adds, that the sheep may be kept every day among the beans till they are in blossom; but they must not be suffered to lie down. *Museum Rusticum*, vol. III. p. 339.

When beans are intended to be planted according to the new husbandry, the ground should be four times ploughed before the beans are set, which will break the clods, and render it much better for planting. Then use a drill plough, to which a hopper is fixed for setting the beans, the drills should be made at three feet asunder, and the spring of the hopper set so as to scatter the beans at three inches distance in the drills. By this method less than one bushel of seed will plant an acre of land. When the beans are up, if the ground be stirred between the rows with a horse-plough, it will destroy all the young weeds; and when the beans are advanced about three or four inches high, the ground should be again ploughed between the rows, and the earth laid up to the beans; and if a third ploughing, about five or six weeks after be given, the ground will be kept clear from weeds, and the beans will stalk out, and

produce a much greater crop than in the common way. *Miller's Gard. Diet.*

A correspondent of the editors of the *Museum Rusticum*, has given the following method of cultivating beans in the vale of Aylesbury.

"First, says he, I plough two furrows on each outside of the land, but sow no beans in them: I afterwards drill, with an instrument hereafter described, the three next furrows: then I plough two furrows without drilling any beans in them, and so on, sowing three, and leaving two for intervals, till the land is finished.

"When the beans are about two or three inches high, I plough two furrows up each interval, turning the furrows from the beans, so as to make a ridge in the middle of each interval. I have a little plough on purpose for this use; about half the size of a common plough, which is drawn by one horse.

"This work should be done after a rain. This year, 1764, on the fifteenth of May we had rain. I therefore went to plough in the intervals on the eighteenth, and continued at plough till all were finished. On the eighth of June we had rain again. On the ninth of June I went to harrow the intervals with the triangular harrow hereafter described. About a week after that we had more rain. I then went to harrow again, going up the interval I went down before; and down that which I went up. This is what we call cross-tining. Thus my land is laid quite smooth, kept clear from weeds, and the beans have a fine loose mould to strike their fibres into; and it is by far the cheapest way of weeding beans.

Proportions of the above DRILL (see Plate III. fig. 3.)

"Diameter of the iron wheel twenty inches.

"Length of the box from A to B, twenty inches.

"Breadth of the box from B to C, ten inches.

"Depth of the box from C to D, five inches and a half.

"Diameter of the cylinder of wood upon the iron axis of the wheel, four inches. This cylinder turns out the beans regularly.

"Length of the cylinder two inches and a half. On this cylinder are twenty-one holes, a quarter of an inch deep, and half an inch in diameter.

"E is a tongue, which drops upon the cylinder, and plays up easily: the tongue is half an inch thick, and three quarters wide. When a larger bean than ordinary comes, it will throw the tongue up, which naturally recovers its place again; and so the work goes on well and even. The tongue is represented separately with its notch at E: the notch does not go quite through it; it falls exactly on the holes of the cylinder.

"A lid takes off to put the beans into the box; and buttons down at F."

The triangular HARROW described (see Plate III. fig. 4.)

"From A to B eighteen inches.

"The tines are nine inches a-part.

"The three tines in the cross-bar are only three inches and a half a-part.

"E, a cock which plays upon a pin; in which are three holes to hang the whipple tree in. If you put it into the upper hole, the tines bear very heavy upon the ground; I generally use the middle hole." *Museum Rusticum*, vol. III. p. 26.

When the beans are ripe they are reaped with a hook, as is generally practised for pease; and after having lain a few days on the ground, they are turned, and this must be repeated for several times, until they are dry enough to stack; but the best method is to tie them in small bundles, and set them upright; for then they will not be in so much danger to suffer by wet, as when they lie on the ground; and they will be more handy to carry and stack, than if they were loose.

The common produce is from twenty to twenty-five bushels on an acre of land. *Miller's Gard. Diet.*

In the stiff, strong land, of the vale of Aylesbury, they annually sow a great many acres of horse-beans, all which they usually mow with a bare scythe, in swarth, as they call it; that is they mow beans towards the beans; and each mower has a boy, who follows him with a fork, and lays the beans in wads. Their reason for mowing them in swarth, is on account of the largeness of their crops, and the beans leaning inwards; it is only when they have a thin crop,

crop, that they venture to mow them against their bending (this they call throatings;) for should they do it in common, it would break the hearts of the mowers, being as hard work again as the other.

When they mow in swarth, the workmen always keep the points of their scythes downwards, or they would strip off great quantities of the beans.

In Hertfordshire also, some farmers mow their beans with a scythe, and a three ribbed strong cradle: this cuts a great deal in a day, lays the beans in regular rows, and saves the expence of a wadder; but in Buckinghamshire they cannot use a cradle, their crops being in general so heavy, that the workman could not carry over the swarth. *Museum Rusticum*, vol. I. p. 275.

The beans should lie in the mow to sweat, before they are threshed out; for as the haulm is very large, and succulent, so it is very apt to give and grow moist; but there is no danger of the beans receiving damage, if they are stacked tolerably dry; because the pods will preserve the beans from injury; and they will be much easier to thresh after they have sweat in the mow than before; and after they have once sweated and are dry again, they never after give.

By the new husbandry the produce has exceeded that of the old by more than ten bushels an acre; for if the beans cultivated in the common method are observed when they are in pod, it will be found that more than half way of their stems have no beans on them; for by standing close, they are drawn up very tall, so the tops of the stalks only produce, and all the lower part is naked; whereas in the new method, they bear almost to the ground; and as the joints of the stems are shorter, so the beans grow closer together. *Miller's Gard. Dict.*

Beans are a part of the diet of horses, but chiefly used in mixture with bran or chaff, and by some upon the road, with oats; but they are mostly given to coach horses and others that are constantly in draught. They afford the strongest nourishment of all other grain, and will enable horses to go through a great deal of heavy labour; but in some seasons they breed a kind of vermin, which the farmers call a red bug, and is reckoned dangerous, and therefore the best way at such times is to have them well dried and split, which may, in some measure, destroy the quality that is engendered in them. *Gibson on Horses*, vol. I. p. 171.

Mr. Marshall, in his Minutes of Agriculture, recommends the rolling of both peas and beans as a good preparative to hoeing; at a time when they open a broad leaf, and lay flat on the ground; Indeed he trampled on them and rubbed some of the plants hard with his foot, and at the expiration of a week they had not the appearance of having received any injury; and he says that beans when their broad leaves lie flat on the ground may be harrowed and rolled with safety.

Mr. Young, in the 2nd. vol. of his Annals of Agriculture, observes that the May beans are not subject to the grub as others are, and they are by much the best bearers. In another part of that valuable work in vol. VII. he experienced the great benefit of bean straw in feeding lean cattle.

In the 5th vol. of the memoirs of the Bath society of agriculture, page 39 is the following paragraph:

"I have found, by repeated experience that beans are a much more hearty and profitable food for horses than oats. Being out of old oats the two last springs, I substituted horse beans in their stead. In the room of a sack of oats with chaff, I ordered them a bushel of beans with chaff to serve the same time. It very soon appeared the beans were superior to the oats from the life, spirit, and sleekness of the horses.

Whoever has frequented the corn markets in London cannot but know that old horse-beans sell from ten to fifteen, and even more, per cent. dearer than new corn: because new beans will, by their abundant crudity, give a horse the gripes, and other disorders equally fatal. To prevent such consequences, and at the same time save the difference between the expence of old and new corn, a correspondent of the editors of the *Museum Rusticum* tells us that he made the following experiment.

He purchased a quantity of new beans, and filled a large tub with them, pumping in as much water as was necessary to wet them: after soaking about ten hours he drew off the water, and laid the beans in a heap on the floor. In this manner he suffered them to continue till they began to heat, when he spread them out thinner, moving them often with a malt shovel, and letting them lie in beds till the germ

swelled and became turgid. Then he carried them to a malt-kiln, and dried them gradually; and gave part of them to his horses, as soon as cold.

By this preparation he assures us new beans will agree as well with cattle as any old corn that can be procured at the market.

The greatest nicety in the operation is to prevent the beans from sprouting, or malting, which would injure them, and not to dry them by too quick a heat. *Museum Rusticum*, vol. I. p. 327.

BEAR, or *berc*, a species of barley, called also winter barley, square barley, and big.

This grain is chiefly cultivated in Scotland, the northern parts of England, and Ireland. It yields a very large return, but is not esteemed so good for malting as the common barley, for which reason it is very little cultivated in the southern parts of England. See BARLEY.

BEARD, the same with awn. See AWNS.

BEARD of a horse, a name given to the hairs scattered on his under lip to the place where the curb of the bridle rests.

BEARDED oat grass, the same with wild oats. See the article WILD OATS.

BEASTS of BURTHEN. See OXEN, and HORSES.

BEDS, a name given by many writers on the new husbandry to the spaces occupied by the rows of corn; to distinguish them from the intervals, or open spaces between these beds, which they term alleys. See ALLEY.

Yellow ladies BEDSTRAW, *cheefe-rennet*, *maid's hair*, or *petty mugwort*, a weed very common in moist meadows and pasture grounds. Its slender stalks rise to about a foot in height. The leaves come out in whorls, eight or nine together. They are long, narrow, and of a green colour. Two little branches generally come out near the top of the stalk, supporting a considerable number of small yellow flowers, consisting of one petal, divided into four parts, and succeeded by two large kidney-shaped seeds.

BEE, a small and well known insect, famous for its industry.

This useful and laborious insect is divided by two ligaments into three parts or portions, the head, the breast, and the belly. The head is armed with two jaws and a trunk; the former of which play like two jaws opening and shutting to the right and left. The trunk is long and taper, and, at the same time, extremely pliant and flexible, being destined by nature for the insect to probe to the bottom of the flowers through all the impediments of their chives and foliage; and drain them of their treasured sweets: but were this trunk to be always extended, it would prove inconvenient, and be liable to be injured by a thousand accidents, it is therefore of such a structure, that, after the performance of its necessary functions, it may be contracted, or rather folded up; and besides this, it is fortified against all injuries by four strong scales, two of which closely sheathe it, and the two others, whose cavities and dimensions are larger, encompass the whole. From the middle part or breast of the bee grow the legs, which are six in number: and at the extremity of the paws are two little hooks, discernible by the microscope, which appear like sickles, with their points opposite to each other. The wings are four, two greater and two smaller, which not only serve to transport them through the air, but, by the noise they make, to give notice of their departure and arrival, and to animate them mutually to their several labours. The hairs with which the whole body is covered, are of singular use in retaining the small dust that falls from the chives of the flowers, of which the wax is formed, as will be observed hereafter. The belly of the bee consists of six rings, which slide over one another, and may therefore be lengthened or contracted at pleasure; and the inside of this part of the body contains the intestines, the bag of honey, the bag of poison, and the sting. The office of the intestines is the same as in other animals. The bag of honey is transparent and crystal, containing the sweet juices extracted from flowers, which the bee discharges into the cells of the magazine for the support of the community in winter. The bag of poison hangs at the root of the sting, through the cavity of which, as through a pipe, the bee ejects some drops of this venomous liquor into the wound, and so renders the pain more excessive. The mechanism of the sting is admirable, being composed of two darts, inclosed within a sheath that tapers into a fine point, near which is an opening to let out the poison. The two darts are ejected through another aperture, which, being armed with several sharp beards like those of fish-hooks,

hooks, are not easily drawn back again by the bee ; and indeed she never disengages them if the wounded party happens to start and put her into confusion ; but if one can have patience to continue calm and unmoved, she clinches those lateral points round the shaft of the dart, by which means she recovers her weapon, and gives less pain to the person stung. The liquor which at the same she infuses into the wound, causes a fermentation, attended with a swelling, which continues several days ; but that may be prevented by immediately pulling out the sting, and enlarging the puncture, to let the venomous matter have room to escape.

Let us now consider the generation, polity, and labours of these insects, the true knowledge of which is very much owing to the modern invention of glass-hives, through which all the secrets of the community are laid open to a curious observer. Any person who carefully examines a hive at different seasons of the year, will distinguish three sorts of bees ; of which the far greater number are the common working bees, who do all the business of the hive, and seem to be neither male nor female. The working bees are represented on Plate III. fig. 5. The second sort, called drones, are the males, and somewhat larger than the former as fig. 6. They have no sting, nor even stir from the hive, but live upon the honey prepared by the others. The third sort is a much larger and longer bodied bee, of which there are often but one in every swarm or colony of young bees, who are from time to time detached from the hive in search of another habitation. This large bee is what the ancients called the king, from the respect they always saw paid to it by other bees ; but being the female, the moderns more properly give it the title of queen, or mother of the swarm. See Plate III. fig. 7.

When these industrious insects begin their works, it is observed they divide themselves into four parties, one of which is destined to the fields to provide materials for the structure : the second works upon those materials, and forms them into a rough sketch of the dimensions and partitions of the cells ; the third examines and adjusts the angles, removes the superfluous wax, polishes the work, and gives it its necessary perfection ; and the fourth is employed in bringing provisions to the labourers that build them, because polishing is not so laborious. They begin their work at the top of the hive, continuing downwards to the bottom, and from one side to the other ; and to make it the more solid they use a sort of tempered wax, resembling glue. The form of the cells of the honey-comb is hexagonal, which figure, and besides what is common with a square and equilateral triangle, has the advantage of including a greater space within the same surface.

The expedition of the bees in their labours is almost incredible ; for notwithstanding the elegance and just proportions of the work, they are so indefatigable, that they will, in one day, finish a honey-comb a foot long, and six inches broad, capable of receiving three thousand bees.

It is not easy to know, particularly, the manner in which they employ themselves at this work, on account of the number of bees then in motion, by which means the eye can hardly distinguish any thing but confusion. We have however been able to observe the following particulars : some bees, bearing in each of their talons a little piece of wax, are seen running to the places where their companions are at work upon the combs ; at their arrival they fasten the wax to the work by means of the same talons, which they apply sometimes to the right, and sometimes to the left. Each bee is employed but a short time on this work, when another takes its place.

While a part of the bees are at work in constructing the cells, others are employed in perfecting those that are newly modelled, finishing the angles, sides, and bases, in so exquisite a manner, and with such remarkable delicacy, that three or four of these sides laid upon one another, are not thicker than a leaf of common paper ; and because the entrance of the cell, which is adapted to the size of the bee, would on account of this delicacy, be subject to break, they strengthen the entrance of each cell with a border of wax.

We have already observed, that the bees which build the cells work but a little while at a time ; but it is different with regard to those that polish them, for they work for a long while, and with great expedition, never intermitting their labour, unless it be to carry out of the cell the particles of wax taken off in polishing : and, to

prevent this wax from being lost, other bees stand ready to receive it from the polishers, and carry it to some other part, in order to its being employed.

Each comb has two rows of cells opposite to each other, which have their common bases. The thickness of each comb is something less than an inch ; and, consequently, the depth of each cell about five lines : but at the same time the breadth of each is little more than two.

All the combs are constructed with cells of this size, except a small number of others in some particular parts of the hive, which are larger and appropriated to the lodging eggs, that afterwards become drones, or malebees.

There are also, in some parts of the hive, three or four cells bigger than the others, and constructed in a different manner. They are of a spheroidal figure, open in the inferior part, and attached to the extremities of the combs.

When the cells are completed, the queen takes possession of those she likes best to deposit her eggs in, and the rest are left to be filled with honey. She lays one egg in each cell, and sometimes more than an hundred of those eggs in a day ; but what is still more remarkable, she lays those eggs which are to produce common bees in cells of the common shape and size ; those that are to become drones or males, in the cells of a larger size, and deposits those which are to become females, like herself, in the spheroidal cells already described.

These eggs, after lying some time in the cells, are hatched into maggots, and fed with honey ten or twelve days, after which the other bees close up the cells with a thin piece of wax ; and under this covering they become gradually transformed into bees, in the manner as silk-worms are into butterflies. Having undergone this change, the young bees pierce through their waxen doors, wipe off the humidity from their little wings, take their flight into the fields, rob the flowers of their sweets, and are perfectly acquainted with every necessary circumstance of their future conduct. As to the males or drones, which are destined only to propagate their species, they live very comfortably for about three months after they are hatched ; but when that time is over, and the females are impregnated, the common bees either kill them, or drive them from the hive, as burthenome to the community, and not a drone is to be found till the next season.

The method in which the bees collect their wax and honey deserves to be a little explained. At the bottom of all flowers there are certain glands which contains more or less honey, that is, the most exalted particles of the sugary juices of the plant. These juices the bee sucks up with her proboscis or trunk above-mentioned, and draws it into her mouth ; and when it has thus taken a sufficient quantity into her stomach, returns to the hive, and discharges the honey into the common magazine.

When the cells prepared to receive it are full, the bees close up some with wax till they have occasion for the honey ; the rest they leave open, to which all the members of the society resort, and take their repast with a very instructive moderation.

It is an excellent observation of a modern author, that the hive is a school to which numbers of people ought to be sent ; prudence, industry, benevolence, public spiritedness, oeconomy, neatness, and temperance, are all visible among the bees. These little animals are actuated by a social spirit, which forms them into a body politic, intimately united, and perfectly happy. They all labour for the general advantage ; they are all submissive to the laws and regulations of the community : having no particular interest, no distinction but those which nature or the necessities of their young have introduced amongst them. We never see them dissatisfied with their condition, or inclinable to abandon the hive in disgust, or find themselves slaves or necessitous : on the contrary, they think themselves in perfect freedom, and perfect affluence ; and such indeed is their real condition. They are free, because they only depend on the laws ; they are happy, because the concurrence of their several labours inevitably produces abundance, which contributes to the riches of each individual. Let us compare human societies with this, and they will appear altogether monstrous. Necessity, reason, and philosophy, have established them for the commendable purposes of mutual aid and benefits : but a spirit of selfishness

destroys all ; and one half of mankind, to load themselves with superfluities, leave the other destitute of common necessities.

Wax is composed of the farina, or dust, formed on the apices of flowers. This the bees collect, and with their fore-feet and jaws, roll up into little balls, which they convey, one at a time, to the feet of their middle legs, and from thence to the middle joints of their hind-legs, where there is a small cavity like a spoon to receive it. These balls are not, however, true wax, but the substance or basis of it: to reduce this crude substance into wax, it must first be digested in the body of the bee.

After the bees have brought home this crude substance, they eat it by degrees ; or, at other times, three or four bees come and ease the loaded bee by eating each of them a share, the loaded bee giving them a hint so to do. Hunger is not the motive of their thus eating the balls of waxy matter, especially when a swarm is first hived ; but it is their desire to provide a speedy supply of real wax for making their combs. At other times, when there is no immediate want of wax, the bees lay this matter up in repositories, to keep it in store.

When this waxy matter is swallowed, it is by the digestive powers of the bee, converted into real wax, which the bees again disgorge as they work it up into combs ; for it is only while thus soft and pliant from the stomach that they can fabricate it properly. That the wax thus employed is taken from their stomachs, appears from their making a considerable quantity of comb soon after they are hived, and even on any tree or shrub where they have rested but a short while before their being hived, though no balls were visible on their legs, excepting those of a few which may be just returned from the field.

Bees collect crude wax also for food ; for if this was not the case, there would be no want of wax after the combs are made : but they are observed, even in old hives, to return in great numbers loaded with such matter, which is deposited in particular cells, and is known by the name of *bee-bread*. We may guess that they consume a great deal of this substance in food, by the quantity collected, which, by computation, may in some hives amount to an hundred weight in a season, whilst the real wax in such an hive does not perhaps exceed two pounds.

But besides the three substances, honey, wax, and bee-bread, already mentioned, there is another with which the bees close every crevice in their hives, and which is called propolis. It is a kind of resin easy to be rolled out, much more tenacious than wax, and more easily fixed. It does not seem to require any preparation, being a real resin, which they collect from trees, and employ as they find it. It grows very hard in the hive, but may be softened by heat. It is dissoluble in spirit of wine. It commonly diffuses a very agreeable smell when heated. Its outward colour is of a reddish brown ; its inside resembles wax, and is a little yellowish. When the bees make use of it, it is soft and pliable ; but it hardens daily, and becomes in time harder than wax. This propolis serves also for another purpose, which is, that when a snail, slug, or any other creature too large to be carried out by the bees, has been slain in the hive, they cast it over with this substance, and thereby prevent the bad effects of the putrid smell arising from dead bodies.

When the hive is become too much crowded, by the addition of the young brood, a part of the bees think of finding themselves a more commodious habitation, and with that view single out the most forward of the young queens. A new swarm is therefore constantly composed of one queen at least, and of several thousand working bees, as well as of some hundreds of drones. The working bees are some old, some young.

Scarce has the colony arrived at its new habitation, when the working bees labour with the utmost diligence, to procure materials for food and building. Their principal aim is not only to have cells in which they may deposit their honey ; a stronger motive seems to animate them. They seem to know that their queen is in haste to lay her eggs. Their industry is such, that in twenty-four hours they will have made combs twenty inches long, and wide in proportion. They make more wax during their first fortnight, if the season is favourable, than they do during all the rest of the year. Other bees are at the same time busy in stopping all the holes and crevices they find in their new hive, in order to guard against the entrance of insects which covet their honey

their wax, or themselves ; and also to exclude the cold air, for it is indispensably necessary that they be lodged warm.

When the bees first settle in swarming, indeed when they at any time rest themselves, there is something very particular in their method of taking their repose. It is done, by collecting themselves in a heap, and hanging to each other by their feet. They sometimes extend these heaps to a considerable length. It would seem probable to us, that the bees from which the others hang, must have a considerable weight suspended to them. All that can be said is, that the bees must find this to be the situation agreeable to themselves. They may perhaps have a method of distending themselves with air, thereby to lessen their specific gravity, in the same manner as fishes do, in order to alter their gravity, compared with water.

When a swarm divides into two or more bands which settle separately, this division is a sure sign that there are two or more queens among them. One of these clusters is generally larger than the other. The bees of the smaller cluster, or clusters, detach themselves by little and little, till at last the whole, together with the queen, or queens, unite with the larger cluster. As soon as the bees are hived and settled, the supernumerary queen, or queens, must be sacrificed to the peace and tranquillity of the hive. This execution generally raises a considerable commotion in the hive, and several other bees, as well as the queen, or queens, lose their lives. Their bodies may be observed on the ground, near the hive. The queen that is chosen is of a more reddish colour than those which are destroyed ; so that fruitfulness seems to be a great motive of preference in bees ; for the nearer they are to the time of laying their eggs, the bigger, larger, and more shining are their bodies.

For three or four nights before a swarm falls forth, there is in the hive a peculiar humming noise, of which authors give very different descriptions, probably owing to the strength of imagination in each. Every sound among bees arises from their striking their wings against the air : their wings being their sole organ of sound, if we may be allowed the expression. By moving their wings more or less forcibly and swiftly, they beat the air, and form the varied confused sounds which we call humming. The noise which foretells their swarming is easily distinguished by those who are accustomed to it, and is more especially observed before the casts, or second and following swarms. The hive appears so full of bees, that part of them hang in clusters on the outside ; and the drones are perceived flying about in greater numbers than usual. But the most certain sign, and which indicates this event to be on that day, is, that the bees refrain from flying into the fields, though the season seems inviting. Just before they take their flight, there is an uncommon silence in the hive, and this continues for some time : but as soon as one breaks forth, they all follow, and are instantly on the wing. They seldom swarm before the sun has warmed the air ; that is, not before ten in the morning, and seldom later than three in the afternoon ; and the time of the year in which they most generally swarm, is from the middle of May to the end of June : but sometimes sooner or later, according as the season is more or less favourable. The earliest swarms do not always prove the best, especially if they are so early as the end of April or beginning of May : for the weather often is afterwards so wet and cold, that they are frequently in danger of being destroyed, or greatly reduced by famine. Though swarms which issue forth so late as July are not in danger of a present famine ; yet, they scarcely have time and opportunity to lay in a sufficient store for the winter. Towards the season of swarming, the door of the hive should be enlarged, to give the bees the greater freedom to issue out ; and it should likewise remain so for young swarms, during the first fortnight or three weeks, to allow the freer entrance to the bees, at that time extremely busy in collecting their necessary stores. The entrance should afterwards be gradually lessened, to prevent the otherwise easy access of enemies, of which there is great danger, especially as the autumn advances.

Hives continue sometimes to send forth swarms till the old hive becomes too much weakened, part that of it is empty. It is probable, that the prolific young queens prompt the bees to swarm thus frequently : for it is certain that if there is not a young mother qualified to bring forth a numerous progeny, though there be ever so great a number of bees, they will all remain, and die rather than quit the hive.

When-

Whenever the bees of a swarm fly too high, they are made to descend lower, and disposed to settle, by throwing among them handfuls of sand or dust: probably the bees mistake this for rain. It is usual at the same time to beat on a kettle or frying-pan; perhaps from its being observed that the noise of thunder prompts such bees as are in the field to return home. Precautions of this kind are the more necessary, if, as Dr. Warder, in his *Truë Amazont*, observes, "the bees always provide a place for their habitation before they swarm; either in some hollow tree, or in the hollow part of some old building, or in some deserted hive, which the swarms have already prepared, by cleaning out whatever may be offensive to their cleanly nature." Of this he gives an instance; and concludes, that "though they provide themselves with a house before they swarm, and take much pains about it; yet if you are early enough in your taking the swarm, and they find themselves at unawares in a convenient house, they have no mind generally to leave it: but if they rise again the same or next day, be sure not to hive them in the same hive again, for it is plain they have some dislike to it."

That the bees provide themselves a habitation before they swarm, is a very just observation, a remarkable instance of which I was witness of at a gentleman's seat in Gloucestershire some years ago, where, walking in the garden in which were several bee-hives in the month of June, the bees were in full work, and passing in and out of the hives in great numbers, as is usual in fine weather at that season. In one hive only a very few bees were passing, and I was told it was an empty hive. I turned it up, and found it so, except a few bees near the crown of it, and the reason of their being there did not then occur to me: but next day a woman who lived in the neighbourhood, came running to the gardener, acquainting him, that she had just lost a swarm of bees she had hived the evening before, which she saw go off, and had followed them to the garden wall, and requested she might be permitted to take them away, being persuaded that they were lodged somewhere in the garden. Upon search, a swarm was found in the hive that I had observed was empty the day before: some of the bees were in the hive, and the rest at the mouth of it, on the outside. In the evening the woman brought her hive, hived the bees in it a second time and carried them home at night: but next morning they came off again, and settled as at first upon the empty hive in the gentleman's garden. As it appeared by this that the woman's hive was disagreeable to them, she was allowed to carry the bees home in the hive they had chosen for themselves, which she placed where she had put them at first, and in this hive they remained quiet, and soon went to work.

I have related this, not only in confirmation of what is observed above, of bees providing a habitation for themselves before they swarm, but also for another reason: for having once a pretty large apiary, consisting of common straw hives, and boxes of various constructions, some of which happening to be empty, I found a swarm had taken possession of one of them. After this I placed some empty hives every summer in my apiary, whereof one or more were commonly filled by swarms from my other hives, which saved the trouble of watching and hiving them. And sometimes swarms would settle in them, that I knew not whence they came. In this way a person desirous of having bees might obtain some, without any trouble, if the situation is good: by placing a few empty hives in readiness for them, and many good swarms might be thus saved, that fix themselves in hollow-trees, old walls, and other inaccessible places, where they are of no use to any body. All the preparation necessary for these empty hives is, that they be very sweet and perfectly clean, and the insides well rubbed with a clean coarse linen cloth, to break off the short straws, or other roughness in the hive. Some in dressing their hives, rub the insides of them with sweet herbs, and some with honey: but I made no other preparations, than rubbing off the short straws, and keeping them very clean. Bees are commonly put into straw hives; and swarms seem to take to these more readily than to boxes, when left to their own choice.

As soon as the swarm is settled, the bees which compose it should be got into a hive with all convenient speed, to prevent their taking wing again. If they settle on a small branch of a tree, easy to be come at, it may be cut off, and laid upon a cloth; the hive being

ready immediately to put over them. If the branch cannot be conveniently cut, the bees may be swept from off it into a hive. Lodge but the queen in the hive, and the rest will soon follow. If the bees must be considerably disturbed in order to get them into the hive, the most advisable way is to let them remain in the place where they have pitched, till the evening, when there is less danger of their taking wing. If it be observed that they still hover about the place they first alighted upon, the branches there may be rubbed with rue, or elder leaves, or any other thing distasteful to them, to prevent their returning to it.

The hive employed on this occasion should be cleaned with the utmost care, and its inside be rubbed very hard with a coarse cloth, to get off the loose straws, or other impurities, which might cost them a great deal of time and labour to gnaw away. It may then be rubbed with fragrant herbs or flowers, the smell of which is agreeable to the bees, or with honey.

The hive should not be immediately set on the stool where it is to remain, but should be kept near the place at which the bees settle, till the evening, lest some stragglers should be left. It should be shaded, either with boughs, or with a cloth, that the too great heat of the sun may not annoy the bees.

We sometimes see a swarm of bees, after having left their hive, and even alighted upon a tree, return to their first abode. This never happens but when the young queen did not come forth with them for want of strength, or perhaps courage to trust to her wings for the first time; or possibly from a consciousness of her not being impregnated.

Bees are not apt to sting when they swarm: therefore it is not necessary then to take much extraordinary precaution against them. It is however advisable for those who are not accustomed to them, to cover their face and hands.

A second swarm scarcely is, and much less are the subsequent ones, worth keeping single; because, being few in number, they cannot allow so large a proportion of working bees to go abroad in search of store, as more numerous swarms can, after having appointed a proper number for the various works to be done within. For this reason it is advisable to unite two or more of these last or latter swarms into one hive, so as to procure a sufficient number of bees in one hive. Bees sometimes swarm so often, that the mother-hive is too much weakened. In this case, the swarms should be restored back; and this should also be done when a swarm produces the first summer, as it sometimes does. The best way, indeed, is to prevent such swarming, by giving the bees more room: though this, again, will not answer when there is a young pregnant queen; she well knowing that her life is the forfeit of her remaining at home.

The usual method of uniting swarms is very easy. Spread a cloth at night upon the ground close to the hive, in which the two casts of swarms are to be united; lay a stick across this cloth; then fetch the hive with the new swarm, set it over the stick, give a smart stroke on the top of the hive, and all the bees will drop down upon the cloth in a cluster. This done, throw aside the empty hive, take the other from off the stool, and set this last over the bees, who will soon ascend into it, mix with those already there, and become one and the same family. Others, instead of striking the bees down upon the cloth, place with its bottom upmost the hive in which the united swarms are to live, and strike the bees of the other hive down into it. The former of these hives is then restored to its natural situation, and the bees of both hives soon unite. If some bees still adhere to the other hive, they may be brushed off on the cloth, and they will soon join their brethren. Or one may take the following method, which gives less disturbance to the bees. Set with its mouth upmost the hive into which the young swarm has been put, and set upon it the other hive. The bees in the lower hive, finding themselves in an inverted situation, will soon ascend into the upper.

Though all writers acknowledge, that one of the queens is constantly slain on these occasions, and generally a considerable number of the working bees; yet none of them, Columella excepted, has proposed the easy remedy of killing the queen of the latter cast or swarm before the union is made; a means by which the lives of the working bees may be preserved. This may be done, either by intoxicating them, and then picking her out, or by searching her out when the bees are beating down upon the cloth; for this being done in the night, to

prevent the battle which might otherwise ensue, there will be no great difficulty in finding her.

A large swarm may weigh eight pounds, and so gradually less, to one pound: consequently a very good one may weigh five or six pounds. All such as weigh less than four pounds should be strengthened, by uniting to each of them a less numerous swarm. The size of the hive should be proportioned to the number of the bees; and, as a general rule, it should be rather under than over sized, because bees require to be kept warmer than a large hive will admit of.

Columella directs, that the apiary, or bee-garden, should face the south, in a place neither too hot, nor too much exposed to the cold; that it be in a valley, in order that the loaded bees may with the greater ease descend to their homes; that it be near the mansion-house, on account of the convenience of watching them, but so situated as not to be exposed to noisome smells, or to the din of men or cattle; that it may be surrounded with a wall, which however should not rise above three feet high; that, if possible, a running stream be near them, or, if that cannot be, that water be brought near them, in troughs, with pebbles or small stones in the water, for the bees to rest on whilst they drink; or that the water be confined within gently declining banks, in order that the bees may have safe access to it; they not being able to produce either combs, honey, or food for their maggots, without water. That the neighbourhood of rivers or basins of water with high banks be avoided because winds may whirl the bees into them, and they cannot easily get on shore from thence to dry themselves; and that the garden, in which the apiary stands, be well furnished with such plants as affords the bees plenty of good pasture. The trees of this garden should be of the dwarf kind, and their heads bushy, in order that the swarms which settle on them may be the more easily hived.

The proprietor should be particularly attentive that the bees have also in their neighbourhood such plants as yield them plenty of food. Columella enumerates many of these fitted to a warm climate: among them he mentions thyme, the oak, the pine, the sweet smelling cedar, and all fruit trees. Experience has taught us, that furz, broom, mustard, clover, heath, buck-wheat, &c. are excellent for this purpose. Pliny recommends broom, in particular, as a plant exceedingly grateful, and very profitable to bees; and Mr. Bradley speaks highly of the advantages which arise from the planting of it for the food of these useful insects. See the article BROOM.

Plantations of mustard, of the flowers of which bees are extremely fond, may be kept in bloom for several weeks running.

Great improvements may also certainly be made in the essential article of providing plenty of pasture for bees, whenever this subject shall be more carefully attended to than it, unfortunately, has hitherto been. A rich corn country is well known to be a barren desert to them during the most considerable part of the year; and therefore the practice of other nations, in shifting the places of abode of their bees, well deserves our imitation.

Columella informs us, that, as few places are so happily situated as to afford the bees proper pasture both in the beginning of the season and also in the autumn, it was the advice of Celsus, that after the vernal pastures are consumed, the bees should be transported to places abounding with autumnal flowers; as was practised by conveying the bees from Achaia to Artica, from Eubœa and the Cyclad islands to Scyrus, and also in Sicily, where they were brought to Hybla from other parts of the island. He likewise directs, that the hives be carefully examined before they are removed from one place to another, and to take out such combs as appear old, loose, or have moths in them, reserving only those that are sound, in order that the hive may be stored with combs collected from the best flowers.

Mr. Maillet, in his curious description of Egypt, relates, that "spite of the ignorance and rusticity which have got possession of that country, there yet remain in it several footsteps of the industry and skill of the ancient Egyptians. One of their most admirable contrivances is, their sending their bees annually into distant countries, in order to procure them sustenance there, at a time when they could not find any at home; and their afterwards bringing them back, like shepherds who should travel with their flocks, and make them feed as they go. It was observed by the ancient inhabitants of Lower Egypt, that all plants blossomed, and the fruits of the earth ripened, above six weeks earlier

in Upper Egypt than with them. They applied this remark to their bees; and the means then made use of by them, to enable these useful industrious insects to reap advantage from the more forward state of nature there, were exactly the same as are now practised, for the like purpose, in that country. About the end of October, all such inhabitants of the Lower Egypt as have hives of bees, embark them on the Nile, and convey them upon that river quite into Upper Egypt; observing to time it so that they arrive there just when the inundation is withdrawn, the lands have been sown, and the flowers begin to bud. The hives thus sent are marked and numbered by their respective owners, and placed pyramidically in boats prepared for the purpose. After they have remained some days at their farthest station, and are supposed to have gathered all the wax and honey they could find in the fields within two or three leagues around, their conductors convey them, in the same boats, two or three leagues lower down, and there leave the laborious insects so long time as is necessary for them to collect all the riches of this spot. Thus, the nearer they come to the place of their more permanent abode, they find the productions of the earth, and the plants which afford them food, forward in proportion. In fine, about the beginning of February, after having travelled through the whole length of Egypt, gathering all the rich produce of the delightful banks of the Nile, they arrive at the mouth of that river, towards the ocean; from whence they set out, and from whence they are now returned to their several homes: for care is taken to keep an exact register of every district from whence the hives were sent in the beginning of the season, of their numbers, of the names of the persons who sent them, and likewise of the mark or number of the boat in which they were placed."

The author of the Natural History of Bees, gives the following account of what is practised in this way in France; an example well worthy of our imitation in many parts of this kingdom. "M. Proutaut, says he, keeps a great number of hives. His situation is one of those in which flowers become rare or scarce very soon, and where few or none are seen after the corn is ripened. He then sends his bees into Beauce, or the Gatinois, in case it has rained in those parts. This is a journey of about twenty miles, which he makes them take: but if he concludes that the bees could not meet in either of those countries, wherewith to employ themselves advantageously, he then has them carried into Sologne about the beginning of August, as knowing that they will there meet with a great many fields of buck-wheat in flower, which will continue so till about the end of September. His method of transporting them is thus. His first care is, to examine those hives, some of whose honey-combs might be broken or separated by the jolting of the vehicle: they are made fast one to the other, and against the sides of the hive, by means of small sticks, which may be disposed differently as occasion will point out. This being done, every hive is set upon a packing-cloth, or something like it, the threads of which are very wide: the sides of this cloth are then turned up, and laid on the outside of each hive, in which state they are tied together with a piece of small pack-thread wound several times round the hive. As many hives as a cart built for that purpose will hold, are afterwards placed in this vehicle. The hives are set two and two, the whole length of the cart. Over these are placed others; which make, as it were, a second story or bed of hives. Those which are stored with combs should always be turned topsy-turvy. It is for the sake of their combs, and to fix them the better, that they are disposed in this manner; for such as have but a small quantity of combs in them, are placed in their natural situation. Care is taken in this stowage, not to let one hive stop up another, it being essentially necessary for the bees to have air; and it is for this reason they are wrapped up in a coarse cloth, the threads of which were wove very wide, in order that the air may have a free passage, and lessen the heat which these insects raise in their hives; especially when they move about very tumultuously, as often happens in these carts. Those used for this purpose in Yèvre, hold from thirty to forty-eight hives. As soon as all are thus stowed, the caravans set out. If the season is sultry they travel only in the night; but a proper advantage is made of cool days. You will imagine that they do not ride post. The horses must not be permitted even to trot; they are led slowly, and through the smoothest roads. When there are not combs in the hives sufficient to support the bees during their

their journey, the owner takes the earliest opportunity of resting them wherever they can collect wax. The hives are taken out of the cart, then set upon the ground, and after removing the cloth from over them, the bees go forth in search of food. The first field they come to serves them as an inn. In the evening, as soon as they are all returned, the hives are shut up; and being placed again in the cart, they proceed in their journey. When the caravan is arrived at the journey's end, the hives are distributed in the gardens, or in fields adjacent to the houses of different peasants, who, for a very small reward, undertake to look after them. Thus it is that, in such spots as do not abound with flowers at all seasons, means are found to supply the bees with food during the whole year."

These instances of the great advantages which attend shifting of bees in search of pasture, afford an excellent lesson to many places in this kingdom: they direct particularly the inhabitants of the rich vales, where the harvest for bees ends early, to remove their stocks to places which abound in heath, this plant continuing in bloom during a considerable part of the autumn, and yielding great plenty of food to bees. Those in the neighbourhood of hills and mountains will save the bees a great deal of labour, by taking also the advantage of shifting their places of abode.

We come now to explain the most inhuman method commonly practised of taking bees, which consists in wantonly destroying the whole swarm, in order to enjoy the fruits of their labours.

Were we to kill the hen for her egg, the cow for her milk, or the sheep for the fleece it bears, every one would instantly see how much we should act contrary to our own interest; and yet this is practised every year in regard to bees. Would it not argue more wisdom in us to be contented with taking away only a portion of their wax and honey, as is the practice of many countries? The common method here is, that when those which are doomed for slaughter have been marked out (which is generally done in September) a hole is dug near the hive, and a stick, at the end of which is a rag that has been dipped in melted brimstone, being stuck in that hole, the rag is set on fire, the hive is immediately set over it, and the earth is instantly thrown up all around, so that none of the smoke can escape. In a quarter of an hour, all the bees are seemingly dead; and they will soon after be irrecoverably so, by being buried in the earth that is returned back into the hole: I say, they will soon be absolutely killed by this last means; because it has been found, by experiment, that all the bees which have been affected only by the fume of the brimstone, recover again, excepting such as have been singed or hurt by the flame. Hence it is evident, that the fume of brimstone might be used for intoxicating the bees, with some few precautions. The heaviest and the lightest hives are alike treated in this manner; the former, because they yield the most profit, with an immediate return; and the latter, because they would not be able to survive the winter. Those hives which weigh from fifteen to twenty pounds, are thought to be the fittest for keeping.

The practice of the ancients was, however, very different from this: they were content to share with these industrious insects the produce of their labours; and some very laudable attempts have been made in our own country, to attain the desirable end of getting the honey and wax without destroying the bees. John Geddy, esq; published, in the year 1665, his invention of boxes for preserving the lives of bees. These were improved by Joseph Warder, physician, at Croydon, who at the same time embellished his account of the structure and use of these boxes, with several other curious circumstances concerning bees, in his work intitled, *The True Amazons, or the Monarchy of Bees*. Two very worthy clergymen, the reverend Mr. John Thorley of Oxford, and the reverend Mr. Stephen White, M. A. rector of Holton in Suffolk, have brought the method of preserving the lives of bees to still greater perfection. We shall relate the opinions and practice of each, beginning with Mr. Thorley, who lived many years before Mr. White, and add to their accounts the best improvements that have been lately made in foreign countries.

Mr. Thorley, in his *Enquiry into the Nature, Order, and Government of Bees*, thinks colonies preferable to hives, for the following reasons. First, the more certain preservation of very many thousands of these noble and useful creatures: Secondly, their greater strength (which consists in numbers), and consequently their greater safety

from robbers: Thirdly, their greater wealth, arising from the united labours of the greater number. He tells us, that he has in some summers taken two boxes filled with honey from one colony, and yet sufficient store has been left for their maintenance during the winter, each box weighing forty pounds. Add to these advantages, the pleasure of viewing them with the greatest safety, at all seasons, even in the busiest time of gathering, and their requiring a much less attendance in swarming time. The bees thus managed are also more effectually secured from wet and cold, from mice, and other vermin.

His boxes are made of deal, which, being spongy, sucks up the breath of the bees sooner than a more solid wood would do. Yellow dram-deal, thoroughly seasoned, is the best.

An octagon, being nearer to a sphere, is better than a square form: for as the bees, in winter, lie in a round body near the center of the hive, a due heat is then conveyed to all the out parts, and the honey is kept from candying.

The dimensions which Mr. Thorley, after many years experience, recommends for the boxes, are ten inches deep, and twelve or fourteen inches broad, in the inside. He has tried boxes containing a bushel or more, but found them not to answer the design like those of a lesser size.

The top of the box should be made of an entire board, a full inch thick after it has been planed, and it should project on all sides at least an inch beyond the dimensions of the box. In the middle of this top there must be a hole five inches square, for a communication between the boxes; and this hole should be covered with a sliding shutter, of deal or elm, running easily in a groove over the back window. The eight pannels, nine inches deep, and three quarters of an inch thick when planed, are to be let into the top so far as to keep them in their proper places; to be secured at the corners with plates of brass, and to be cramped with wires at the bottom, to keep them firm; for the heat in summer will try their strength. There should be a glass window behind, fixed in a frame, with a thin deal cover, two small brass hinges, and a button to fasten it. This window will be sufficient for inspecting the progress of the bees. Two brass handles, one on each side, are necessary, to lift up the box: these should be fixed in with two thin plates of iron, near three inches long, so as to turn up and down, and put three inches below the top-board, which is nailed close down with sprigs to the other parts of the box.

Those who chuse a frame within, to which the bees may fasten their combs, need only use a couple of deal sticks of an inch square, placed across the box, and supported by two pins of brass; one an inch and a half below the top, and the other two inches below it; by which means the combs will quickly find a rest. One thing more, which perfects the work, is a passage four or five inches long, and less than half an inch deep, for the bees to go in and out at the bottom of the box.

Mr. Thorley, son to the above-mentioned clergyman, has improved his father's method of managing bees; and having been convinced, from near sixty years experience, that his bee-hives would be productive of much greater profit to the owners of bees, and also render that cruel and ungenerous practice of destroying these animals not only unnecessary, but pernicious, presented a bee-hive of this construction to the Society of Arts, &c. in the Strand, who readily purchased another of his hives filled with honey, &c. that they might be inspected by the curious, and brought into universal use; and from this bee-hive the view on Plate III. fig. 8. was drawn. The society, persuaded that the invention would prove of the greatest advantage to this country, published a premium of two hundred pounds, in order to introduce Mr. Thorley's, or some other method of a similar kind, whereby much larger quantities of honey and wax might be procured, and, at the same time, the lives of these laborious and useful insects preserved.

The bottom part, marked *a*, is an octangular bee-box, made of deal boards, about an inch in thickness, the cover of which is about 17 inches in diameter, but the internal part only 15½, and its height 10 inches. In the middle of the cover of this octangular box is a hole, which may be opened or shut at pleasure, by means of a slider *d*. In one of the pannels is a pane of glass, covered with a wooden door, *c*. The entrance, *f*, at the bottom of the box, is about three inches and a half broad, and half an inch high. Two slips of deal, about half an inch square, cross each other in

the center of the box, and are fastened to the pannels by means of small screws. To these slips the bees fasten their combs.

In this octangular box the bees are hived, after swarming in the usual manner, and there suffered to continue till they have built their combs, and filled them with honey, which may be known from opening the door, and viewing their works through the glass-pane, or by the weight of the hive. When the bee-master finds his laborious insects have filled their habitation, he is to place a common beehive of straw, represented at *b*, made either flat at the top, or in the common form, on the octangular box, and draw out the slider, by which a communication will be opened between the box and the bee-hive; the consequence of which will be, that those laborious insects will fill this hive also with the product of their labours. When the bee-master finds the straw-hive is well filled, he may push in the slider, and take it away, placing another immediately in its room, and then drawing out the slider. These indefatigable creatures will then fill the new hive in the same manner. By proceeding in this method, Mr. Thorley assured the Society that he had taken three successive hives, filled with honey and wax, from one single hive, during the same summer; and that after he had laid his insects under so large a contribution, the food still remaining in the octangular box was abundantly sufficient for their support during the winter. He added, that if this method was pursued in every part of the kingdom, instead of that cruel method of putting the creatures to death, he was persuaded, from long experience, that wax would be collected in such plenty that candles might be made with it, and sold as cheap as those of tallow are at present.

Mr. Thorley has also added another part to his beehive, which cannot fail of affording the highest entertainment to a curious and inquisitive mind. It consists of a glass receiver, represented at *D*, eighteen inches in height, eight inches in diameter at the bottom, and in the greatest part thirteen. This receiver has a hole at the top, about an inch in diameter, through which a square piece of deal *E* is extended nearly to the bottom of the vessel, having two cross bars to which the bees fasten their combs. When the bees have filled their straw-hives, (which must have a hole in the center, covered with a piece of tin) Mr. Thorley places the glass *c* upon the top of the straw-hive, and draws out the piece of tin: the bees, now finding their habitation enlarged, pursue their labours with such alacrity, that they fill this glass-hive likewise with their stores. And as this receptacle is wholly transparent, the curious observer may entertain himself with viewing the whole progress of their works. One of the hives, now deposited at the Society's room in the Strand, is filled with the produce of the labours of those insects; and the glass-hive is supposed to contain about thirty-eight pounds of honey.

It will, however, be necessary to cover the glass with an empty hive of straw, or at least with a cloth, which may be easily removed when you inspect your bees, lest too much light prevent your insects from working.

When the glass is completely filled, slide a tin-plate between it and the hive or box, so as to cover the passage, and in half an hour the glass may be taken off with safety. What few bees remain in it, will readily go to their companions. He then very obligingly offers his service and farther information to any gentleman or lady whose curiosity may incline them to inspect his apiary. He has added a glass window to his straw-hives, in order to see what progress the bees make; which is of some importance, especially if one hive is to be taken away while the season still continues favourable for their collecting of honey: for when the combs are filled with honey, the cells are sealed up, and the bees forsake them, and reside mostly in the hive in which their works are chiefly carried on. Observing also, that the bees were apt to extend their combs through the passage of communication into the upper hive, whether glass or other, which rendered it necessary to divide the comb when the upper hive was taken away, he now puts in that passage a wire-screen, or netting, the meshes of which are large enough for a loaded bee to go easily through them; this prevents the joining of the combs from one box to the other, and consequently obviates the necessity of cutting them, and of spilling some honey, which, running down amongst a crowd of bees, used before to incommode them much; it being difficult for them to clear their wings of it.

The reverend Mr. Stephen White, rector of Holton in Suffolk, informs us, that his fondness for these little

animals soon put him upon endeavouring, if possible, to save them from fire and brimstone; that he thought he had reason to be content to share their labours for the present, and great reason to rejoice if he could at any time preserve their lives, to work for him another year; and that the main drift of his observations and experiments has therefore been, to discover an easy and cheap method, suited to the abilities of the common people, of taking away so much honey as can be spared, without destroying or starving the bees, and by the same means to encourage seasonable swarms.

In his directions how to make the bee-boxes of his inventing, he tells us, speaking of the manner of constructing a single one, that it may be made of deal or any other well-seasoned boards which are not apt to warp or split. The boards should be near an inch thick: the figure of the box square, and its height and breadth nine inches and five eighths every way, measuring within. With these dimensions it will contain near a peck and an half. The front part must have a door cut in the middle of the bottom edge, three inches wide, and near half an inch in height, which will give free liberty to the bees to pass through, yet not be large enough for their enemy the mouse to enter. In the back part you must cut a hole with a rabbit in it, in which you are to fix a pane of the clearest and best crown-glass, about five inches in length, and three in breadth, and fasten it with putty: let the top of the glass be placed as high as the roof within-side, that you may see the upper part of the combs, where the bees with their riches are mostly placed. You will, by this means, be better able to judge of their state and strength, than if your glass was fixed in the middle. The glass must be covered with a thin piece of board, by way of shutter, which may be made to hang by a string, or turn upon a nail, or slide sideways between two mouldings. Such as are desirous of seeing more of the bees works, may make the glass as large as the box will admit, without weakening it too much; or they may add a pane of glass on the top, which must likewise be covered with a shutter, fastened down with pegs to prevent accidents.

The side of the box, which is to be joined to another box of the same form and dimensions, as it will not be exposed to the external air, may be made of a piece of slit deal not half an inch thick. This he calls the side of communication, because it is not to be wholly inclosed: a space is to be left at the bottom, the whole breadth of the box, and a little more than an inch in height, and a hole or passage is to be made at top, three inches long, and more than half an inch wide. Through these the bees are to have a communication from one box to the other. The lower communication being on the floor, our labourers, with their burthens, may readily and easily ascend into either of the boxes. The upper communication is only intended as a passage between the boxes, resembling the little holes, or narrow passes, which may be observed in the combs formed by our sagacious architects, to save time and shorten the way when they have occasion to pass from one comb to another; just as, in populous cities, there are narrow lanes and alleys, passing transversely from one large street to another.

In the next place you are to provide a loose board, half an inch thick, and large enough to cover the side where you have made the communication. You are likewise to have in readiness several little iron staples, an inch and half long, with the two points or ends bended down more than half an inch. The use of these will be seen presently.

You have now only to fix two sticks crossing the box from side to side, and crossing each other, to be a stay to the combs; one about three inches from the bottom, the other the same distance from the top; and when you have painted the whole, to make it more durable, your box is finished.

The judicious bee-master will here observe, that the form of the box now described is as plain as is possible for it to be. It is little more than five square pieces of board nailed together; so that a poor cottager, who has but ingenuity enough to saw a board into the given dimensions, and to drive a nail, may make his own boxes well enough, without the help or expence of a carpenter.

No directions are necessary for making the other box, which must be of the same form and dimensions. The two boxes differ from each other only in this, that the side of communication of the one must be on your right-hand, of the other on the left. Plate III. fig. 9. represents two of these boxes, with their openings of communication, ready to join to each other.

Mr.

Mr. White's manner of hiving a swarm into one or more of these boxes, is thus :

You are to take the loose board, and fasten it to one of the boxes, so as to stop the communications. This may be done by three of the staples before-mentioned ; one on the top of the box near the front, the two others on the back, near the top and near the bottom. Let one end of the staple be thrust into a gimblet-hole made in the box, so that the other end may go as tight as can be over the loose board, to keep it from slipping when it is handled. The next morning, after the bees have been hived in this box, the other box should be added, and the loose board should be taken away. This will prevent a great deal of labour to the bees, and some to the proprietor.

Be careful to fasten the shutter so close to the glass, that no light may enter through it : for the bees seem to look upon such light as a hole or breach in their house, and on that account may not so well like their new habitation. But the principal thing to be observed at this time, is to cover the box, as soon as the bees are hived, with a linen-cloth thrown loosely over it, or with green boughs, to protect it from the piercing heat of the sun. Boxes will admit the heat much sooner than straw-hives ; and if the bees find their house too hot for them, they will be wise enough to leave it. If the swarm be larger than usual, instead of fastening the loose board to one box, you may join two boxes together with three staples, leaving the communication open from one to the other, and then hive your bees into both. In all other respects, they are to be hived in boxes after the same manner as in common hives ; which being well known, it were needless here to give particular directions concerning it.

The door of the second box should be carefully stopped up, and be kept constantly closed, in order that the bees may not have any entrance but through the first box.

When the boxes are set in the places where they are to remain, they must be screened from the summer's sun, because the wood will be otherwise heated to a greater degree than either the bees or their works can bear ; and they should likewise be screened from the winter's sun, because the warmth of this will draw the bees from that lethargic state which is natural to them, as well as to many other insects, in the winter season. For this purpose, and also to shelter the boxes from rain, our ingenious clergymen has contrived the following frame :

Plate III. fig. 10. represents the front of a frame for twelve colonies ; *a, a*, are two cells of oak, lying flat on the ground, more than four feet long. In these cells you are to fix four oaken posts, about the thickness of such as are used for drying linen.

The two posts *b, b*, in the front, are about six feet two inches above the cells ; the other two standing backward, five feet eight inches.

You are next to nail some boards of slit deal horizontally from one of the fore-posts to the other, to screen the bees from the sun. Let these boards be seven feet seven inches in length, and nailed to the inside of the posts, and be well seasoned, that they may not shrink or gape in the joints.

c, c, are two splines of deal, to keep the boards even, and strengthen them.

Plate III. fig. 11. represents the back of the frame. *d, d, d, d*, are four strong boards of the same length with the frame, on which you are to place the boxes. Let the upper side of them be very smooth and even, that the boxes may stand true upon them ; or it may be still more advisable, to place under every pair of boxes a smooth thin board, as long as the boxes, and about a quarter of an inch wider. The bees will soon fasten the boxes to this board, in such manner that you may move or weigh the boxes and board together, without breaking the wax or resin, which for many reasons ought to be avoided. These floors must be supported by pieces of wood, or bearers *e, e*, &c. which are nailed from post to post at each end. They are likewise to be well nailed to the frame, to keep them from sinking with the weight of the boxes.

f represents the roof, which projects backward about seven or eight inches beyond the boxes, to shelter them from rain.

You have now only to cut niches or holes in the frame, over against each mouth or entrance into the boxes, at *h, h, h*, in fig. 10. Let these niches be near four inches long ; and under each you must nail a small piece of wood for the bees to alight upon.

The morning or evening sun will shine upon one or both ends of the frame, let its aspect be what it will : but you may prevent its over-heating the boxes, by a loose board set up between the posts, and kept in by two or three pegs.

The same gentleman, with great humanity, observes, that no true lover of bees ever lighted the fatal match without concern ; and that it is evidently more to our advantage to spare the lives of our bees, and be content with part of their stores, than to kill and take possession of the whole.

About the latter end of August, says he, by a little inspection through your glasses, you may easily discover which of your colonies you may lay under contribution. Such as have filled a box and a half with their works, will pretty readily yield you the half box. But you are not to depend upon the quantity of combs, without examining how they are stored with honey. The bees should, according to him, have eight or nine pounds left them, by way of wages for their summer's work.

The most proper time for this business is the middle of the day : and as you stand behind the frame, you will need no armour, except a pair of gloves. The operation itself is very simple, and easily performed, thus : open the mouth of the box you intend to take ; then with a thin knife, cut through the resin with which the bees have joined the boxes to each other, till you find that you have separated them ; and after this thrust a sheet of tin gently in between the boxes. The communication being thereby stopped, the bees in the fullest box, where most likely the queen is, will be a little disturbed at the operation ; but those in the other box, where we suppose the queen is not, will run to and fro in the utmost hurry and confusion, and send forth a mournful cry, easily distinguished from their other notes. They will issue out at the newly opened door ; not in a body, as when they swarm, nor with such calm and cheerful activity as when they go forth to their labours ; but by one or two at a time, with a wild flutter, and visible rage and disorder. This, however, is soon over ; for as soon as they get abroad, and spy their fellows, they fly to them instantly, and join them at the mouth of the other box. By this means, in an hour or two, for they go out slowly, you will have a box of pure honey, without a living bee in it to molest you ; and likewise without dead bees, which, when you harin them, are often mixed with your honey, and both waste and damage it.

Mr. White's boxes are very convenient, not only for taking away part of the honey, without breaking the combs, without killing any of the bees, or much disturbing them, but also on two other accounts : first, for feeding weak swarms, or such whose stock of provision is exhausted, and require to be fed to keep them alive ; the usual methods of feeding them with sugar and other substances being often ineffectual : and even honey is in some degree so also, for several reasons, but principally because the natural food of bees is not honey alone ; and whether bee-bread, or whatever else, is their food, they have it ready prepared for them, by adding a box to their store that was taken from them, or some of the colonies, in autumn ; for some of these boxes, full of combs, should be kept entire, and given them when their own store is exhausted. A colony of these boxes is also very conveniently, and with little trouble, cleared of moths, or other insects, that are pernicious or troublesome to the bees ; for the boxes may be taken away from the colony singly ; and after the moths, &c. are destroyed, may be immediately returned to the colony.

The indefatigable Mr. Wildman has obliged the world with the following method of taking the wax and honey, without destroying the bees :

Remove, says he, the hive from which you would take the wax and honey, into a room ; into which admit but little light, that it may at first appear to the bees as if it were late in the evening. Gently invert the hive, placing it between the frames of a chair, or other steady support, and cover it with an empty hive, keeping the side next the window of the empty hive raised a little, to give the bees sufficient light to get into it. While you hold the empty hive steadily supported on the edge of the full hive, between your side and your left arm, keep striking with your other hand all round the full hive from top to bottom, in the manner of beating a drum, so that the bees may be frightened by the continual noise from all quarters ; and they will, in consequence, mount out of the full hive into the empty

and leave the bees thus cut off from the rest of their companions for the space of half an hour or more. In this time, having lost their queen, they will fill themselves with honey, and be impatient to be set at liberty.

If, in this interval, you examine the box or boxes beneath, and observe all to be quiet in them, you may be confident that the queen is there, and in safety. Hereupon raise the back part of the hive or box so far, by a piece of wood slipped under it, as to give the prisoners room to come out, and they will return to their fellows: then lifting the box from off the colony, and turning it bottom upmost, cover it with a cloth all night; and the next morning, when this cloth is removed, the bees that may have remained in it will return to the colony. Thus you have a hive or box of honey, and all your bees safe.

Mr. Thorley adds, that the method he has pursued with great success for many years, and which he recommends to the public, as the most effectual for preserving bees in common hives, is incorporation, or uniting two stocks into one, by the help of a peculiar fume or opiate, which will put them intirely in your power for a time, to divide and dispose of at pleasure. But as that dominion over them will be of short duration, you must be expeditious in this business.

The queen is immediately to be searched for, and killed. Hives which have swarmed twice, and are consequently reduced in their numbers, are the fittest to be joined together, as this will greatly strengthen and improve them. If a hive which you would take is both rich in honey, and full of bees, it is but dividing the bees into two parts, and putting them into two boxes, instead of one. Examine whether the stock to which you intend to join the bees of another, have honey enough in it to maintain the bees of both: it should weigh full twenty pounds.

The narcotic, or stupefying fume, is made with the *fungus maximus*, or *pulverulentus*, the large mushroom, commonly known by the name bunt, puckst, or frog-cheese. It is as big as a man's head, or bigger: when ripe, it is of a brown colour, turns to powder, and is exceeding light. Put one of these pucks into a large paper, press it therein to two-thirds, or near half the bulk of its former size, and tie it up very close; then put it into an oven some time after the household bread has been drawn, and let it remain there all night: when it is dry enough to hold fire, it is fit for use. The manner of using it is thus:

Cut off a piece of the puck, as large as a hen's egg, and fix it in the end of a small stick slit for that purpose, and sharpened at the other end, which place so that the puck may hang near the middle of an empty hive. This hive must be set with the mouth upward, in a pail or bucket, which shall hold it steady, near the stock you intend to take. This being done, set fire to the puck, and immediately place the stock of bees over it, tying a cloth round the hives, that no smoke may come forth. In a minute's time, or little more, you will hear the bees fall like drops of hail into the empty hive. You may then beat the top of the full hive gently with your hand, to get as many of them as you can: after this, loosing the cloth, lift the hive off to a table, knock it several times against the table, several more bees will tumble out, and perhaps the queen among them. She often is one of the last that falls. If she is not there, search for her among the main body in the empty hive, spreading them for this purpose on a table.

You must proceed in the same manner with the other hive, with the bees of which these are to be united. One of the queens being secured, you must put the bees of both hives together, mingle them thoroughly, and drop them among the combs of the hive which they are intended to inhabit. When they are all in, cover it with a pucking or coarse cloth, which will admit air, and let them remain shut up all that night, and the next day. You will soon be sensible that they are awaked from this sleep.

The second night after their union, in the dusk of the evening, gently remove the cloth from off the mouth of the hive, (take care of yourself) and the bees will immediately fly forth with a great noise; but being too late, they will soon return; then inserting two pieces of tobacco-pipes to let in air, keep them confined for three or four days, after which the door may be left open.

Providence has ordained that insects which feed on leaves, flowers, and green succulent plants are in an insensible or torpid state from the time that the winter's cold has deprived them of the means of subsistence. Thus the bees, during winter, are in so lethargic a state, that little food

supports them: but as the weather is very changeable, and every warm or sunny day revives them, and prompts them to return to exercise, food becomes necessary on these occasions. Mr. White very judiciously observes, that a greater degree of cold than is commonly imagined to be proper for bees, is favourable to them in winter. If a sharp frost, says that experienced gentleman, continues for two or three months, without intermission, you may observe through your glass, that the bees are all this time closely linked together in clusters between the combs. If they are not altogether without motion, yet it is certain they stir not from their places, while the cold continues, and therefore are not at all.

A colony of bees therefore placed on the north side of a building, will waste much less of their provisions, than others which stand in the sun; for coming seldom forth, they eat little; and yet in the spring are as forward to work and swarm, as those which had twice as much honey in the preceding autumn. The owner should however examine their state in the winter, if he finds that instead of being clustered between the combs, they fall down in numbers on the stool or bottom of the hive, the hive should be immediately carried to a warmer place, where they will soon recover.

Mild winters are very injurious to bees in England; a small degree of warmth enlivens them, and then they eat and consume great part, and some winters all their stock of honey, which is necessary to them in a cold wet spring. The sunshine in winter entices them to go abroad, where, by a sudden shower of rain, or alteration in the degree of cold, they are disabled, and if obliged to rest, are soon killed. By these accidents, many swarms that were strong, and had large provisions of honey in autumn, are so weakened, and their stock of provision so much lessened, that they never recover so as to gather any valuable quantity of honey.

But when the weather is cold, and continues so through great part of the winter, they are not so liable to these accidents as in milder winters; for during the continuance of frosty weather they remain inactive, torpid, and almost motionless; and eat very little or no honey.

This appears to be the reason that bees thrive so much in some countries more than in others, that in other respects seem to be equally proper for them; and is probably one principal reason of bees thriving remarkably well in Poland, where the weather is not so changeable as in England, and the cold of their winters continue longer, and more uniformly.

Hence a method has been thought of to preserve bees in England, and prevent the waste of honey in winter, different from any of those hitherto mentioned.

At the usual time of the approach of winter, the hives are removed into a dark vault or cellar; where the bees being kept cold and dark, soon fall into a torpid state, and so continue throughout the winter, and till the flowers they feed upon begin to be disclosed. They are then removed to their summer situation, and enter upon their labours with great vigour and activity; and having a good stock left of the last year's provision, are in no danger of starving, or suffering much by a backward or unfavourable spring, by which other bees are often greatly injured.

The bees thus removed, are not in much danger from an excess of cold, as that may be moderated in the same manner as is done for preserving wine lodged in vaults or cellars in severe winters. The great difficulty seems to be to prevent the bees being too warm in mild winters, which might make them very uneasy and restless, as they are known to be when too much exposed to heat in summer. Some have proposed as a remedy for this, to place the hives in ice-houses; but this could be of service in a very few places only, and can never be of general use, if such a degree of cold was necessary, which probably it is not, as the trials that have been hitherto made of this method of disposing of bees in winter have succeeded; all their lives, and all their honey also, or much the greater part of it have been saved.

Should this method be found effectual upon full experience, it seems likely to be of more general use, than any other hitherto proposed; as it will without doubt be a means of greatly encreasing the quantity of wax and honey, where it shall be judiciously practised.

Most writers on bees have observed, that these insects are subject to a kind of purging in the spring, which is often fatal to the whole hive. Madam Vicat ascribes this

distemper to the honey being candied in the hive by the cold. But Columella describes it as an annual distemper which seizes them in the spring, when the spurge blossoms, and the elm discloses its seeds; for that the bees, being allured by the first flowers, feed so greedily upon them, that they surfeit themselves therewith, and die of a looseness, if they are not speedily relieved. He relates Hyginus's advising, in this case, to cover the bees with ashes of the fig-tree; and affirms, that being enlivened by the warmth of these ashes, the bees will revive in two hours, and go into a hive brought to them. Columella advises giving them rosemary and honey diluted with water. Aristomachus seems to have prescribed the most effectual cure, namely, to take away all the vitiated combs, that is, all the combs in which there are open cells appearing to have candied honey.

The authors of the *Maison Rustique*, impute this purging to the bees feeding on pure honey, which does not form a food sufficiently substantial for them, unless they have bee-bread to eat at the same time; and advise giving them a honey-comb taken from another hive, the cells of which are filled with crude wax or bee-bread.

The common practice is to feed them in the autumn, giving them as much honey as will bring the whole weight of the hive to near twenty pounds. To this end, the honey is diluted with water, and then put into an empty comb, split reeds, or, as Columella directs, upon clean wool, which the bees will suck perfectly dry.

The following directions given for this purpose in the *Maison Rustique*, seem to be very judicious. Replenish the weak hives in September, with such a portion of combs full of honey, taken from other hives, as shall be judged to be a sufficient supply for them. In order to do this, turn up the weak hive, after taking the precaution of defending yourself with the smoke of rags, cut out the empty combs, and put the full ones in their place, where secure them with pieces of wood run across, in such a manner that they may not fall down when the hive is returned to its place. The bees will soon fix them more effectually. If this method be thought too troublesome, set under the hive a plate of liquid honey, unmixed with water, with straws laid across it, and over these a paper pierced full of holes, through which the bees will suck the honey, without daubing themselves. This should be done in cloudy or rainy weather, when the bees stir least abroad; and the hive should be covered, to protect the bees from robbers, who might be allured to it by the smell of honey.

Another circumstance which may render it very necessary to feed the bees, is, when several days of bad weather ensue immediately after they have swarmed; for then, being destitute of every supply beyond what they carried with them, they may be in great danger of being starved. In this case honey should be given them in proportion to the duration of the bad weather.

Mr. Marshall, in his *Rural Economy of Norfolk*, gives the following account of a swarm of bees taking possession of a hive that had had its swarm destroyed by accident.

"I put a swarm of bees into a wooden hive, of a particular construction. They took it remarkably well, and in the course of the summer laid up an ample store. But the mildness of the autumn, and the length of the spring, were fatal to a principal part of the bees in the country; and to these among the rest. Nevertheless, through inattention, I let the hive stand in its place, with the empty comb in it.

Passing by it on the twenty-fourth of July, (the height of swarming-time this year) I saw several bees about the mouth of the hive; but in the evening they disappeared. Next morning they returned; and, at noon, were followed by a very large swarm, which took possession of the hive; and, in a few hours, began throwing out the dead, and clearing their new habitation; a work that employed them that and the ensuing day.

Perhaps this was a stray flight, which had settled upon some neighbouring tree; and the first were out-scouts, searching for a hollow tree, or a fissure in a rock.

But it is not enough to know how to manage bees in all seasons; it will be also requisite to know how to defend them from their enemies; among which hornets and wasps, and especially that species of wasps which are scarcely larger than bees, are very formidable; for they seize a bee loaded with honey. If this robbery is committed near the mouth of the hive, they carry off the bee to a place of greater safety. Their nests should therefore be carefully destroyed, by pouring plenty of boiling-water into them; for this is by much the safest method.

The field-mouse is an enemy to be carefully guarded against as soon as the cold begins to approach: for if it enters at that season, it makes dreadful havock. At first it destroys the lowest parts of the combs; but as the weather grows colder, and the bees more torpid, it ascends up the hive, and seizes on the richest treasure: nor does the evil end here: for other bees, smelling the honey spilt by the mouse, fall upon the hive, and rob it of what remained; or as soon as the warm weather returns, and the bees stir about, they are sometimes so disgusted at the havock made by the mouse, that they desert the hive. The only way to guard against this, is to prevent its entering into a hive. Whilst the bees continue in their vigorous state, it dares not attack them: therefore, as soon as the cold approaches, the entrance to the hives should be lessened.

Bees may themselves be reckoned enemies to bees: for they sometimes wage cruel wars against each other.

Their fighting and plundering one another ought chiefly to be imputed, as Mr. Thorley observes, either to their perfect abhorrence of sloth and idleness, or to their insatiable thirst for honey: for when, in spring or autumn, the weather is fair, but no honey can be collected for plants, and is to be found only in the hives of other bees, they will venture their lives to get it there.

Dr. Warder assigns another cause of their fighting, which is, the necessity that the bees are reduced to when their own hive has been plundered, at a season when it is too late for them to repair the loss by any industry in the fields.

Sometimes one of the queens is killed in battle. In this case, the bees of both hives unite as soon as her death is generally known among them. All then become one people: the vanquished go off with the robbers, richly laden with their own spoils, and return every day, with their new associates, to pillage their own habitation. This causes a throng unusual for the season, at the door of the hive they are plundering; and if the owner lifts it up at night, when all are gone home, he will find it empty of inhabitants; though there perhaps will remain in it some honey, which he takes as his property.

When two swarms take flight at the same time, they sometimes quarrel, and great numbers are destroyed on both sides, till one of the queens are slain. This ends the contest, and the bees of both sides unite under the surviving sovereign.

Robbers make their attacks chiefly in the latter end of July, and the month of August. They appear to act with caution at first, and to procure themselves an entrance by stealth; not pitching boldly like the native bees, and then entering at once in at the door. If they are encouraged by success, they return in greater parties, sometimes all the bees of a hive, and endeavour to force that entrance which they sought before with so much caution. They come in such numbers, as frequently to make those who are not acquainted with these scenes, mistake them for new swarms: but the number of dead bees strewed on the ground, soon convince them of this error. Columella advises to kill the queen, if possible; but the most effectual way to prevent the loss of bees, as well as of honey, occasioned by these robberies, is, early in the autumn, to lessen the entrance into the hive, as before directed, so as to leave room for only two or three bees to pass a breath.

In the third class of enemies to bees is a small caterpillar, termed the wax-worm, or wax-moth, because of the havock it makes on wax. It is tender in its frame, unarmed and defenceless; and yet can subsist itself in the midst, and at the cost, of the most numerous hive. A few of these little caterpillars will destroy and break to pieces the combs of a hive, build up new edifices for lodging themselves in it, and finally force the bees to quit the place.

This insect is of the species of the false-moth, and is extremely nimble. It is enough for it to get into a hive unawares. It runs so very swiftly, that it passes unperceived, and slides into some narrow place between the combs, perhaps inaccessible to bees, there to lay its eggs in security. This done, it makes its escape as well as it can. From each of these eggs proceeds a caterpillar, which escapes certain death merely by its extreme smallness, and the quickness with which it spins and wraps itself in a covering sufficient to secure it from all harm. This covering, or tube, is glued to the wax which the caterpillar feeds on, and this insect lengthens the tube as it eats the wax, till at last it shuts itself up, in order to be transformed into a chrysalis. Several caterpillars, and consequently several moths, must proceed from the eggs which the males and females engender. Probably the bees destroy great num-

numbers of the moths: however, if a single female has an opportunity to lay her eggs, she is so exceedingly prolific, that this second brood may quite overspread the hive. If one of the impregnated females escapes out of the hive by means of her great nimbleness, she seeks out another hive, in which she spreads the same source of mischief.

The only method of destroying these pernicious insects is to take away the infected hive; and after clearing it from the moths, restore it to the proper owners, who will now work with greater diligence and resolution.

The next particular necessary to be known, is how to separate the honey from the wax. In order to this, the combs should be laid in a place perfectly secure from the access of bees; for otherwise the bees would not only carry off much honey, but also be extremely troublesome by stinging the people at work. It is proper to burn cow-dung, or rotten hay, at the doors and windows of this place; because the smell of the smoke arising from thence is so disagreeable to the bees, that it will drive them away. If any bees remain in the comb, they should be brushed off with the wing of a fowl into a tub of water, and being afterwards dried in another place, they will fly back to their hive. If the combs are taken out of the hive before the end of autumn, there are generally young bees in them. The parts of the combs in which these are should be laid aside, for they would give a bad taste to the honey. The bee-bread must also be separated, and both should be melted with the wax.

Before the combs are laid to drain out their honey, they should be carefully cleaned of every sort of filth, or insects. The crust with which the bees cover the honey in them should then be pared off with a sharp, thin, broad knife, and the combs themselves should be divided through the middle, in such manner as to render the cells open at both ends, that the honey may flow the more freely out of them. The combs should be laid in this state on sieves, or some other contrivance which will afford the honey a free passage. It will run quite clear; and the honey thus obtained should be kept by itself, as being the purest and best.

The combs, which are but partly filled, and also those that were full and have done running, are broken by hand, and the honey in them is squeezed out. Some put the broken combs into a strong bag, and then use a press to squeeze the honey out of them; and even warm the broken combs with the help of fire: but neither of these last consider that, in both these ways, much of the wax passes through the bag with the honey, and thus the wax being of greater value than the honey, the owner sustains a loss in that respect, besides that his honey becomes the less valuable, in proportion to its being less pure. It is true, that great part of the wax thus mixed with the honey soon rises to the surface, and may be taken off, especially after the honey is grown hard.

The makers of mead need not be extremely solicitous about separating the honey so very perfectly from the wax, because, by washing the wax in cold water, the honey will dissolve in the water, and the wax being strained from it by running the water through a coarse cloth, neither bad taste nor impurity will be communicated by it to the water, which may afterwards be used for making mead. The wax that has been skimmed off the honey separated by pressure, should be washed in the same manner; because, by this means, no part of the wax will be lost.

The goodness and flavour of honey depend on the fragrance of the plants from which the bees collect it: and hence it is that the honey of different places is held in different degrees of estimation. Mr. Marshall, in his Rural Economy of Norfolk, doubts the evil effect of buck on honey, until it be proved, notwithstanding the present received opinion; and thinks that the inferior quality of honey produced in that country may be attributed to the heath, which is well known to afford much honey but of an inferior quality. This he remarks also in his Rural Economy of Yorkshire, which he says may be called a bee-country; especially the Morelands and the northern margin of the Vale; where great numbers of bees have been usually kept; and great quantities of honey collected; chiefly from the flowers of the heath, which afford an abundant supply; but the produce is of an inferior quality; brown and strongly flavoured.

In hives situated between the heaths and the cultivated country, a striking contrast is observable between the spring and the autumnal combs. The former gathered wholly from the meadows, pasture-lands, trees, and cultivated

crops; the latter entirely from the flowers of the heath; none of the species of which begin to blow until late in the summer. The combs of the former will be nearly white as snow: and the honey limpid almost as the purest oil. Those of the latter brown: and the honey they yield of the colour and consistency of melted rosin. This difference is most striking when the hive is carried in autumn, from the lower parts of the marginal heights, into the Moreland dales, to be filled up with honey; a practice which, singular as it may appear, has been followed with success.

In the winter of 1782-3, a general mortality took place among the bees of this country. Many bee-keepers lost their whole stock. I remember to have seen in the spring of 1783, twelve to fifteen empty stones in one garden without a single surviving hive.

But the universality of the destruction, uncommon as it was, being such as no one can remember, was not so remarkable as the manner in which it was effected. The bees were observed to dwindle away, by degrees; though they had plenty of honey in their hives; at length vanishing: while still, perhaps, a considerable quantity of honey remained unexhausted.

A man who has paid some attention to bees, and whose ideas are frequently well grounded, was of opinion that the effect was entirely owing to the want of a succession of young bees; under a supposition that the year preceding had not been a breeding year; and that the bees which dwindled away in the spring were the old bees dying of age.

There may be some truth in this opinion; the unusually backward, and extremely wet spring and summer of 1782, might check the breeding of young bees; but it is unlikely that it should wholly put a stop to it; and that not one hive in ten should have bred a single bee. For under this argument the young ones, though few, would, with an ample store of honey, have survived.

In the course of the spring of 1783, an incident led me to a theory which seems to explain the phenomenon more fully.

Being attentive to a female fallow which was in blow, I observed that bees were equally busy among its flowers, as they were among the male catkins of a neighbouring tree.

This induced me to consider the nature of the materials they collect, and to reflect on whether the different parts of generation, even in hermaphrodite flowers may not afford them distinct materials. Honey, it is well understood, is collected from the nectarium. Wax may well be considered as a collection of the viscid mucus of the pistillum; as bee-bread appears to be merely an aggregation of the farina of the stamen.

It is well understood by bee keepers in general, and is asserted by Wildman himself, that bees cannot live without bread. That they cannot exist with pure honey alone, is, I believe, well ascertained. But honey which has been pressed hard from a comb containing bee-bread as well as honey, is considered as a safe and certain relief to them when their own stores are exhausted.

Admitting that bees require bread, as well as honey, to support them in winter; and admitting that bee-bread is a collection of the staminate farina of flowers; the phenomenon under notice is easily explainable.

It is well known, that flowers are tenacious of their parts of generation in a rainy season; exposing them with caution. Nor is it mere exposure that fits the stamina for the purpose of the bee. The anthers must be burst by the sun, before the bee can load its thighs with the contained farina; which being exposed, is liable to be washed away, or shook down, by the first heavy shower. Hence the collection of bee-bread, in a moist showery season, must be very precarious and inconsiderable.

But the collecting of wax and honey depends less on the weather. For the flower once open, the bee has free access to the nectary and pistil, whose productions are less liable to a shower than is the farina. Besides, it is, I believe, a fact which is not doubted, that bees collect honey from what are, perhaps, improperly called honey-dews, as well as from flowers. That which is made early in the year is also preferred to what is collected in the latter end of the season.

In order to obtain the wax in a pure state, what remains of the combs after separating the honey, together with the combs which contain bee-bread and young bees or maggots, is put into a copper with a sufficient quantity of clean water, which is made to boil over a slow fire, and stirred frequently with a stick. When the wax is melted, it is

run through bags, which are put into a press, to separate the wax perfectly. The wax runs from the press into a vessel placed underneath, with some water in it, to prevent the wax from sticking to it. What remains after the pressure may be again boiled in water, in order to obtain more wax from it: and this should be repeated by slow boilings, rather than by boiling it strongly at once.

When all the wax is thus separated from the dregs, it is again melted in water, over a very gentle fire, and skimmed clean whilst any scum arises. It is then poured into vessels suited to give it the desired form, after previously putting into them a little water, to keep the wax from sticking to them. These vessels are then carried into a place where the wax may cool gradually. It is found that, the larger the cakes of wax are, the better the wax keeps, and the higher price it brings; also, that the more gentle it has been boiled, the better it likewise is: for too hasty boiling renders it hard, and this increases the difficulty of bleaching it. Whatever filth sticks to the bottom of the cake, is scraped off with a knife.

We shall conclude this article with a few directions for purchasing bees; which should always be done in the spring, as the dangers of the winter are then over. The summer is an improper time for buying them, because the heat of the weather then softens the wax, and thereby renders the combs liable to break, if they are not very well secured. The honey too, being then thinner than at other times, is more apt to run out of the cells, which is attended with a double disadvantage, namely, the loss of the honey, and the daubing of the bees, whereby many of them may be destroyed. A first and strong swarm, may indeed be carried away in the night after it has been hived.

The hive should be full of combs, and well stored with bees. The purchaser should examine the wax, in order to know the age of the hive. The combs of a year old are white; those of two years are dark coloured, or yellow; and where the combs are black, the hive should be rejected; because old hives are most apt to be infected with the moth, and most liable to other accidents. For this reason, the state of the combs should be examined as high up as possible; because the lower parts of the combs may have been cut off, and renewed in the preceding summer. It sometimes, though rarely, happens, that two queens continue to govern separately in the same hive; and in this case a large comb forms the barrier. Such hives should be rejected, because there is not in them that harmony which is necessary for the success of the bees.

In order to judge of the state of the hive, it may be raised a little in the evening, so as to admit a more than usual degree of cold; for this will drive the bees to the top of the hive, and so benumb them, that the next morning there will be no danger of their stinging. If any such danger does appear, a pot of lighted charcoal, with some linen-rags upon it, may be got ready, and held under the hive whilst it is pulled back in order to be examined.

We may also judge of the thriving state of the hive by the following appearances. Bees which are in good condition will get into the fields early in the morning, return loaded, enter boldly, and not come out of the hive in bad weather; for when they do, this indicates that they are in great want of provisions. They are alert on the least disturbance; they preserve their hive free from all filth, or dead nymphs or bees; they are ready to assist the bees which return loaded from the fields, and to defend the hive against every enemy that dares to approach: they make a continual humming noise, which increases on the least touch. Indeed, by the loudness of the humming, we may judge of the strength and progress of the hive, and therefore this should be frequently noticed, to enable us to form the better judgment of the present state the bees are in. *Columella, lib. IX. Maison Rustique, tom. I. Memoires, &c. de la Societe de Bern, Ann. 1764. Reaumur's Memoires pour servir à l'Histoire Naturelle des Insectes, tom. V. Thorey's Enquiry into the Nature, &c. of Bees. Warder's Monarchy of Bees. White's collateral Bee-boxes. Milp's Essay on the Management of Bees.*

BEECH, the name of a well known tree, and of which some planters suppose there are two distinct species: calling the one the mountain or wild beech, and the other the common beech. They also say, that the wood of the former is whiter than that of the latter; but Mr. Miller assures us that there is only one species of this tree, and that the difference in the colour of the wood arises from the difference in the soils.

This tree is propagated by sowing the mast, which may be done at any time from October to February, only observing to secure the seeds from vermin when early sown; and, if this be carefully done, the sooner they are sown after they are fully ripe, the better: a small spot of ground will be sufficient for raising a great number of these trees from seed; for if the plants are come up very thick, the strongest of them should be drawn out the autumn following, that those left may have room to grow; so that a seed-bed, carefully managed, will afford a three year's draught of young plants, which should be planted in a nursery, and, if designed for timber trees, at three feet distant row from row, and eighteen inches asunder in the rows.

But if they are designed for hedges, to which the tree is very well adapted, the distance need not be so great: two feet row from row, and one foot in the rows, will be sufficient. In this nursery they may remain two or three years, observing to dig up the ground between the roots, at least once a year, that their tender roots may the better extend themselves every way: but be careful not to cut or bruise their roots, which is injurious to all young trees; nor should you ever dig the ground, in summer, when the earth is hot and dry; for by letting in the rays of the sun to the roots, the young trees are often destroyed.

This tree will grow to a considerable stature, though the soil be stony and barren, as also upon the declivities of hills and chalky mountains, where they will resist the wind better than most other trees; but then the nurseries for the young trees ought to be made upon the same soil; for if they are raised on good ground, and in a warm exposure, and afterwards transplanted into a bleak barren situation, they seldom thrive. The nursery should therefore be made upon the same soil, where the plantation is intended, and the plants drawn annually to extend the plantation.

This tree is very proper to form large hedges to surround plantations, or wilderness quarters; and may be kept in a regular figure, if sheared twice a year; especially if they shoot strong; in which case, if they are neglected but a season or two, it will be very difficult to reduce them again.

The shade of this tree is very injurious to most sorts of plants which grow near it, but is generally believed to be very salubrious to human bodies.

It delights in a chalky or stony ground, where it generally grows very fast; the bark of the trees in such land is clear and smooth, and although the timber is not so valuable as that of many other trees, yet as it will thrive on such soils, and in such situations where few better trees will grow, the planting of them should be encouraged, especially as the trees afford an agreeable shade, and the leaves make a fine appearance in summer, and continue green as long in autumn as any of the deciduous trees; therefore in parks, and other plantations for pleasure, this tree deserves to be cultivated among those of the first class, especially where the soil is adapted to it. *Miller's Gard. Dict.*

The timber is of great use to turners for making trenchers, dishes, trays, &c. and also to carpenters for making stools, bedsteads, &c. Shipwrights likewise often use it for the keels of ships; and it is esteemed the best wood for firing. The thin lamina, or scale of the wood, commonly called paste-board, is used in making band-boxes, hat-cases, &c.

Beech-wood is well known to be subject to worms which soon destroy it. This worm is supposed to feed up on the sap remaining in the wood after it is cut into scantlings, and worked up for use. If therefore the sap, can, by any means, be extracted, the wood will be much less subject to decay. Upon this principle, a correspondent of the authors of the *Museum Rusticum* greatly improved the wood, by laying it a reasonable time in a pond, and afterwards drying it in the shade; by which means the timber when applied to use, was at least as good, and as durable as elm. He adds, that by boiling the wood intended for smaller works, such as bowls, trenchers, chairs, &c. two or three hours in a copper filled with water, all the sap will be extracted, the wood will work pleaster, be more beautiful when finished, and last, without comparison, longer. *Museum Rusticum, vol. II. p. 135.*

BEECH mast, the seed of the beech-tree.

This mast is very good for feeding swine; so that in some counties of England, where there are large woods of beech trees, the hogs are fed for months together on the mast only. They thrive prodigiously on this food only, so that many porkers are killed in a year fatted with beech-mast, with-

out the assistance of any other food. It is, however, the better way to take them up, and give them either pollard, barley-meal, or pease, for a month or five weeks, when they will be fit for the tub.

But beech-mast, like acorns, are apt to give the hogs a distemper called the garget; which may be effectually prevented, if a few pease or beans, moistened with water, and sprinkled over with antimony finely powdered, be given them every other day for a fortnight or three weeks. *Museum Rusticum*, vol. I. p. 474.

BEES-NEST, or *birds-nest*, the same with wild carrot. See the article *WILD CARROT*.

BEESTINGS, the first milk taken from a cow after calving.

If this milk be not taken away clean from the cow upon her first calving, it will often make the cow's milk to dry away. Nor should the beestings be given to the calf, as it is very apt to surfeit. *Lisle's Husbandry*, vol. II. p. 143.

BEETLE, a wooden instrument in the form of a mallet, but much larger, used in driving piles, wedges, hedge-stakes, &c.

BEETLE, is also the name of a flying insect, of which there are a great variety of species; but they have all of them cases over their wings to defend them from hard bodies, which they often meet with when they dig holes in the ground, or gnaw rotten wood with their teeth, to make themselves houses or nests. When they fly they fill the air with a humming noise, and, perhaps, greater than that of any other insect. There are different sorts of beetles, some being large with horns, and others small, and without horns.

BEEVES, a general name for oxen, or black cattle in general.

BEHEN, a species of chickweed, frequently called spatling-poppy. See *CHICKWEED*.

BENT-grass, a species of grass common in pasture grounds; there are several sorts of this grass, particularly that called fine bent, for the gathering the seeds of which the Society offered a premium. We have given a figure of one of the species of bent-grass, on Plate III. fig. 11.

BERBERRY. See *BARBERY*.

BERE, or *bear*, a species of barley. See the article *BARLEY*.

BERNE-MACHINE, the name of an engine for rooting up trees, invented by Peter Sommer, a native of Berne in Switzerland.

A model of this machine was sent by the Berne Society to the Society for the Encouragement of Arts in London, and from this model the drawing on Plate IV. fig. 1. was made. The engine consists of three principal parts, the beam, the ram, and the lever. The beam A B C, of which only one side is seen in the figure, is composed of two stout planks of oak of three inches thick at least, and separated by two transverse pieces of the same wood at A and C, about three inches thick. These planks are bored through with corresponding holes, as represented in the figure, to receive iron pins, upon which the lever acts between the two sides of the beam, and which are shifted higher and higher, as the tree is raised, or rather pushed out of its place. The sides are well secured at top and bottom, by strong iron hoops.

The iron pins on which the lever rests, should be an inch and a quarter, and the holes through which they pass, an inch and a half in diameter. The position of these holes is sufficiently indicated by the figure.

The foot of the beam, when the machine is in action, is secured by stakes represented at G, driven into the earth.

The ram D, which is made of oak, elm, or some other strong wood, is capped with three strong iron spikes, represented at f, which takes fast hold of the tree. This ram is six or eight inches square, and a slit is cut lengthwise through the middle of it, from its lower end at L, to the first scule a, in order to allow room for the chain g h, to play round the pulley K, which should be four inches thick, and nine inches in diameter. This ram is raised by means of the chain g h, which should be about ten feet long, with links four inches and three quarters in length, and an inch thick. One end of this chain is fastened to the top of the beam at C, while the other, after passing through the lower part of the ram, and over the pulley K, terminates in a ring or link represented fig. 3. the two ears m, n, of which serve to keep it in a true position between the two planks of the beam. In this ring the hook P is inserted.

The hook is represented in profile, fig. 2. where P is the

part that takes hold of the ring. But it must be observed, that the parts of this machine, represented in fig. 2, 3. are drawn on a scale twice as large as the whole engine, fig. 1.

The hook F fig. 2. should be made of very tough iron, as well as the handle D, and the arch E c. This handle should be two inches thick at z, where it joins to the hook, and the thickness gradually lessen by degrees up to the arch, which need not be more than half an inch thick.

On each side of the pin z, is a semi-circular notch, x, y, which rests alternately on the pins, when the machine is worked. The hole D, and the arch E c, serve to fix a long lever of wood E F, fig. 2. by means of two iron pins; and by this contrivance the lever is either raised or depressed at pleasure, in order to render the working of the machine easy in whatever part of the beam the lever may be placed: for without this contrivance the extremity of the lever E F, would, when the handle d F was near the top of the beam C, be much higher than men standing upon the ground could reach. It must, however, be remembered that the lever is often shortened by this contrivance, and consequently its power lessened.

The machine is worked in the following method: it is placed against a tree, in the manner represented in the figure, so that the iron spikes at f may have hold of the tree, and the end of the beam A be supported by stakes represented at G. The iron handle, fig. 2. is placed in the opening between the two planks of the beam, and the wooden lever fixed to it by means of the iron pins already mentioned. The hook F takes hold of the chain, and one of the iron pins is thrust into the outer row of holes, by which means the outer notch x will rest on the pin, which will now be the center of motion; and the end of the lever E, fig. 1. being pressed downwards, the other notch y, fig. 2. will be raised, and at the same time the chain, and consequently the ram. The other iron pin is now to be thrust into the hole in the inner row, next above that which was before the center of motion, and the end of the lever E, fig. 1. elevated, or pushed upwards, the latter pin on which the notch y rests, now becoming the center of motion. By this alternate motion of the lever, and shifting the pins, the chain is drawn upwards, over the pulley K, and consequently the whole force of the engine exerted against the tree. There is a small wheel at L, in order to lessen the friction of that part of the machine.

From this account the reader will very easily perceive that the machine is nothing more than a single pulley, compounded with a lever of the first and second order; and therefore its power may be easily computed from the nature of the pulley and lever.

It must, however, be remembered, that as the push of the engine is given in an oblique direction, it will exert a greater or lesser force against the horizontal roots of the tree in proportion to the angle formed by the machine with the plane of the horizon; and that the angle of 45° is the maximum, or that when the machine will exert its greatest force against the horizontal roots of the tree.

M. N. E. Tschanner, secretary to the Berne Society, observes, in a letter sent to the Society for the Encouragement of Arts, &c. in London, and dated Berne, Jan. 10th, 1763, that by repeated experiments with this machine, he has found that the chain g h, is so far from giving an additional power, that it hinders the play and effect of the engine by its friction; and that when the ram presses strongly against the beams, the chain is squeezed between the beams so as to render the upper holes useless, and prevents the machine from being worked out to its full length; in consequence of which it is obliged to be removed from its first place, and fixed again anew; which necessarily occasions a loss of time. He also found that the ram was too short. He has therefore taken away the chain, and lengthened the ram four feet.

The inconvenience of the chain was immediately seen by the Society for the Encouragement of Arts, and therefore the machine at large made by their directions, was constructed without it. The ram moved between the two cheeks of the beam, and was pushed up by the alternate motion of the lever. And that the force of the machine might not be lessened by the removal of the chain, the lever was made of twice the length of that in the Berne model.

It will be very readily granted that an engine constructed in this manner will be very useful in saving the labour of men; though very inadequate to the task intended, that of throwing down trees. For it sufficiently appeared from experiments made by the committee of mechanics, that trees

above

above sixteen inches diameter, especially of oaks or elms, cannot be thrown down with this engine, without the assistance of cutting their roots.

BIENNIAL *plants*, such as continue two years.

BIG, the same with bere, or square barley. See the article BARLEY.

BIGGE, a pap, or teat.

BILL, an edged tool used by husbandmen in cutting bushes, &c. It is a kind of hatchet with a hooked point, and a handle either shorter or longer, according to the various uses for which it is intended.

BIN, or BINN, a place where corn, &c. is deposited.

BIND-WEED, called by some *with-wind*, *dodder* or *devil's guts*, also *boggar-weed*, a troublesome weed, of which there are two species, the smaller and the greater.

The first, or smaller bind-weed, commonly called gravel bind-weed, is very common upon dry banks, and in gravelly ground in most parts of England, and is generally a sign of gravel lying near the surface. Its roots penetrate very deep into the ground, whence it is in some countries called devil's guts. It is a very troublesome weed both in gardens and fields.

The second or greater bind-weed, is also a troublesome weed; but in an open clear spot of ground, where the plants are constantly hoed down for three or four months, they may be effectually destroyed; for when the stalks are broken or cut, a milky juice flows out, by which the roots are soon exhausted, and decay; but as every part of the root will grow, this circumstance renders it a troublesome weed to destroy, where its roots are intermixed with those of other plants. *Miller's Gard. Dict.*

Mr. Lisle, after observing that he believes bind-weed propagates itself in pasture grounds chiefly by its seeds, and by its roots in arable land, because it seems to flower too late in corn, to seed before the corn is cut, thinks the reason why it is most apt to multiply in clayey soils, is because such ground being, in the common practice, ploughed only in winter months, after wheat, for other crops, as barley, pease, or oats, and not till about September for winter vetches; this tillage cannot destroy the roots or seeds of weeds like the summer fallows for wheat; but, on the contrary, promotes their increase, particularly from the off-sets, or joints of the roots. "I have known, says he, in this case, clay-land folded for barley, and particularly that part of it which, waiting for the folds going over it last, was latest fallowed, bring up such an increase of with-wind, that, though the spring and summer had been very dry, every stem of barley had a with-wind round it. As the fold brought up a crop of this corn, it brought up with each plant its enemy, which would eat it out, pull it down before it could ripen, and thereby prevent the filling of the grain. The crop is also greatly hazarded here, after it is cut, from the danger it must run by laying in swarth, till this weed is withered before it can be carted. Again, near the end of the first summer, after the first year of a crop of hop-clover, which I fed, that is about the beginning of August, I fallowed the ground for wheat, then dunged the fallows, and sowed the wheat before Michaelmas. I had a very good crop of wheat; but a with-wind came up to every plant; so that had it been a wet and cold summer, instead of a hot and dry one, as it chanced to be, my corn would have been pulled down and lodged while green in the ear, and in the milk, and could not then have filled in body and flour, but must have been of the nature of blighted corn. The increase of the with-wind here was, without doubt, occasioned by laying down this ground only to one summer seed after the hop-clover was sown, when it had borne three or four crops of summer corn after its wheat crop; for, by the winter ploughing as I intimated before, the off-sets of the roots of weeds, and their seeds, were propagated. I could not conveniently destroy these roots or seeds by giving the ground a seasonable summer fallow in the beginning of June; because I should then have lost the fruits of my hop-clover crop, by ploughing it in at the beginning of the first summer: though this would have contributed much to the killing of the with-wind: whereas, by delaying the fallowing three months longer, viz. to the beginning of August, when the sun had lost its strength to burn up the roots and malt the seeds, and it was too late for the ground to lie long to a fallow, the dung laid on the fallows, gave new life to the roots and seeds." *Lisle's Husbandry*, vol. II. p. 303.

BIRCH, the name of a tree so well known as to need no description. This tree is not much esteemed for its

wood, but however it may be cultivated to advantage upon barren land, where better trees will not thrive; for there is no ground so bad, but this tree will thrive in it; for it will grow in any moist springy land, or in dry gravel or sand, where there is little surface: so that upon ground which produced nothing but moss, these trees have succeeded so well, as to be fit to cut in ten years after planting, when they have been sold for near ten pounds per acre standing, and the after-produce have been considerably increased. And as many of the woods near London, which were chiefly stocked with these trees, have of late years been grubbed; so the value of these plantations have advanced in proportion. Therefore those persons who are possessed of such poor land, cannot employ it better, than by planting it with these trees, especially as the expence of doing it is not great.

The best method to cultivate this tree, is to furnish yourself with young plants from the woods, where they naturally grow, and are generally found there in great plenty; but in places where there are no young plants to be procured near, they may be raised from seeds, which should be carefully gathered in the autumn, as soon as the scales under which they are lodged begin to open, otherwise they will soon fall out and be lost: the seeds are small, so should be not buried deep in the ground. The autumn is the best season to sow them; and in a shady situation, as the plants will thrive better than when they are exposed to the full sun; for in all places where there are any large trees, their seeds fall, and the plants come up well without care; so that if the young plants are not destroyed by cattle, there is generally plenty of them, in all the woods where there are any of these trees. These wild plants should be carefully taken up, not to injure the roots. The ground where they are to be planted, will require no preparation; all that is necessary to be done, is to loosen the ground with a spade or mattock, in the places where the plants are to stand, making holes to receive their roots, covering them again when the plants are placed, closing the earth hard to their roots. If the plants are young, and have not much top, they will require no pruning; but where they have bushy heads, they should be shortened, to prevent their being shaken and displaced by the wind. When the plants have taken root, they will require no other care, but to cut down the great weeds which would over-hang the plants, being careful not to cut or injure the young trees. This need not be repeated oftener than twice in a summer the two first years, after which time the plants will be strong enough to keep down the weeds, or at least be out of danger from them.

These may be planted any time from the middle of October, till the middle of March, when the ground is not frozen; but in dry land the autumn is the best season, and the spring for moist. The distance which they should be planted, is four feet square, that they may soon cover the ground, and by standing close they will draw each other up; for in situations where they are much exposed, if they are not pretty close, they will not thrive so well.

If the plants take kindly to the ground, they will be fit to cut in about ten years; and afterwards they may be cut every seventh or eighth year, if they are designed for the broom-makers only; but where they are intended for hoops, they should not to be cut oftener than every twelfth year.

The broom-makers are constant customers for birch, in all places within twenty miles of London, or where it is near water-carriage: in other parts the hoop-benders are the purchasers; but the larger trees are often brought by the turners, and the wood is used for making ox-yokes, and other instruments of husbandry.

In some of the northern parts of Europe, the wood of this tree is greatly used for making of carriages and wheels, being hard and of long duration. In France it is generally used for making wooden shoes. It likewise makes very good fuel.

In some places these trees are tapped in the spring, and the sap drawn out to make birch-wine, which has been recommended for the stone and gravel, as is also the sap unfermented. The bark of the birch-tree is almost incorruptible. In Sweden, the houses are covered with it, where it lasts many years. It frequently happens, that the wood is entirely rotten, and the bark perfectly sound and good. *Miller's Gard. Dict.*

The best method of obtaining the sap of the birch-tree for

for making wine, &c. is to bore a hole slanting upwards with a middle-sized augre to a moderate depth in the tree, and to fasten a bottle to the orifice, by which means a large quantity of the sap may be speedily procured. Or many gallons in a day may be gathered from the boughs of the trees by cutting them off, leaving their ends fit to go into the mouths of bottles, and so by hanging many bottles on several boughs, the liquor will distil into them very plentifully.

The season for this work is from the end of February to the end of March, whilst the sap rises, and before the leaves shoot out from the tree; for when the sap is forward, and the leaves begin to appear, the juice, by a long digestion in the branch, grows thick and coloured, which before was thin and limpid. Nor will the sap distil either in the night, or in cold weather while the north and east winds blow; but very well and freely, when the south-west winds blow, or the sun shines warm.

The liquor is best that proceeds from the branches having been a longer time in the tree, and thereby better digested, and acquired more of its flavour than if it had been extracted from the trunk. *Mortimer's Husbandry*, vol. II. p. 406.

In order to have enough of this liquor to set about making wine with it, many trees should be tapped at the same time, so that a sufficient quantity of sap may be obtained in a few days; for it will not keep long, without a tendency to putrefaction. To prevent this, some authors advise setting that which is first drawn in bottles, or other proper vessels, in the sun, till the rest be ready, and to put into it a hard toast of rye-bread cut thin, to make it ferment. But as it is necessary to mix with this juice either sugar or raisins, in order to give it a body, to enable it to undergo a regular fermentation, which alone can render it fit for keeping, and for want of which it is, that this wine is so apt to burst the bottles into which it is put, that first fermentation will certainly be found hurtful. When therefore the husbandman has not a sufficient number of trees to obtain sap enough for his purpose in two or three days, the most advisable way will be to put the sap into very sweet vessels, and place them in a cool cellar; for it will keep there perfectly sound, for a much longer time, especially if it be covered with oil, or bunged up close.

The proportion of sugar may be varied according to the taste and intention of the brewer: but, in general, a pound of sugar is thought to be the proper allowance for a gallon of this liquor. The sap and sugar must be thoroughly united by a heat just sufficient to make them boil; but the long boiling, which is generally advised, can answer no good purpose: on the contrary, it will render the liquor less disposed to ferment kindly, and likewise deprive it of a considerable part of the peculiar fragrance and flavour of the tree from whence it was taken. It should therefore be carefully remembered, that the sole purpose of boiling this liquor is, to make a thorough dissolution of the sugar in it. Some people substitute honey instead of sugar; in this case a quart of honey is esteemed equal to a pound of sugar. With regard to various spices ordered by different writers, they must be left to the taste and opinion of the maker.

It is generally found necessary in order to ferment this liquor, to put into it a little yeast, a bit of dough, or thin toast of leavened bread; after which it is treated in all respects like other vinous liquors. See the articles FERMENTATION and WINE.

It is said, that in the North, where large birch and plane trees are frequent, their sap is obtained in such plenty as to be used for brewing, instead of water, and that it makes equally strong beer with much less malt. Dr. Tong, in the Philosophical Transactions, N^o 46. says, that one bushel of malt brewed with this liquor will make as good ale as four bushels with common water. He thinks the sap of the sycamore the best for brewing; because it is very sweet, and, at the same time, very wholesome.

BIRDS FOOT TREFOIL, or the Lotus Corniculatus of Linnaeus, does, notwithstanding the dryness of a season, flourish in a singular manner, in the most exposed situation. On bowling-greens and mown lawns, it is almost the only green herbage left, (the daisy excepted) variegating their stone-coloured surfaces, in some instances, beautifully. In meadow and pasture grounds it is abundant. Its very strong deep tap root is evidently the cause of its thus resisting drought. Might not a productive va-

riety of this plant be cultivated with profit in dry situations? *Marshall's Rural Economy of the Midland Counties*, vol. II.

BIRD-GRASS, or FOWL-MEADOW-GRASS, a very excellent grass imported from Virginia, by the late Peter Wych, Esq. and has been cultivated with success by Mr. Roque. The Rev. Dr. Elliott, of New-England, in his Essays on field-husbandry, tells us, that it acquired this odd name from its being brought into a piece of poor meadow at Dedham, by ducks and other wild water-fowl. We have given a figure of this valuable grass on Plate IV. fig. 4.

As Mr. Roque is the only person that has successfully cultivated this species of grass, we shall give our readers his own account of it, which he sent in a letter to the Society for the Encouragement of Arts, &c.

"In the month of March, 1764, I received from the late Peter Wych, Esq. the chairman of the committee of agriculture in the Society for the Encouragement of Arts, &c. an ounce and a half of the seed of a species of grass called bird-grass. He obtained it from Virginia, where it grows, though it is not a native grass. The intention of putting it into my hands was, in order that I should cultivate it, and be thence able to form a judgment whether it might have any peculiar properties not found in our grasses, that would render it an advantageous article of culture here. He had, himself, conceived a very high opinion of it, by the information he had gained concerning it, from the country whence it came; and intended, as soon as he should have due proof from experiment, of what he hoped, to bring it before the Society for the Encouragement of Arts, &c. who had, with public-spirited zeal, entered very minutely into the consideration of the means of improving pastures. Being very solicitous to acquit myself of the trust, I carefully preserved this little treasure till the month of April, which I thought might be a fit time to sow it. Not being acquainted with the particular nature of this grass, I prepared the ground for it, in the same manner I should have done for a flower-bed: raking it with a wooden rake: I did this as I was willing by every means to secure its coming up: but such care would not have appeared in the least necessary, had I known its great hardiness, and force of vegetating power, as I have done since.

"At the time I expected the bird-grass to rise from my seed, I found the weeds and common grass coming up very thick: so that I could not distinguish the desired kind from these intruders: particularly the poa-grass. Being a stranger, as I before said, to the appearance of the bird-grass, I thought it the best way to weed out the other grass and herbs which I knew, and to let what I could not distinguish to be so, remain in the ground: and my eagerness was so great to perceive whether the bird-grass was come up, that I went almost every hour to look after it. I discovered it at last, in about a month from the time of its being sown, by its having a deeper green hue than is commonly seen in our grasses: and I transplanted it as soon as I imagined it would bear moving, into some of the same kind of ground, as that on which it had been raised: having first turned it up and cleared it from weeds. The size of this piece of ground was about twenty rods: part of it a little gravelly, and the other part of it moory land. I soon perceived the bird-grass grew better on the gravelly than on the moory part of the ground. That on the gravelly being of a better colour and sweeter than that on the moory; which was pale and yellow. And with respect to the moory ground itself, one part was moister than the other, and the bird-grass grew better on the drier side than on the wet. The grass, however, looked well all the summer, and in the month of September following, I began to gather the seed, and proceeded in it till October. The quantity of seed was above twelve pounds.

"The first year the grass did not grow to above two feet and a half high: but the second it rose to be four feet high. On the fourteenth of June of that year, being 1765, I measured out ten rods of this grass, and cut it. Three days after I weighed the product of this ten rod, herb and seed together: and they amounted to twelve hundred pounds. The tenth of August following, the same grass was again grown to the height of two feet eight inches, and was a second time fit to cut for hay: but I did not cut it; because I wanted a second crop of seed: which I obtained in the beginning of October; and it proved a much greater crop than the former. About this time a good deal of rain fell, which occasioned me no small share of trouble in drying the grass, and turning the little cocks. I then first remarked that shoots were made from almost every

every joint, in consequence of the moisture: but from some more than others: and of these many were of a finger's length. Had I not suffered this grass to stand, that I might have the seed, I am satisfied I could have mowed it thrice in the year; but wanting to collect as great a quantity as I could of the seed, I have not yet actually tried that experiment. I am very confident, however, that this kind of grass may be brought to afford eight tons of hay per acre in the year: and any person who may entertain doubts of the reasonableness of this supposition, may have them cleared up by ocular proof, if they will take the trouble to call on me; as great numbers of gentlemen have already done, to their entire satisfaction in this point. The latter end of May, and the beginning of June, will be a proper time for such inspection; as this grass, being a forward kind, will be fit to cut at that season.

"This grass has a peculiar quality, different from what is found in any other kind I ever knew before; which is that it had very short joints, and that every joint sends out shoots which strike root whenever they touch the ground. On taking a full grown plant of the grass out of the ground, it will be found; moreover capable of being divided into twenty smaller roots or off-sets, proper to be again planted: and these off-sets though taken thus from the root, even in the beginning of July, will bear seed the same year. If, likewise, when this grass is ready to be moved there should happen to be much rain, no damage will ensue in waiting a month for fair weather. Because, as this grass is constantly sending out shoots at every joint, it always keeps fresh; and does not wither, nor rot at the bottom as other grasses do: but, on the contrary, it continues green, even till the seed is ripe, which is certainly a very singular property, and of great consequence.

"The goodness of this kind of grass may also be very obviously inferred from the following particular. When I had sowed it, which was in the month of April, 1764, I had, as I have above declared, only one ounce and a half of seed: but betwixt that time and the present, I have found such a surprising increase, that I have collected from the successive crops of this ounce and a half, as much seed as has sown two hundred and fifty acres of land; and have besides, as much by me at present, as will sow one hundred acres more.

"I shall not dwell any longer on the commendation of this grass, than only to say, that it has every quality requisite to make good hay. That it is easily propagated, and from a very small portion of seed. That it is not subject to rot, or fall in patches, as most other kinds of grass do. That it is a beautiful green at all times, and consequently affords a most pleasing verdure, when sown in sight of any house, or made part of any prospect. And, lastly, that the produce of hay from it is extremely great, being much more than any other kind of true grass will yield. Of the truth of all this many persons can witness, who have, on seeing the real trials respecting it, given the greatest encomium on it: I shall therefore proceed now to offer some directions for its culture.

"The ground on which the seed of this kind of grass is intended to be sown, is to be prepared in the manner that is proper for lucern; that is it should be well ploughed and harrowed; and cleared, as much as possible, from all weeds, in the same way as is done for barley. When the ground is well mellowed and sweetened, the seed may be sown: the quantity of which may be about one pound and a half per acre; and the time of doing it, from March to April.

"Before the bird-grass seed be sown, it will be proper to sow as much barley or oats, as will afford half a crop, and such barley or oats being harrowed in, the pound and half of bird-grass seed should be sown over it: after which, in general cases, the ground is only to be rolled the first opportunity when it is dry. But if the soil be sandy or dry, it may be proper to give it a very light harrowing.

"This kind of grass cannot be well sown without some corn. Because it is of so fine and delicate a nature, at its first coming up, that the weeds would overpower and choke it at that time: or a greater expence would be necessary for clearing them away by hand. But when this grass is so mature as to be in the state of a pasture, or fit to cut, it grows so close and thick, that if a handful of money was thrown up over it, none would, when fallen, I am certain, reach the ground.

"As to the nature of the soil proper for the culture of bird-grass, almost every kind will do very well for it; except, as has been observed before, such as is too wet or

moory; and this is one of the good properties of this grass, because few kinds flourish much on dry gravelly ground.

"This is a just account of the observations and experiments I have hitherto made on this valuable grass; and they seem sufficient to justify me, in endeavouring to render it known to the public, as an object worthy their attention."

BIRD'S-NEST, the name of a weed, otherwise called wild carrot. See *Wild CARROT*.

BISHOPING, a cant term made use of by horse-jockies, implying the unfair practices they make use of to conceal the age of an old horse, or the ill properties of a bad one.

BIT, or **BITT**, the iron part of a bridle, put into a horse's mouth.

BLACK, a colour in horses, esteemed very beautiful, especially when they are of a jet shining black, and well marked, without having to much white: for as a great deal of white, especially when it spreads round their eyes, and a great way up their legs, adds nothing to their beauty, so neither does it add any thing to their goodness. The English black horses have more white about them than the black horses of any other country. The Spanish, Arabian, Dutch, and Danish horses, seldom have much; though a star or blaze, and sometimes a white muzzle, and one or more of the feet tipped with white, always looks beautiful and lively, and is so far from being a diminution of the goodness of a horse, that most think it an addition, from an opinion that horses without marks are generally stubborn and ill-conditioned. Some black horses have brown muzzles, are brownish on their flanks, and between their hips. These are often called black browns, as they are not a perfect black, but approach near to the colour of a tawny black hound; some are of a lighter colour about their muzzles, and are called mealy-mouthed horses; and of these sort are the pigeon-eyed horses, which have a white circle round their eye-lids and their fundaments often white. Those that partake most of the brown, are generally the strongest in constitution. *Gibson on Horses, vol. I. p. 46.*

BLACK CANKER, a species of caterpillar very destructive to turnips, and other plants, which Mr. Young, in the second volume of his *Annals of Agriculture*, gives an account how they were effectually destroyed by Mr. Coke at Holkam in Norfolk; who ordered his bailiff to buy all the ducks he could get, who presently collected 400; on the 16th of July they were turned into the thirty-three acres, having water at one corner of the field, and in five days they cleared the whole most completely, marching at last through the field on the hunt, eying the leaves on both sides with great care to devour every one they could see, and filling their crops several times in the day. The ducks having saved above sixty pounds worth of turnips, were sent to the poultry yards. The ducks might be allowed fifteen days for doing this work, in which case 400 ducks would secure 100 acres. Upon such a proportion, twenty or thirty might be employed on a small farm to great effect.

BLACK-GRASS, a species of grass in America, of which the following account is given by the late Dr. Elliot of New England.

"We have, says that worthy writer, in a letter to Mr. Mills, an excellent sort of grass in our salt-marshes. It thrives best and grows largest, in those meadows which border on tide-rivers, and have the greatest mixture of fresh-water. Where the water is very salt it is not apt to fix and spread; but will remain short and poor. It is very tender, and cuts as easily as garden cives, grows thicker and taller than the common salt-marsh grass, and affords from two to three tons of hay to the acre: but it is a slow grower, after it has been cut. Its seeds are small, like those of tobacco. The colour of this grass is a very deep green, which renders it so conspicuously different from every other kind, that it is universally known by the name of black-grass.

"This species introduced itself long since the settlement of New England. Our first planters knew nothing of it; nor has it yet travelled very far south-west. Its first appearance in this colony was on a marsh at Saybrook, to which an old boat was brought down Connecticut river, by a great flood and there cast up. This inclined me to think, that it was originally an inland grass which happened to suit with such salt marshes as are well supplied with fresh water; and what confirms me in this opinion is, that a person in the town of Killingworth, where I reside, having

cleared a swamp far distant from salt water, and afterwards sent into this fresh meadow, cattle which had been foddered with hay of the black grass, had there in a short time (undoubtedly by means of its seeds carried thither in the dung of these cattle) a fine growth of this very grass, which has since not only established itself, spread, extended, and, like a conqueror, beaten out the natural grass; but looks as flourishing in that fresh meadow, as any growing on a salt-marsh.

"I have a large tract of peat meadow, in which no grass feeds will grow. I design to try the seeds of this black grass in that dead fresh meadow, since the other sorts which I have tried do not succeed. What encourages me to do this, is my having introduced it into a once useless, worthless morass, worse indeed than nothing, though of considerable extent, for I was obliged to be at the expence of fencing it, for the sake of other land. It was quite over-run with reeds, bushes, and brakes.

"Between this land of mine and a creek of salt-water, intervened three meadow lots belonging to other persons. I obtained leave of the owners to cut a ditch six feet wide through their ground, and carried this ditch to the upper end of my land, where several cross ditches were then dug, to invite in, and retain the salt-water. The gaping mouths of these numerous ditches soon occasioned a strong indraught of salt-water, and, in time, converted the main ditch into a proper tide creek. The salt water thus introduced has done wonders. It has not only killed the trees, bushes, brakes, and levelled great inequalities, but has also introduced the black grass, and thereby rendered an acre of that land, which was not worth any thing before, now worth thirty-five pounds of our occurrency.

"The salt-water in its passage through my neighbours' ground has also done them great service, by introducing this black grass; and all this with small expence." *Mill's Husbandry, vol. III. p. 416.*

To this account of the black grass given by doctor Elliot, we shall add the following, transmitted in a letter from that gentleman's son-in-law, the reverend doctor Gale.

"Its (the black grass) early spring and growth, its lively green, its great produce, the preference given to it by cattle, when distributed promiscuously with salt grass for their food; its rendering the turf of mirey, loose, dirty meadows, firm and solid, and its extraordinary quality when improved for pasture in the spring and summer, raised its reputation, and endeavours were used to propagate it: but it proved very fullen and uncertain in its growth; growing only where it listeth, from the seed promiscuously shed, and wafted about by the tide which overflowed the meadows.

"It is observed to grow and flourish well near the banks of rivers, which admit the salt water, and even in flat or low meadows, which are in some measure overflowed every tide by the salt-water: but these low meadows must also be of that kind only, where there is a course of fresh water when the tide is out: so that a mixture of both fresh and salt water seems to be necessary for its prolific vegetation.

"It grows largest and best in reedy and rushy coves, or arms of the salt meadows, which are a little higher than the general level of the salt marsh, which are not commonly overflowed by the flux and reflux of the tides, which lie at some distance from salt creeks or courses of salt water, and which are watered by fresh springs rising from the banks or adjoining uplands.

"I have seen several such meadows which flourish remarkably with this sort of grass, though but lately brought under culture: am credibly informed, that eight acres of such a cove produced this year thirty-two tons of black grass in an adjoining township.

"The black grass is not near so much impregnated with salt as the common grass is, when both of them grow together; and the dew which adheres to the black grass is fresh, when that on the salt grass is highly pregnated with salt.

"It thrives best on a clay or strong loam. The natural turf should be broken, and the seed, after being mixed with fresh cow dung, should be spread, and fastened in by treading, that it may not be carried off by the water; or it may be propagated by transplanting the turf taken from a black grass meadow, by which means it will be made to spread apace.

"It will also grow where salt water never reaches. I have seen it growing on moist upland, and the turf has been so firm, that it was hard work for six oxen to plough through it."

We shall only add, that the above gentlemen has just sent the Society for the Encouragement of Arts, &c. a considerable quantity of the seed of this black grass; and that they have distributed it to a number of gentlemen, in order to their sowing it on proper soil; so that there is great reason to hope that this valuable grass will soon be as well known in England as it is in America.

BLACK-LAND, a name given to a particular sort of clayey soil, which is rather a grey than a true black. But however pale it may be when dry, it always blackens by means of rain: and when ploughed up at those seasons, it sticks to the plough-share and the more it is wrought the muddier and duskier coloured it appears.

These sorts of lands when somewhat fat, yet porous, light, and sufficiently tenacious, are good both for corn and grass; but as they are mostly in bottoms, so the wetness of them often spoils them for corn; but where they are dry, they are extraordinary fruitful, especially for barley; they will bear also good wheat upon an erish crop: but if they are so very rich, that your fear lodging of the corn, you may, if a deep mould, plant them with liquorice or sow them with hemp, woad, cole, rape seed, madder, or some other rich commodity, that best agrees with such land; and afterwards with corn, when some of the fertility is abated. The natural produce of these lands is commonly thistles, docks, and all sorts of rank weeds and grass. It will bear excellent clover. The best manure is chalk, lime, dung, &c. *Mortimer's Husbandry, vol. I. p. 75*

BLACK-LEGS, a name given in Leicestershire to a disease frequent among the calves and sheep. In Staffordshire they call it the wood-evil.

It is a white jelly, and sometimes a bloody jelly, settling in their legs, from whence it has its name of black-legs, and often in the neck between the skin and the flesh, which will make them carry their necks awry. If it falls on the joints they overcome it; but if on their bowels they die, nor is there any cure. *Lisle's Husbandry, vol. II. p. 135.*

BLACK OATS, a species of oats greatly cultivated in the northern parts of England, being esteemed a very hearty food for horses. See the article OATS.

BLACK THORN, a species of bushes well known, and much used in making fences, &c.

It is not reckoned quite so good for fences as the white-thorn, because it is apt to run more into the ground, and is not so certain of growing; but then the bushes are much the best, and most lasting of any for dead hedges, or to mend gaps: nor are cattle so apt to crop them as the other. They will grow on the same sort of soil with the white-thorn; but the richer the mould is, the more they will prosper. *Mortimer's Husbandry, vol. I. p. 5.*

BLADE, the spire of grass, or green shoots of corn.

BLACK TWITCH, the festuca duriuscula of Linnaeus, a noxious plant, which flourishes notwithstanding the extreme dryness of a season; and is very injurious to any crop.

BLAIN, a disease to which cattle are subject in the spring of the year. Some think it is occasioned by a little red worm which the cattle lick up. It often occasions a bladder as large as a hen's egg under the tongue, and when this happens, the beast may be cured by breaking the bladder, and rubbing it with salt.

Others impute the disease to a sudden rising of the blood; and may be known by the beast's eyes running with water; and as the distemper advances, its eyes will swell, and, if bled under the rump, the blood will feel hot. In this case the following drench is recommended. Take a pennyworth of English liquorice, and an equal quantity of English aniseeds, turmeric, long-pepper, horse-spice, or diapente, all ground fine, and just boiled up in a quart of strong beer; but if the heat of the blood indicates that the distemper proceeds from a hot cause, the horse-spice should be omitted. It is added, that if the bladder cannot be found under the tongue, the bum-gut should be raked, where it will be found in the back. If a knife be run through the ear of a beast near the root, it will, according to the report of experienced graziers, prove a certain cure in this distemper, provided it be done before the beast falls. *Lisle's Husbandry, vol. II. p. 127.*

BLAST, the same with blight. See BLIGHT.

BLAZE, a white mark in a horse's face.

BLAZES. It is a notion, that those horses that have white faces or blazes, if the blazes be divided in the middle, crossways, is the mark of an odd disposition.

BLEA, that part of a tree which lies immediately under the

the bark, or between that and the hard wood, and is the first progress of the alteration of the bark into wood, by the natural growth, and strengthening the fibres.

While the blea remains any thing soft, and retains somewhat of the nature of bark, it may maintain a feeble vegetation; but when it is grown absolutely hard and woody, it can no longer contribute to carry on that operation.

BLEEDING, an operation frequently necessary among all kinds of cattle particularly horses; and consists in opening a vein by means of an instrument called a fleam.

Those horses that stand much in the stable, and are full fed, require bleeding more than those which are in constant exercise; but especially when their eyes look heavy and dull, red and inflamed; or when they look yellow or inflamed in their lips, and insides of their mouths; when they seem hotter than usual, and mangle their hay. These are all indications that require bleeding, and likewise to lower their diet till they have more exercise.

Young horses should be bled when they are shedding their teeth, which is a relief to them, and removes those feverish heats, to which they are subject at that time.

The spring is always a proper season for bleeding, because their blood is then more luxuriant than at other times; and in summer it is often necessary to prevent fevers, always choosing the cool of the morning, and keeping them cool the remaining part of the day.

Some bleed their horses three or four times a year, or even oftener, by way of prevention. These take a very small quantity at a time, not exceeding a pint, or a pint and half, only to give a kind of brisker motion to the blood, and by that means to preserve or render it more thin and fluid, and to prevent its stagnating in the smaller vessels, which indeed is the first beginning of almost all diseases; but how far this succeeds, can only be known to those who have practised it a sufficient time. There is, however, this inconvenience from frequent bleeding, that it grows into a habit, which in some cases, cannot be easily broken off without hazard; and some horses have been known to become weak from frequent bleeding, while others have had their necks so full of scars, that they are apt to inflame and fester every time they are bled, which is always troublesome, and often ends with the loss of the vein. And therefore to prevent such accidents, those who bleed horses should not confine their operation to one place of the vein, as they generally do, but use themselves to open it higher or lower as they see occasion; and if they meet with any difficulty in bleeding in the neck veins, the plate veins, or any other large veins, that can be made to run a full stream, will equally answer the same end.

But the cases that require bleeding most, are colds, fevers of almost all kinds, falls and bruises, which are sometimes dangerous to horses, because of their great weight. Hurts and wounds of the eyes, strains in hard riding, or drawing, and all other accidents where a stagnation of the blood may be suddenly expected, or where the small vessels may be broke, and the blood extravasated. Those horses that refuse their food after riding, or any sort of work, require to be bled more frequently than others, to prevent fevers, and inward inflammations of the lungs, the liver, or any of the principal viscera. Nor is it less necessary to bleed horses at grass, when the purgation is over, and they begin to gather flesh, or at any other time, when they look heavy about their eyes, for this is a proper indication for bleeding; and some rank pastures require more bleeding than others.

There are also other indications that require bleeding by way of prevention, viz. when any epidemic distemper prevails among the horses; at such times the sound ones may be bled, to keep them, if possible, from being infected; and if the contagion continues, it may not be amiss to repeat the bleeding once in two or three months, or oftener, but in small quantities, for the loss of too much blood may be hurtful in some times of contagion. It is likewise necessary to keep sound horses from the unsound, or to remove them into places where the infection has never spread itself. *Gibson on the Diseases of Horses*, vol. I. p. 218.

BLEYME, an inflammation in an horse's foot, occasioned by blood putrefied in the inner part of the coffin towards the heel, between the sole and the coffin-bone.

There are three sorts of bleymes; the first, bred in spoiled, wrinkled feet with narrow heels, are usually seated in the inward or weakest quarter; the second, besides the usual symptoms of the first, infects the gristle, and must be extirpated, as in the cure of a quitter-bone.

See **QUITTER-BONE**. The third is occasioned by small stones, or gravel, between the shoe and the sole. For the cure they pare the foot, let out the matter, if any, and dress the sore like the prick of a nail.

BLIGHT, a general name for various distempers incident to corn and fruit trees.

It is well known that this disease is most injurious in a wet season; and hence, principally, the scarcity and advanced price of wheat after such seasons. It is also remarked to affect the north side of a field much more than the south, and that the effect is governed by the state of ripeness; and that a few days of forwardness may be sufficient to prevent the effect. For the south sides of ridges, though always forwarder, are seldom ripe more than a few days before the north side. It is evident from observation, that the forward wheats, are least liable to be blighted; for that having passed some certain stage of maturation, they become invulnerable to the attack of this mischievous enemy; at least, no obvious injury is incurred. It is also observable that no perceptible blight takes place while a dry season continues. The only guard a farmer has against the attack of this secret enemy appears to be that of sowing early. *Marshall's Rural Economy of Midland Counties*.

M. du Hamel treats that part of this subject which relates to corn in a very masterly and instructive manner; dividing what we generally call blights into the following species, viz. empty ears, parched and shrivelled corn, glazed corn, abortive or rickety corn, barren corn, and fallen or lodged corn. The reader will find each under its proper articles, as **EMPTY EARS**, &c.

BLIND, deprived of the sense of sight.

Moon **BLIND**, or *lunatic*, a disease to which horses are subject, the symptoms of which are no other than the forerunners of cataracts, and generally end in blindness.

Signior Ruini, says that experienced writer Mr. Gibson, and most other foreign writers, both French and Italian, in treating the diseases of horses, have all of them reckoned the moon-blind symptoms as a peculiar disease of the eyes, without having any relation to a cataract, which they have considered apart, as another disease of the eyes, which shews they built more on looks than experience. But from many years observation, I do not remember I have even seen a cataract bred in the eyes of any other horses than those which were called lunatic, or moon-blind. The Arabians were the first that ascribed so much to the moon in the diseases of the human body: and after the decay of learning all over Europe, their superstitious notions were so firmly rivetted, and so universally prevailed, that they could not be easily exploded, even by the ablest physicians, till the modern discoveries in natural knowledge made way for more solid improvements in the medical art; and therefore it is no wonder, that the first writers on the subject of farriery, notwithstanding some of them were men of learning, should fall in with all the common superstitions that had so long prevailed, and had so great an influence on the practice of physic.

These writers have described this distemper as appearing at certain times of the moon, coming sometimes at the new-moon; sometimes at the full; and sometimes in the wane of the moon; that it sometimes returns once in three months; sometimes once in two months, and in some not above once in six months: that the eyes look so clear when the distemper abates, that it is impossible to see any imperfection in them. But these observations are very liable to exception; for any one who has the least knowledge of the eyes, must needs see, that when the distemper is the most abated, and the eye the most clear, it still shews a remarkable weakness, and upon full trial, the sight will be found defective. Neither could I perceive that the eyes were affected by any of the moon's periods, so as not to vary, unless by mere accident. And therefore these observations are neither of any great use to the knowledge of the distemper, nor to lead us into a right method of curing it when it happens.

I have already taken notice, that the symptoms which appear in the moon-blind horses, are, for the most part, no other than the prognostics of breeding cataracts. These symptoms generally make their first appearance, when a horse is turned five, coming six, at which time one eye becomes clouded, the eye-lids swollen, and very often shut up; and, for the most part, a thin viscid water runs from the diseased eye, down the cheek, which is generally more or less in proportion, as the eye and eye-lids happen to be more or less swelled and inflamed; and, in some constitutions

tutions, the inflammation is so great, and the humour so sharp and corrosive, that it scalds and fetches off the hair wherever it comes. The veins of the temples and under the eye, along the side of the nose, are also turgid and full: others run but little; nor is the humour very sharp.

This disorder is apt to come and go, till the cataracts are perfect and ripe, and then all pain and anguish, and the soreness and running of the eyes, go off with blindness, when the horse is between seven and eight years old, this being about the time when most horses are spread and come to their full growth; so that from its first appearance to its completion, is generally about two years, or two years and a half, during which time, some horses have the returns of the disorder, not only more frequently than others, but the symptoms also are more strong and violent. In some the eye is not much disturbed above a week, when it clears up again, and returns to its former state. In some horses the eye continues bad a fortnight or three weeks. In others a month or longer, before the disorder goes off; and the time of the return, so far as I could observe in many horses, was always uncertain, and could not be fixed to any period of the moon, as many have imagined, being sometimes sooner, sometimes later, according to its predominancy, or according to the treatment a horse meets with from his farrier and keeping. Some have their returns once within the space of two or three months; some within the space of four; and, with the greatest care and pains, the disorder seldom keeps off above five months, without a relapse.

This is usually the case of those moon-blind horses, which have their eyes strongly infected with a hot sharp humour, that shuts them up with swelling and inflammation. But there is another kind of moon-blindness which is also the forerunner of cataracts, where no humour of weeping attends the eye. It is never shut up or closed, as in the case above described, but will now and then look thick and troubled, at which time the horse sees little, and perhaps nothing distinctly. Here the eyes always appear sunk and perishing, though the cataracts do not become so soon complete, as in those that are full, and where a humour is predominant; nor is it unusual in this case for one eye to escape, whereby a horse will retain sight to guide him, so as to render him fit for common drudgery.

The causes of this distemper are various, and when it proceeds from a natural defect in the eyes, it may no doubt be hereditary; but in a horse that has naturally good eyes, and yet turns moon-blind, it is usually owing to lickness, or some other malady that has terminated in the eyes; though we seldom see horses turn moon-blind and breed cataracts, but where the eyes are naturally in fault. These eyes are, for the most part, faulty, that are very large and prominent, or very flat, small, and sunk; both which defects in the eyes of horses are liable to blindness, though they differ in their manner; and therefore colts, that have large eyes, that run abroad, always feed with their heads downwards, and are continually exposed to the sun in hot weather, may easily contract an habitual weakness in their eyes, especially as the blood and juices of all young animals are naturally of a viscid and balsamic texture, and thence may be the more easily retarded in the vessels of the eye, which are exquisitely fine. These causes produce weakness and relaxation in the eyes, and this still increases till the blood is in that state, which we may reasonably suppose to continue till a horse is done spreading, and turned seven, for then the cataracts generally grow complete. On the other hand, when the eyes are flat, and lie deep within their orbits, the surface of the eye being also flattish, the rays of light falling directly upon the pupil, and these not being sufficiently refracted, as they are in those eyes that are more convex, or of a rounder make, must needs weaken the eye, affect the optic nerve, and consequently weaken the tone of the muscles. And, perhaps, this may be the reason why the eyes perish and decay, while the cataracts are growing.

The signs of this distemper may, in some measure, be deduced from what has been already observed; viz. swelling and inflammation of the eyes alternately, sometimes one eye, and sometimes the other, with a running of a thin watery serum, which is often so hot and scalding, as to fret off the hair. In others the eyes run but little, and some not at all; but look deadish, sunk, and perishing. In all moon-blind horses, the eyes are sometimes tolerably clear, at other times thick and muddy, of a wheyish colour, or a dusky yellow; and when this happens, a

moon-blind horse sees but little, and when he is brought out into the light, he takes little notice of any person or object that is near him, but always looks upwards, with his head raised, lifts his feet high, and sets them down with fear. Though in this distemper the humour shifts from one eye to the other by turns, and at some intervals seems to go off, yet when the eyes of such horses are at their best, they look weak, and with a deadness, and when any such horse has his head held up, the weakness of the muscles, and of the whole eye, is easily perceived.

When this distemper happens to horses that have large full eyes, resembling those of a calf, and when the humour continues by long periods, and the returns are frequent, there is great danger of blindness. If the eyes be of a moderate size, well formed, and the periods or returns of the distemper short; if the horse sees perfectly when the humour goes off, and the eyes in those intervals look clear, the horse may recover. When the humour attacks one eye without changing to the other, there is also hopes of a cure, at least, of saving one eye. But when the eyes look flat and depressed, and decay gradually, it is generally the forerunner of blindness; for in this case the nerves and muscles of the eyes are affected, and the cataracts always grow in the progress of the distemper. Here, however, as in the preceding case, when the distemper seizes only one eye, the other may be sometimes saved, and when this happens, the remaining eye generally grows stronger when its fellow is gone. But when the distemper proceeds from a violent cold, as sometimes happens, whereby we often see the eyes swollen, and quite shut up, though the horse may be threatened with blindness by several returns, yet by good management it may sometimes be prevented, and the eyes recover. Nor does the distemper always prove incurable, when the eyes are darkened with a yellow cloud, provided the eye be not naturally bad, and the above symptom of long continuance. In all cases of moon-blindness, the most promising signs of a recovery are when the attacks come more seldom, and their continuance grows shorter: or when the inflammation and swelling in those eyes that are naturally full and large abates. Also, when the eyes, that looked sunk and perished, grow more plump and full; and when in either the cornea looks clear and transparent, without muddiness, and the horse looks more attentive to his way, and goes on without much fear or startling; all these are promising signs, and with good and careful management he may recover.

The most difficult part still remains to be treated of, namely, the method of curing this disorder, for few moon-blind horses escape; and when it is hereditary, or the eyes naturally defective, it is not advisable for any one to be at much expence and trouble to save them, as there is great reason to fear he will meet with a disappointment. We, however, sometimes see moon-blind horses, at least such as have many of the same symptoms, recover and do well, even beyond expectation.

If the eyes are large, full, swollen, and inflamed, the horse should be bled at proper intervals, sometimes in the neck, and sometimes backward, to make a revulsion. But where the eyes appear sunk or perishing, bleeding is often pernicious. After bleeding, for those that are full and run a thin sharp water, make a strong tincture of roses in the following manner.

Take two drams of red-rose-buds, either fresh or dried, infuse them in half a pint of boiling water in the manner of making tea; when it has stood to be cold, pour off the infusion, which will be of a reddish colour.

In four ounces of this tincture dissolve half a dram of sugar of lead, and wash the horse's eyes, and all over his eye-lids, with a piece of sponge, or a clean bit of rag, twice a day. If the matter digest and thicken, which usually happens before it abates, add to the whole quantity of this tincture about two drams of honey (which will dissolve in the fluid, by holding the phial near the fire, and shaking it) and use it as before. At the same time, if the parts near the eye be hot, and the veins over the face, and along the side of the nose be turgid and full, bathe those parts frequently with the best vinegar, verjuice, or vinegar of roses, till the heat and running of the eye abates, the veins sink, and become less apparent, and the eye begins to look clear. In the mean

mean time some lenient mild purges may be administered, such as the following :

Take lenitive electary and cream of tartar, of each four ounces ; syrup of the juice of buckthorn berries, two ounces ; mix these with white wine and water, warmed, about a pint, and give it fasting.

Or,

Take lenitive electary and cream of tartar, of each four ounces ; Glauber's purging salts, three ounces ; the solutive syrup of roses, two ounces ; to be mixed with white wine and water, or warm water-gruel.

Either of these may be given to moon-blind horses. The latter is rather the more mild and cooling, and exceeding proper if the horse be fat and full of blood, and will work so gently, that it may be repeated twice a week, till the eye becomes clear, and attains its usual brightness.

The horse should have feeds of scalded bran while these lenitives are given him, and he may have moderate exercise, or may be made use of in any kind of easy business ; for these draughts, for the most part, work off in about two hours. But as the blood, in all these cases, is generally fizy, and as this disposes young horses to frequent returns of the distemper, it is therefore necessary to administer such things as may attenuate the juices, and preserve them in a more fluid state. These are called alteratives, because their property is gradually to alter the state of the blood. The following has been often used, in this and many other cases, with great success :

Take the finest succotrine aloes, half an ounce, or six drams ; cream of tartar half an ounce ; fresh jallap in fine powder, and salt of tartar, of each one dram ; make the whole into a ball, with a sufficient quantity of oil of amber, and roll it in liquorice powder.

One of these balls may be given every week, in the manner of a common purge, with scalded bran, and his water milk-warm. The first day it will work plentifully by urine, and the day following both ways ; but no more than just to empty his guts, unless when there is a foulness, by reason of a redundant slime or grease ; when it will often work very powerfully two or three days, without the least diminution of the horse's strength, or loss of flesh. The alterative purges should be continued for a month or six weeks, and after omitting another month to begin again ; in all which time the horse may be kept in any common business, except hunting, going journies, or any other laborious exercise.

In the intervals between the purges it will be proper to give him an ounce of crude antimony every day, made into a fine impalpable powder, in one of his feeds, which may be continued for three months or longer. But if the horse be of value, instead of crude antimony, he may have powders compounded of native cinnabar, or cinnabar of antimony, and gum guaiacum, equal parts, giving him an ounce every day, till he has taken two or three pounds ; and after an interval of about three months, to proceed in the same method till the eyes look strong and clear, and the horse shews no signs of blindness, or any defect in his sight or weakness in his eyes. Several gentlemen have followed this method with good success, where the eyes have been full, and no way perished. A pound of guaiacum wood boiled in three gallons of water till it is reduced to two, is a cheap remedy, and may be profitably administered to horses of small value. It promotes perspiration, dries up superfluous humidity, strengthens the solids when relaxed, and sweetens the blood. It may be given a quart or two every day, in a horse's water, and will have a good effect to prevent moon-blindness, where it is not hereditary, nor proceeds from a natural defect in the eye.

But when the eyes are sunk and perishing, and the eye-brows are pinched at their inner corners next the nose ; when there is little or no inflammation or running, except a more than ordinary moisture in the caruncle, or haw of the eye, or where there is no moist-

ture at all, as we often find ; many moon-blind horses in wherever these symptoms are, a method of cure is required quite different from the preceding. For as we suppose here the nerves of the eye to be affected, and the supplies of the arterial blood by that means denied ; therefore, wherever the fault may be, whether originally in the blood or in the nerves, it is necessary, in either case, to administer such things as not only attenuate the blood, but may cause a greater derivation thereof to the eye : so that the most likely way to succeed is by the proper use of mercurials ; and these such as are the most efficacious, and at the same time the most safe. But first of all let the horse have the last mentioned purge given him by way of preparation, and when the operation is over, which will be mild and gentle, the following ball may succeed :

Take mercurius dulcis that has been often sublimed and dulcified, two drams ; make it into a small ball, with a sufficient quantity of conserve of red roses, and wheat flour.

Let this ball be given early in the morning fasting, and tie up the horse from eating two or three hours after it ; then let him have a feed of scalded bran, with warm water, or warm gruel to drink ; which regimen ought to be continued the whole time he is under this course of mercurial and purging physic ; cold water and other cold drinkables being somewhat unsafe at such a time. The mercurial ball may be repeated every other day, in the morning, till the horse has taken three or four. If his mouth grows tender, which may possibly happen, if he be not of a pretty strong constitution, he must be fed with water-gruel for two or three days, till that symptom wears off. At the same time the purge may be repeated once or twice, and the following eye-water applied outwardly to both his eyes, if both be weak and disordered :

Take crude sal ammoniac, cleaned from the black scurf that is usual on the outsidess of the cakes, two drams ; dissolve it in a pint of warm water, or the above tincture of roses ; and add to it a gill of spirit of wine, or the best brandy, shaking them together in a quart bottle.

The eyes may be bathed all over with this mixture, twice a day, or it may be used in the manner of a fomentation, by wringing cloths out of it, and applying them warm over the eyes. This will act as a stimulus, and may also help to thin and rarefy the gummy juices, and bring new supplies of nourishment to the perishing eyes. At first it may cause a little smarting ; but after using it a day or two that symptom goes off, and if the eyes grow more plump and full, there will be hopes of a recovery, at least of saving one eye ; and therefore the best way upon this prospect is to proceed in the same method, after a month's interval, and so on, as you find encouragement. And in all the intervals, the powders mentioned above should be given in all his feeds, or the decoction of guaiacum in his water.

Some take up the eye veins to prevent blindness, but without distinction, whether the eyes are full with redundant humours, or sunk and perishing. In the latter case the taking up the veins may possibly be of service, because by that means the eyes may be better supplied with its proper nutritive juices ; but this too is uncertain, because the fault may be in the nerves, or the distemper may proceed from some original configuration of the eye, which may be defective, and then such operations are like to prove fruitless. But the taking up the veins where the eyes are full, must, for the most part, prove hurtful, by cutting the channels which should convey the blood and juices from thence in the course of circulation, and consequently increase the distemper, instead of abating it. In this case the taking up the arteries might be of some service ; but this is an operation that only persons well skilled in the anatomy of a horse, should presume to undertake, and in the end might perhaps be uncertain.

The cutting out the haw is another operation usually performed on moon-blind horses. The haw is a swelling or sponginess of the caruncle or fleshy substance in the inner corner of the eye next the nose, and when it is soaked with

too much moisture and humidity it swells and turns spongy. The membrane to which it adheres also grows thick, and spreads itself so as to cover a considerable part of the eye, but seldom reaches so far as to cover any part of the pupil. The ligament which runs along the verge of this membrane becomes horny; and when it rises to this state, it compresses the eye-ball like a hoop, and by its continual pressure causes constant pain, and increases all those bad symptoms that are the fore-runners of blindness. Haws grow sometimes in eyes that are not naturally bad, after colds and surfeits; but moon-blind horses are seldom without them; and wherever this symptom appears, that the haws grow large and spongy, and derive a drain of humours upon the eye, the operation becomes necessary, and is performed by taking hold of the membrane with a small hook, and cutting off so much of the caruncle as looks moist and spongy, with part of the membrane and gristle that cause a pressure on the eye. When this operation is well performed, it does great service, and often recovers horses that are not subject to cataracts; and even in this case it makes the eyes look something better, and helps to protract the blindness, but will not prevent it when it is hereditary. This is an easy operation, and what almost every farrier pretends to; but they are apt to cut off too much of this substance, and by that means weaken the eye, and forward the blindness, instead of preventing it. The proper application after cutting out the haw, is honey of roses, or rather tincture of roses, with a little honey dissolved in it. But if the eye continues still to abound with moisture, after the haw is extirpated, and threatens a fresh fungus, the case may be deemed bad; and then it will be necessary to blow into it a small quantity of burnt alum and fine loaf-sugar; and in some cases it may be touched with the blue vitriol-stone, or the lunar caustic; but these violent symptoms seldom happen, and when they do, we may suppose the blood to have a very bad disposition: so that it will be hardly worth while to attempt a cure, considering both the length of time, and the uncertainty of success. *Gibson on the Diseases of Horses*, vol. I. p. 326.

BLINDNESS in Horses, may be thus discerned: the walk, or step of a blind horse, is always uncertain and unequal: so that he dares not set down his feet boldly, when led in one's hand: but if the same horse be mounted by an expert horseman, and the horse himself be a horse of mettle, then the fear of the spurs will make him go resolutely and freely, so that his blindness can hardly be perceived.

Another mark by which you may know a horse that has lost his sight, is, that when he hears any body enter the stable, he will prick up his ears, and move them backwards and forwards; the reason is, that a vigorous horse having lost his sight, mistrusts every thing, and is continually in alarm at the least noise he hears.

BLINDNESS, a want of sight. The sheep in some parts of Wiltshire are troubled with a blindness, and are cured by anointing their eyes with goose-dung. *Lisle's Husbandry*, vol. II. p. 212.

BLISTERING ointment, a name given by farriers for a sort of charge or plaster for raising a blister in horses. There are various prescriptions for making this ointment, but the following is equal to any yet known:

Take nerve and marshmallow ointment, of each two ounces; quicksilver one ounce, thoroughly broke with an ounce of Venice turpentine; Spanish-flies powdered, a dram and a half; sublimate, one dram; oil of origanum, two drams.

BLOOD, a red liquor circulating through the veins, arteries, and other vessels of animal bodies; and serving for the support of life, and nourishment of all their parts.

Blood is an excellent manure for almost any sort of soil. Mr. Evelyn tells us, that after the battle of Bagnam-fields, in Devonshire (where lord Hopton obtained a signal victory) the blood of the slain fertilized the land, which had been sown with corn a little while before, to such a degree, that most of the wheat-stalks of the ensuing crop bore two, three, four, nay seven, and some even fourteen ears; a thing almost incredible. The owner of the land seeing how miserably it had been trodden down, thought of re-sowing it; but was dissuaded from that design (perhaps to make the experiment) and had the above-mentioned surprising crop. The husbandman should, therefore, be careful to procure the offals of the shambles, where they are to be had, as they will prove an excellent manure.

BLOOD, a distemper in the backs of cattle, which will make a beast go as if he drew his head aside, or after him. In order to cure it, you should slit the length of two points under his tail, and let him bleed well; but if he bleeds too much, bind his tail next the body, and then bind salt and nettles bruised into it.

BLOOD, *ebullition of the*. A disease in horses which proceeds from want of exercise, and gives rise to outward swellings, frequently mistaken for the farcin.

BLOOD-*running Itch*, happens to a horse by the inflammation of the blood, being overheated by hard riding or other hard labour, yet gets between the skin and the flesh, and makes a horse to rub, scrub, and bite himself; which if let alone too long will turn to a mange; besides the general ones of bleeding in the neck-vein, scraping him, and other things, are various.

BLOOD-*shoten eyes in horses*. In all inflammations of the eyes, whether from external or internal causes, bleed immediately, according to the strength of the horse; purge once every week, and on the days that purges are not operating, let diuretics be given, such as nitre, to two or three ounces a-day, in mashes of bran. The diet, if in the house, should be mashes of bran, or scalded barley; and, while the inflammation is considerable, hay, oats, and all hard meat which requires chewing, should be avoided; hard labour, and sometimes hanging down the head to graze, is hurtful.

Dip a doffel of lint, or a very soft sponge, in the following eye-water, and wash the eye-lid with it two or three times a-day; and, if opportunity favours, squeeze the sponge so as a few drops may run into the eye each time you bathe it:

Take of red-rose leaves dried, two drachms; infuse them in half a pint of boiling water, until it is cold; then add to the strained liquor, twenty grains of sugar of lead.

When the inflammation is nearly gone, the following will be the most proper for completing the cure; as it not only repels the humours, but greatly strengthens the vessels also.

Take of white vitriol, half an ounce; sugar of lead, one drachm; dissolve them in a pint of pure water.

If the inflammation is very considerable, and the veins on the inside the eye-lid are very full, much relief is given by opening one of the most turgid of them with a lancet.

If there is much swelling, as frequently happens after blows, bites, &c. a poultice of scalded bran, or the crum of white bread boiled, must be applied, and renewed as often as it cools.

Sometimes, from the violence of the inflammation, the coats of the eye lose their natural transparency, and turn white, or of a pearl colour: in consequence of this, the sight is greatly diminished, if not totally obstructed: but sometimes a white blister forms itself on the cornea, as large as a grape: this always relieves, and when it breaks, the cure is speedily effected.

In gross habits, and where there seems to be naturally a weakness in the eyes, disposing to this disease, recourse is sometimes had to rowelling, with considerable advantage.

It may not be amiss to give in this place a caution against the use of powders in eye-waters; for, in the state of inflammation, the eye is very tender, and the finest powder will irritate it, and occasion more or less pain; therefore, medicines that admit of solution, are the only proper ones in these cases.

BLOOD-*letting*. See the article BLEEDING.

BLOOD-*spavin*, a swelling and dilatation of the vein that runs along the inside of the hock, forming a little soft swelling in the hollow part, and is often attended with a weakness and lameness of the hock.

The cure should be first attempted by bathing the part twice a day with vinegar or verjuice; or fomented with a decoction of oak-bark, pomegranate, and alum, boiled in verjuice, binding over it, with a roller, a woollen cloth soaked in the same, which will contribute greatly to strengthen all weaknesses of the joints, and, if early applied, will frequently remove the disorder: but if by these means the vein is not reduced to its usual dimensions, the skin should be opened, and the vein tied with a crooked needle and waxed thread passed underneath it, both above and below the swelling, and the turgid part suffered to digest away with the ligatures: for this purpose the wound may be daily dressed with turpentine, honey, and spirit of wine, incorporated together. *Bartlett's Farriery*, p. 279.

BLOSSOM, a general name for the flower of plants, but more especially of fruit-trees. See **ORCHARDS**.

BLOSSOM, or *peach-coloured horse*, is one that has white hairs intermixed all over with sorrel and bay hairs.

Such horses are so insensible and hard, both in the mouth and in the flanks, that they are scarce valued: besides that, they are apt to turn blind.

BLOW-MILK, skimmed, or *floten-milk*: that from whence the cream is blown off.

BLOWN, swelled or hove. See the article **HOVED**.

BLUE-BALL, a name given to the cone-wheat in Somersetshire, from the dark colour on the edge of the husks of the chaff, which cover each grain, and the falling off of the awns when ripe; some of the ears having awns, and others none. See the article **CONE-WHEAT**.

BLUE-BOTTLE, *knappweed*, *matfellow*, or *centaury*, the name of a weed abounding in many corn lands, flowering in July, and ripening its seeds in autumn.

Mr. Miller says the corn blue-bottle is an annual plant; but Mr. Ray and Mr. Lisle think its root is perennial; because, as the latter observes, it not only puts forth new buds every summer at the root for the growth of the next year, but seems also not to seed early enough, before the corn is cut, to propagate itself by its seed in corn-lands, in which it most abounds, especially in a gravelly soil.

BLYPE, the same with *bleyme*. See **BLEYME**.

BOAR, the male swine. See the article **HOG**.

BODY of a horse, the material part or substance of a horse, usually called his carcase. See the article **CARCASE**.

BOG, properly signifies a quagmire, covered indeed with grass, but not solid enough to support the body; in which sense it differs from moors or fens only as a part from the whole. See the articles **MOOR** and **FEN**.

Mr. King, in his account of the bogs in Ireland, published in the *Philosophical Transactions*, Numb. 170, imputes the true cause of them to want of industry.

"The springs, says he, with which Ireland abounds, are generally dry, or near dry in the summer time, and grass and weeds grow thick about the places where they burst out. In the winter, they swell, run, and soften, and loosen all the earth about them. The sward or scurf of the earth, which consists of the roots of grass, being lifted up and made fuzzy by the water in the winter, as I have seen it lifted up a foot or two at the head of some springs, is dried in the spring, and does not fall together, but withers in a tuft, through which arises new grass; which is also lifted up the next winter. By this means the spring is more and more stopt, and the scurf grows thicker and thicker, till at first it makes that which we call a quaking-bog; and as it grows higher and drier, and the roots of the grass and other vegetables become more putrid, together with the mud and slime of the water, it acquires a blackness, and grows into that which we call a turf-bog. I believe that when the vegetables rot, the saline particles are generally washed away with the water, as being apt to be diluted in it. The oily or sulphureous, are those which chiefly remain, and swim on the water; and this is that which gives turf its inflammability.

"I must confess, that there are quaking-bogs caused otherwise. When a stream or spring runs through a flat, the passage, if not tended, fills with weeds in summer, trees fall across it, and dam it up: then, in winter, the water stagnates farther every year, till the whole flat is covered. Afterwards, a coarser kind of grass shoots up, peculiar to these bogs. This grass grows in tufts, its roots consolidate together, and its height increases every year; inso-much that I have seen it as tall as a man.

"This grass rots in winter, and falls on the tufts, and with it the seed, which springs up the next year, and so still makes an addition. Sometimes the tops of flags and grass are interwoven on the surface of the water, and this becomes by degrees thicker, till it lies like a cover on the water: then herbs take root in it, and by the matting of their roots it becomes very strong, so as to bear a man. I have gone on bogs which would rise before and behind, and sink where I stood, to a considerable depth; under which was clear water.

"As a farther proof that want of industry is the principal cause of bogs, Mr. King observes, that the highest mountains in Ireland being full of springs, and uninhabited, are over-run with bogs, as well as the plains, because no care is taken to clear the springs.

"Ireland, continues he, abounds in moss more than, I believe, any other kingdom. This moss is of divers kinds, and that which grows in bogs is remarkable. The light spongy turf is nothing but a congeries of the threads of this moss, as I have already observed, before it be sufficiently rotten. The turf then looks white, and is light. I have seen it in such quantities, and so tough, that the turf-spades could not cut it. In the north of Ireland, they call it *old-wives tow*, being not much unlike flax. The turf-holes, in time, grow up with it again; and all the little gutters in bogs are generally filled with it. To this I chiefly impute the red or turf-bog; and from the same cause even the hardened turf, when broken, is stringy; though there plainly appear in it parts of other vegetables: and I am almost, from some observations, tempted to believe, that the seed of this bog-moss begets heath, when it falls on dry and parched ground. However, the moss is so fuzzy and quick-growing a vegetable, that it greatly stops the spring, and contributes to thicken the scurf, especially in red bogs, where I remember to have observed this most particularly."

A flat spot of ground lower than the level of an adjoining river or lake, may also give rise to a bog; for when that part is filled up by the slime and earth brought from the surrounding grounds, and the rotten plants and animals, which are buried in it, have choaked it up, it will become a bog; and then the water will continue to flow into it from the river or lake, especially when either of these is swelled by a fall of rain, or melting of snow. These waters may also sometimes have this effect, without a communication above ground, by soaking through a sandy or gravelly soil.

Another cause of bogs have frequently arisen from the fall of a number of trees, which, being neglected, have necessarily occasioned a stagnation of the water brought down from higher grounds; so that the earth and other soil conveyed with it, have of course remained among the fallen wood, and given birth to a mossy ground, which, it is plain from hence, is not an original soil. Coarse grass, and weeds which cattle will not eat, spring up in these places, and die there, after shedding their seeds, which, being prevented from rotting by the bituminous acid in the mossy water, produce new plants; so that, this being repeated every year, an annual addition is made to the depth of the moss.

Bogs, draining of. Among the many and great inconveniences which necessarily arise from bogs, Mr. King mentions the following, as cogent reasons why every endeavour should be used to bring them, first to a less hurtful state, and afterwards to a condition in which they may be of service to mankind.

"The finest and smoothest plains, which generally should be meadows, are often covered with useless, too often with really pernicious bogs. These bogs are a great destruction to cattle, the chief commodity of Ireland. In the spring time, when the cattle are weak and hungry, the edges of the bogs are commonly clothed with grass, and the beasts, in venturing to get it, fall into pits or sloughs, where they are either drowned, or, if they are found, hurt, and often maimed, in the pulling out. The fogs and vapours which arise from these places are commonly putrid, and very unwholesome: for the rain which falls on them, stagnating upon their surface, and in their hollows, than which there is hardly any substance, equally soft, more impenetrable by water, corrupts there, and is exhaled by the sun; so that, very little of it running off, it must of necessity affect the air. They corrupt other water, both in its colour and taste: for the water which stands in the pits, or lies on the surface of the bog, is tinged by the reddish-black colour of the turf; and when a shower comes, so as to make these pits overflow, the water which runs from them tinges all it meets, and gives its colour and stench even to many rivers. The only advantage derived from any bog, is turf for fuel. It makes a tolerable sweet fire, in the common way of using it: and is, when charred, perhaps the sweetest and wholesomest thing that can be burnt, fitter for a chamber, and for consumptive people, than either wood or coal.

"All the inconveniences of our bogs, continues Mr. King, may be remedied, and they may be made useful to us, by draining: for I never observed one bog without a fall sufficient to drain it, nor do I believe there is any. The great objection against this improvement is the expence: in which I cannot but think the people are often terrified without sufficient cause. One trench will drain many acres

Acres in quaking-bogs, which, when dry, are generally meadow, or the best grazing ground. Every red bog has about it a deep, marshy, sloughy ground, which is called the bounds of the bog. A deep trench round such a bog keeps out cattle, and turns the bounds into good meadow. I remember a red bog of sixty acres, which a gentleman reduced to a good grazing ground, worth three shillings an acre, for twenty-five pounds; which is less than three years purchase. In all improvements of this kind, gentlemen should consider, that what they lay out, goes by degrees, so that they scarcely feel it; that it goes among their tenants, whom it helps to enable to pay their rent; that they do a work of charity in employing the poor; and that they at the same time contribute to both the ornament and general profit of the kingdom.

"The deep trench before-mentioned, round a red bog, not only drains and improves the bounds of the bog, as I said before, but goes a great way towards drying the bog itself. It serves likewise as a common sink, into which all the drains vent themselves. These drains should be cut so as to cross the little sloughs that run in the bog. The first drains should not be above two or three feet deep, or wide: for the bog is so soft, that deep trenches will not stand, but fill up again. When the surface of the bog is cut in little trenches, suppose at twenty, thirty, or forty perches distance, it will soon be so dried that cattle may graze on it all the summer. A year or two after this, by which time the bog will somewhat dry towards the surface, the drains may be made six feet wide, and as deep as the softness of the bog will permit. This will certainly make the bog useful for grazing; and at the end of another year or two, an attempt may be made to cut one or two of the trenches down to the bottom of the bog; for till that be done, I do not reckon the bog secured. A gentleman may oblige all his tenants to cut their turf in these trenches, and likewise have his own cut there." *Philosophical Transactions, Numb. 170.*

Small bogs may be turned to very good account by planting them with osiers, willows, and alders: but where the extent is considerable, this object becomes of too little consequence. Draining will be however necessary before they can be improved any other way: as a previous step towards which, it will be necessary to examine from whence their too great quantity of water arises, and what retains it. When the causes are known, their effects will be the more easily removed.

The sources from whence the too great quantity of water proceeds, may either be without or within the bog. This is easily discovered by the greater quantity of water in one place than in another, and observing that the water spreads from thence, even under the surface, as through a sponge.

If the water from without comes from neighbouring grounds, it is usually kept off by a surrounding ditch, made large enough to contain the quantity that may at any time flow down, and by extending that ditch to the most convenient outlet, according to the declivity of the ground. If the bed of gravel or sand through which the springs within the bog run, be cut quite through, the source of those springs will certainly be destroyed; and if that bed be only opened in digging this surrounding ditch, the water will so readily discharge itself thereby, that the springs will probably be dried up.

Before any drain be made in the bog itself, an exact level of the ground should be taken; and when the too great moisture proceeds from a spring or springs within the bog, a large ditch should be made, beginning at the lowest part of the bog, where an outlet can be had, and continued from thence to the spring. If the bog be firm enough to bear it, this ditch should be dug down to the very bottom of the bed on which the peat or moss is formed, which, in case of springs, is always gravel or sand: for otherwise the water would force itself a passage in another part, and so make it necessary to extend the ditch thither. If there be more springs than one, the main ditch must be extended to each of them. In all cases, the surest way is to dig the ditch, where it can be done, at least a foot deeper than the spring lies. Between the principal ditches cut in the bog, there should be smaller, emptying themselves into those larger, to carry off the remnant of stagnating water, and to preserve the surface dry. Care should be taken not to lay the earth dug out of any of these ditches too near their sides, lest its weight should make them fall in.

Bogs are generally higher than the land about them, and

highest in the middle; the chief springs that cause them being generally about the middle, from whence they extend by degrees, and puff up the earth in such a manner, that persons are often apt to think the spring lies deeper than they really do. A sure way to know whether the ditch be deeper than the spring, is to observe whether the water comes in at its bottom, or through the sides. The width of the main ditch should be proportioned to its depth; and both will, in a great measure, depend upon the quantity of water necessary to be drained. In general it should widen progressively from its head to its outlet, because the quantity of water in it will be constantly increased. The sides of the ditch should always be dug either more or less sloping, according to the soil. If the ground be very loose and light, and consequently very liable to fall in, it will sometimes be necessary to make a slope so great, that the top of the ditch will be four times as wide as its bottom. If the soil be stiffer, the slope may be less; but no ditch should ever be dug quite perpendicular.

If a deep trench be cut through a bog, the original spring will be found, vast quantities of water will issue from it, and the bog will subside. Mr. King says that he was informed that the bog at Castle-Forbes, where this was done, subsided thirty feet, a fall which seemed indeed incredible: but he found by computation that it could not be less than fifteen.

Mr. Elliot's contrivance for draining a bog, or what he calls a shaking meadow, containing about forty acres, deserves to be mentioned, for the singularity as well as the usefulness of the invention. The surface of this ground, over-run with cranberry vines and wild grass, seemed to be only a sward of their roots laid over a pappy mud, and was deemed so poor that nobody would rent it. At the ordinary outlet of this meadow, there was a sufficient fall, but very rocky, so that it was necessary to dig four or five feet to take advantage of it. In March, when this gentleman went to make the outlet drain, the torrent of water was so great, that nothing could be done in the usual way. He therefore ordered a tree to be felled across the brook, and pieces of plank, the upper ends of which rested against the tree, to be driven down assant into the mud. The chinks and crevices of these planks were then closely stopped with tow, by which means the water was shut into the meadow. The trench or main ditch was then worked at in the day, and the water let out at night, till the drain was completed. When the weather grew sufficiently warm, and the meadow was a little settled, cross ditches were cut, one on each side, and another in the middle, and, so far as they extended, the meadow soon became firm and dry. "Some, adds Mr. Elliot, are deterred from such an undertaking as that of draining their land, by reason of the great charge. They terrify themselves without reason. When I was about to cut my main drain, some thought it impossible; others, that it would cost, at least, an hundred pounds. The place was full of rocks, some of which we dug up, others were broken with steel wedges, and others were blown up with powder. The whole expence did not exceed twenty pounds." *Essay I. on Field Husbandry, p. 7.*

When the ditches and trenches are finished, great care must be taken to keep them in good and lasting condition, lest all the labour bestowed upon them should be lost.

There are different ways of doing this. If the ditches are left open, they must be well cleansed from weeds and mud, twice every year, once in the spring, and once in the autumn. It will also be right to drive in from space to space, along the inside of their banks, strong stakes of oak or alder, to strengthen them, and keep them from falling in. Willows, which delight in a watery soil, may be advantageously planted upon these banks, which their roots will help to keep up and bind.

If a bog be so entirely surrounded with high grounds, as not to have any declivity whatever, by the help of which its waters may be drained off, ditches must then be dug round it to receive the water from the neighbouring hills, and a very large pond must be made in the middle or lowest part of the bog itself, for its waters to run into; to facilitate which, large trenches should be cut from the surrounding ditches to this pond, and channels communicating with these trenches across different parts of the bog. The number and size of which will depend on the greater or less wetness of the ground. When the water is thus collected, engines must be used to raise it to a proper height for a channel to carry it off. The reader will find a description

of several new and useful engines of this kind under the article, DRAINING MACHINES.

Improvement of drained Bogs. The most lasting and most perfect improvement of bogs, is effected by paring off their surface and burning it. See the articles MOOR and BURNBAKING. In order to this the bogs should be levelled; and whatever earth remains unemployed in filling up hollows, should be burnt together with that taken out of the ditches, unless the latter has been already carried off for fuel. The greater quantity of ashes there is, the greater will be the improvement of the soil itself, and the more will the earth brought upon it be benefited. The fire on the surface of the moss, exhales a very considerable part of the bituminous acid of this soil, and the fixed alkaline salt, always found in some proportion in the ashes, corrects or neutralizes it, so that no inconvenience arises from it afterwards, if the ground be kept dry, as it ought to be. The fire should not be fierce, but rather smothered.

When the bog is pared, and the clods are collected to dry, the farmer must prepare earth to cover the surface. Marle, which is often found under bogs, presents the best covering that can be desired. If a clay lies under the bog, it must be prepared before it is spread in the manner directed under the article COMPOST, excepting only that the quantity of other substances mixed with it, such as dung, &c. need not be so great in this case because the ashes, and the bog itself, will greatly assist in opening the body of the clay. If a loamy earth be near at hand, it will perhaps be less expensive to the farmer to bring such earth to cover the bog, than it will be to dig and prepare the clay. But of whatever kind the earth be, which is laid upon the bog, the quantity should always be sufficient to cover its whole surface four, five, or six inches deep, according to the stiffness of the soil so brought. Thus four inches of clay, when mixed with the ashes, and a due quantity of the earth of the bog itself, will give a depth of covering mould equal to what six inches of loam will do, when likewise mixed in proportion to its quality. If the bog be intended for arable land, the depth of the covering earth should be greater; because all kinds of grain, especially wheat, require at least a foot depth of good mould to extend their roots in, before they come to any cold or tenacious substance like peat or clay. The covering, therefore, of clay or marle should be in this case, six or seven inches thick, and that of loam eight or nine inches.

As soon as the surface is burnt, its ashes should be spread and mixed with the additional covering, which will then be fit for the farmer's purpose, whether for corn or grass. If the extent of the bog intended to be improved be considerable, it should be advisable, by means of a sluice, to fill the ditches contiguous to the spot which is to be covered, and to bring the earth in barges, or flat-bottomed boats, kept on purpose to transport the necessary manures, and the produce of the ground. By this means a saving will be made of the surface otherwise necessary for cart-ways. Besides, this soil, especially, when newly trained, does not well bear heavy carriages; a circumstance which renders it needless to observe, that broad wheels are always the most proper, when any must be used upon such land.

The bog being covered with a proportion of earth, the husbandman must next determine to what lasting purpose he can best apply it. The too great moisture of these soils, which always lie flat, renders them unfit for continued tillage; and their mould becomes so loose, by frequent ploughing, that it does not afford sufficient stability to the roots of corn. For this reason, barley, oats, and rye, do better here than wheat, which requires a firmer footing: but neither of them should ever be sowed thick; because the fruitfulness of the soil will always make up in the size of the plants, what some might think wanting in their number. The most beneficial method of employing this sort of land is, undoubtedly, by converting it into meadow; because, when thus prepared, and not injudiciously exhausted by crops of corn, it will yield great quantities of excellent grass. It is, however, usual to begin with sowing some kind of grain on this prepared surface, to indemnify the farmer by the plentiful crop which it generally yields; such, indeed, as sometimes defrays at once the whole expence of the improvement. Perhaps the most profitable method may be, to sow it in the autumn with rape, the leaves of which, shading the surface in hot weather, and rotting in the winter, contribute greatly to mellow the earth: the strong roots of this plant open the soil; its ashes enrich it, when burnt, and its seed brings a great return when sold for mak-

ing oil. One or two ploughings will then prepare it for a crop of wheat. After this is taken off, and the stubble turned down or burnt, white clover and grass-seed from upland pastures should be sowed, and the ground should then be laid down for a lasting meadow; or, if turneps are sowed, or cabbages planted, in the autumn, these, in the spring, may be succeeded by barley, with which the grass-seeds may be sowed.

When, either through necessity, for want of other arable land, or out of choice, the farmer intends to continue ploughing his improved bog, the surface must be raised in ridges, and the farther management of it may be like that of most other ploughed grounds.

If a soil of this kind happens to be situated near a town, a greater profit will accrue from planting it with garden stuff, than from any sort of grain. Beans, pease, cabbages, potatoes, turneps, carrots, &c. thrive exceedingly well in such earth as this, as the marquis of Turbilly experienced to his entire satisfaction.

"I received, says he, from Strasburg, in the year 1755, some seed of the large hard cabbage, which was immediately sowed in my garden, from whence it was afterwards transplanted into a bog, which I had drained and cleared. This spot contains about an acre of ground, and forms a kind of island in my river. It had been pared and burnt; but never received any other manure than the ashes produced by that burning: no sort of dung having ever been laid upon it. The whole of it was planted with this kind of cabbage, excepting only a corner, where a few carrots, parsnips, and beet-roots all of which grew to a prodigious size; and proved exceedingly good, were set out of curiosity. These cabbages thrived wonderfully, several of them weighing forty pounds a-piece, were well tasted, and very wholesome, though some of the country people seemed positive that they and the other pot-herbs would be hurtful, and unhealthy food, as, said they, all plants are during the first year of their growth in new drained bogs.

"These people pretended to have experienced this in other places; but not finding it so here, I ascribed the effect they talked of to some pernicious quality in the soil; for I was very sure, that the violent operation of the fire which mine had undergone, had not left any bad property in the earth. During the rest of the summer, and the autumn, some of the neighbouring peasants, whom I hired for the purpose, carried this great quantity of cabbages to the markets of three different towns, about six miles off: there they sold them; and the accounts which they gave me of their produce amounted in all to eight hundred and fifty livres, that is thirty-seven pounds, three shillings, and nine pence. The wages of these men and the expence of carriage, amounted to about half this sum; which being deducted, my acre of bog produced clear four hundred and twenty-five livres, that is, eighteen pounds, eleven shillings, and ten-pence halfpenny, with which I was the better satisfied, as the cultivating of it had cost me but little. The soil being light, was easily turned up, though fat; and I had drained off the water without difficulty, by means of a slope which happened to be properly situated. I never had been offered above a crown a year for this marshy land, which was quite a shaking-bog, and often overflowed. When drained, its surface sunk a foot lower than before. So great a produce, from so small a spot of ground, of which no one knew the goodness, shews what vast riches are hid beneath the several bogs in this kingdom. They are not, however, all like this, which chanced to be a very fertile soil. I could wish to be master of several others like it. It has since been sowed with hemp, pease, and several other plants, which have done very well, though none of its crops have produced so much money as this first; which shews the difficulty of setting a just value upon land. All the other bogs which I have drained and cleared in different ways, have answered, in general; but no one ever yielded, in proportion, any thing like this spot." *Mémoire sur les Desfrichemens*, p. 167.

BOG-Spavin, an encysted tumour, or according to doctor Bracken, a collection of brownish gelatinous matter, contained in a bag or cyst, which he thinks to be the lubricating matter of the joint altered, the common membrane that incloses it forming the cyst: this case he has taken the pains to illustrate by an instance of a young colt of his own, where he observes, that when the spavin was pressed hard on the inside of the hough, there was a small tumour on the outside, which convinced him the tumour was within-side the joint: he therefore cut into it, dis-

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charged a large quantity of this gelatinous matter, dressed the sore with daisies dipped in oil of turpentine, putting in to it, once in three or four days, a powder composed of calcined vitriol, alum, and bole: by this method of dressing, the bag sloughed off, and came away, and the cure was successfully completed without any visible scar.

This disorder, according to the above account, will scarcely submit to any other method, except firing, when the cyst should be penetrated to make it effectual; and in all obstinate cases that have resisted the above method, both the cure of this, and the swellings called wind-galls, should be attempted in this manner. If, from the pain attending the operation of dressings, the joint should swell and inflame, foment it twice a day, and apply a poultice over the dressings, till it is reduced. *Bartlett's Farriery, p. 279.*

BOIL, a disease to which cattle, especially sheep, are very subject.

In order to cure these boils, it will be necessary to bring them to a head, by applying to them a plaster composed of wheat-flour, yolks of eggs, and tar: and when they feel soft under the finger, to open them with a lancet, and let out the matter. Then anoint the part with ointment of tobacco, and apply over it the following plaster. Take of turpentine, burnt salt, honey, and galbanum, of each one ounce; of rosin an ounce and a quarter. Melt the whole into a salve over the fire. *Ellis on Sheep, p. 101.*

BOLE signifies the stalk or stem of corn.

BOLE, a measure of corn, containing four bushels.

BOLE of Salt, contains two bushels.

BOLING-Trees, pollard trees, or those whose heads and branches are cut off, and only the boles or bodies left.

BONE, a hard, brittle, insensible part of an animal body, affording form and support to the whole machine.

All marrow-bones, fish-bones, hoofs, horns, or shavings of horn, are very useful in manuring lands. Bones are most serviceable when rasped or broken into small pieces; because their salts, in which their principal virtue consists, are more easily extracted by the rains and dews, and communicated to the soil.

Mr. Young, in his third volume of his *Annals of Agriculture*, says, that bones have the superiority of all manures. It is a manure not uncommon in Middlesex and Surry; all are brought from London, where are people who make it their business to collect and break them into small pieces, for those who boil them for the grease; this operation one would suppose would leave them of not much value, but the contrary is the fact. When I found by this and other trials, that their effect was so very great, I bought all I could get; the price 10s. 6d. a waggon load at London, of 96 bushels, which, by the time they were on the farm (for I generally went on purpose for them) amounted from 25s. to 30s. a load. Five and twenty cart loads in this trial being superior to 50, was owing to the latter quantity being too great a dressing. For this miserable soil, which with a summer fallow had before yielded but 30 bushels, to produce 63 by a moderate manuring of bones, shews their amazing effect.

BONE-Spavin, a boney excrescence, or hard swelling growing on the inside of the hock of a horse's leg.

A spavin that begins on the lower part of the hock, is not so dangerous as that which puts out higher, between the two round processes of the leg-bone; and a spavin near the edge, is not so bad as that which is more inward towards the middle, as it does not so much affect the bending of the hock. A spavin that comes by a kick or blow is at first no spavin, but a bruise on the bone or membrane that covers it; therefore, not of that consequence, as when it proceeds from a natural cause: and those that put out on colts, and young horses are not so bad as those which happen to horses in their full strength and maturity; but in very old horses they are generally incurable.

The usual method of treating this disorder, is by blistering and firing, without any regard to the situation or cause, from whence it proceeds. Thus if a fullness on the fore-part of the hock comes after hard riding, or any other violence which threatens a spavin, such coolers and repellers are proper as are recommended in strains and bruises. Those happening to colts and young horses are generally superficial, and require only the milder applications; for it is better to wear them down by degrees, than to remove them at once by severe means.

There are various forms for making what is called the blistering ointment; but of the best of that kind, and what will infallibly answer the intention, has been already given under the article **BLISTERING OINTMENT**.

When a blister is thought necessary, the hair should be cut as close as possible, and then the ointment applied pretty thick over the part; this should be done in the morning, and the horse kept tied up all day without any litter till night; when he may be untied in order to lie down; and a plaster of pitch, or any other sticking substance, may be laid over it, and bound on with broad tape, or a bandage, to keep all close.

After the blister has done running, and the scabs begin to dry and peel off, it may be applied a second time in the same manner as before; the second application generally taking greater effect than the first, and in colts and young horses makes a perfect cure.

When the spavin has been of long standing, it will require to be renewed perhaps five or six times; but after the second application, a greater distance of time must be allowed, otherwise it might leave a scar, or cause a baldness; to prevent which, once a fortnight, or three weeks, is often enough; and it may in this manner be repeated six or seven times, without the least blemish, and will generally be attended with success.

But the spavins that put out upon older, or full aged horses, are apt to be more obstinate, as being seated more inward; and when they run among the sinuosities of the joint, they are for the most part incurable, as they then lie out of the reach of applications, and are arrived to a degree of impenetrable hardness.

The usual method in these cases is to fire directly, or to use the strongest kind of caustic blisters; and sometimes to fire and lay the blisters immediately over the part; but this way seldom succeeds farther than putting a stop to the growth of the spavin, and is apt to leave both a blemish and stiffness behind; besides the great risk run (by applications of these fiery and caustic medicines, to the nervous and tendinous parts about the joints) of exciting violent pain and anguish, and destroying the limb.

The best and safest way therefore is to make trial of the blistering ointment given under that article, and to continue it according to the directions above laid down, for some months, if found necessary; the horse in the intervals working moderately; the hardness will thus be dissolved by degrees, and wear away insensibly.

When the spavin lies deep, and runs so far in the hollow of the joint, that no application can reach it, neither firing nor medicines can avail, for the reasons above-mentioned: though bold ignorant pretenders have sometimes succeeded in cases of this sort by the application of caustic ointments with sublimate, which act very forcibly, enter deep, and make a large discharge; destroying by that means a great part of the substance, and dissolve away the remainder. Though whoever is at all acquainted with the nature of such medicines, must know how dangerous in general their operation is on these occasions, and that a properly prepared cautery made like a steam, under the direction of a skilful hand, may be applied with less danger of injuring either tendons or ligaments. After the substance of the swelling has been properly penetrated by the instrument, it must be kept running, by precipitate mixed with the medicine used in dressing the part, or with a mild blistering ointment.

Where the spavin lies not deep in the joint, and the blistering method will not succeed, the swelling may be safely fired with a thin iron forced pretty deep into the substance, and then the part should be dressed as above directed. *Bartlett's Farriery, p. 257.*

BOORCOLF. See **BORECOLE**.

BOOSE, a stall. Thus ox-boose signifies an ox-stall, &c.

BORECOLE, or **BOORCOLF**, a species of cabbage, of which there are three sorts, namely, the common borecole, the green borecole, and the Siberian borecole, which is the curled colewort, by some called Scotch kale. All these are for winter use, but the last is most esteemed. The two former are sown about the middle of April, and are fit for transplanting in about two months after. When this is done, the plants of either of these sorts should be set a foot asunder in rows two feet distant from each other. They should not be eaten before the frost has rendered them tender; for till then they are tough and bitter. The Siberian borecole, which is extremely hardy, never injured by frost, and always sweeter in severe winters than in mild ones, need not be sown till the middle of July, and when the plants are strong enough for removing, that is when they have six or eight leaves, they should also be set in rows; the distance between which should be about two feet, and that between the plants, ten inches. These will be fit for use soon after Christmas, and continue good till April. The

The soil for borecole should be a good, fresh, deep-loosened earth.

Borecole has been lately found by Mr. John Wynn Baker to be an excellent food for cattle; and the Society for the Encouragement of Arts has accordingly offered two premiums for cultivating it, one of twenty, and the other of fifteen pounds.

Mr. Baker made the experiment under the direction of the Dublin Society, who desired him to print his account of the experiment, an abstract of which we shall give the reader.

This experiment was made on a piece of ground that had been cropped the preceding year with potatoes. After he had reduced the soil to a pretty good tilth, and manured it with a compost composed of earth, lime, and dung, he planted three rows of borecole plants, in ridges two feet asunder. On the 17th of August they were horse-hoed for the first time, by taking off, at one furrow of the plough, only one side of each ridge close to the plants; in which manner they remained till the twenty-fifth, when he ran the plough in the same furrow, by which with the first furrow, he ploughed about twenty-one inches deep. This being finished, the earth was immediately returned back to the plants, which afforded them fresh nourishment; and in order to give their roots time to penetrate this fine earth, which, by the horse-hoeing was become every fine mould, he let them remain in this state till the 12th of September, when he horse-hoed them again, by taking off the other side of every ridge; and on the twentieth deepened the furrow in the same manner as the former, and immediately returned the mould back to the plants; and on the eighteenth threw up a small furrow to each side of every ridge, which finished the culture, and restored the ridges to the form they were in when the borecole was planted.

"On the 18th of December, continues Mr. Baker, I cut two perches in length of one of the rows of borecole, which contained twenty-one plants; they weighed one hundred and eighteen pounds, which is very near five pounds ten ounces for each plant: but I am inclined to believe that these plants will succeed as well, if they are planted only eighteen inches asunder in the rows. However, at the above proportion, there would be seventeen tons, and fourteen hundred upon an acre. But, if the produce would be same, were the plants only eighteen inches asunder, in that case, an acre would produce, by this culture, above twenty-three tons, and twelve hundred.

"This plant is worthy the farmer's or grazier's attention, for, as fast as it is cut, it will again, in about a month or six weeks, afford another crop: I have been cutting these plants for my family use, ever since the middle of August last; I believe some of them have been cutting three times, and they are excellent for the table. For feeding cattle and sheep they are highly valuable, as no frost will injure them; and although the first crop amounts not to as many pounds upon any given quantity of ground as those of cabbage or the turnep cabbage, yet the succeeding crops will, I believe, make their produce nearly, or quite, of equal weight with any other of the cabbage kind. But I must not omit to observe, that, as these plants afford only open leaves, and many of them very small, there will be a little more trouble in collecting and carrying them to the sheep and cattle, than there will be with the other kinds.

"It may not be improper to observe likewise, that, upon the approach of spring, when they begin to throw out their spring shoots for seeds, if the large leaves have not been taken off for winter use, they will decay and fall off.

"I have not yet tried it; but I believe the best way of using this plant, would be to allot one whole field to the culture of it, proportioned in size to the stock intended to consume the produce: and in September or October, to turn the ewes into the field for a few hours, morning and evening, and then to lodge them on any piece of grass or fallow, which may want improvement, to which they will greatly contribute by emptying themselves upon it; and thus continue to turn them into the borecole-field, till they have eat all the luxuriant leaves; then let the plants rest a month, and there will be another crop. By having two small fields under this crop, a flock of store sheep might be maintained a whole winter at a very small expence; for while the produce of one field would be consuming, the other would be coming on.

"This method occurred to me from an accident which attended my borecole this year. My cows got into the field, and presently devoured some of the leaves of the plants;

these plants have engaged my attention ever since, and I have the pleasure of seeing them again in a very luxuriant state.

"If any persons should be able to put this scheme in practice, before I can accomplish it, I recommend it to them not to let the sheep pasture so long on the crop, as to injure the stalks for want of leaves, as too great an injury to the stalks may check the succeeding growth; which injury, I am inclined to believe, will not happen to the plants, at least not in so great a degree, whilst they have a sufficient quantity of leaves.

"It will doubtless be observed, that I confine this scheme to ewes or store-sheep: my reason for that is, that fat sheep should always have as much food before them, as they choose to eat; add to this that sheep when they are fat, are more subject to be lame than store-sheep, to which ploughed ground will greatly contribute."

BORD-Lands, the demesnes which lords keep in their own hands, for the maintenance of their board or table.

BORD-Service, the tenure of board-lands, by which the tenants were to provide provisions for their lord's tables. There is still some remains of this tenure remaining; but the tenants pay only a small rent per acre, instead of finding the provisions formerly required.

BORER, or *Screw-borer*, an instrument invented by the marquis of Turbilly, for searching or exploring the nature of any soil.

This borer is composed of two rods of iron, Plate I. fig. 6 and 7, each six feet long, and an inch in diameter. The end A, of fig. 6, screws into the end B, of fig. 7, after taking out the stopper C, the use of which is to hinder either dirt or dust from getting into the screw. The screw is an inch and a half long, and three quarters of an inch in diameter. D, fig. 6. is a steel point somewhat blunt to pierce the earth, or any substance it may meet with. It should be about three inches long, and made with either three, four, or more sides, as may be thought most convenient. It is screwed into the rod A in the same manner, and with a screw of the same size as A is screwed into the rod B. It is a groove six inches long, a third of an inch wide, and three quarters of an inch deep, rounded in the bottom, and intended to bring up part of each different layer through which it passes. When springs are sought for, a bit of sponge is put into the groove. At the end F, of the rod, fig. 7, is a screw to fix into another rod of the same kind, if it be found necessary to lengthen the instrument; and this may be repeated by the addition of more rods, to any depth desired. G H, fig. 6, is the handle of this instrument two feet and a half long. This handle is fastened to the rod by means of a clasp I, lined with steel, fixed at one end by a hinge, and at the other by the screw L; so that it may be placed at any height. Fig. 8. is the handle separated from the rod, and marked with the same letters as before. Fig. 9. marked with the same letters as before, is another handle, or rather lever, like the handle already described, except its having only one branch or lever marked G. This serves to stop the borer when we are bringing it up from a considerable depth, and also to screw and unscrew the several bars, or joints, as occasion requires; and to put on, or take off the steel point at the bottom. The handle G A, fig. 6. is that by which the rod is held, and worked into the earth, either by twisting it round, especially at first, or after it has penetrated to the same depth, by lifting it up, and letting it fall again, which it does with such force, as to pierce even the hardest rocks; especially if it works at any considerable depth, and has of course been lengthened accordingly; for every foot of this rod weighs three pounds. Two men will easily found the depth of twelve feet in less than a quarter of an hour, if they do not meet with many stones. When the rod becomes too heavy to be properly managed by hand, it may be raised by a rope fastened at one end to the handle, and at the other to a roller, or kind of windlass, erected at a proper height, perpendicularly over the hole, and turned with either one or both handles. This will cost but a trifle, and will easily raise the other rod, which, when let go, will fall with such weight, as to strike each time very deep into the earth. The marquis tells us, that he has seen it worked in this manner to the depth of more than an hundred feet.

The toughest iron is the best for making this instrument which should be well hammered, till its surface be quite smooth and even; for the least roughness and inequality would occasion a friction, which would greatly retard its working. For the same reason, and also to increase the force

force of its fall, it is necessary that it should be perfectly straight, nor should it ever be struck with a mallet, hammer, &c. to force it down; because a blow might bend it, and it would easily break afterwards. The female screw must be turned like that in the breech of a gun barrel, in a separate piece of iron, cross-ways to the grain, and this piece must be afterwards well foldered on to one of the ends of the rod. The reason for this is, that if the female screw were bored only at the end of the rod, it would, by being hammered out in the same direction with the grain, be stringy and porous, and consequently so weak as to give way, or burst, in the working of the rod; whereas, when made of a separate piece, taken cross-ways of the grain, the threads of the screw will run with the grain of the iron, and be thence considerably strengthened. A bit, like that of an augre, proportioned to the thickness of the rod, may at any time be substituted instead of the steel point, to draw up a sample of the substance from the very bottom of the sounding.

If the only thing wanted be to know the nature of the under soil, and layers of earth, so far as they may effect the vegetation of plants, it will be very sufficient to bore eight or ten feet deep. A greater depth is only requisite when water, marl, ore, &c. be sought for.

The common auger indeed will do very well for shallow boring, as we have already observed under that article. See the article AUGRE.

By either of these instruments, there is a certainty of discovering, without much charge, or any hazard, not only what earths are under the upper soil, but also whether any other substance of value lies concealed there, such as marle, chalk, fuller's earth, fossile shells, coals, quarries of slate or stone, ores, &c. many of which are hid, and intirely unthought of in places, where their value, was it known, is ten times more than that of the estate which covers them.

BORING, an operation sometimes practised for the cure of horses, whose shoulders are wrenched.

The operation is performed in the following manner: they cut a hole in the skin in the middle of the shoulder, and with the flank of a tobacco-pipe, blow it as a butcher does a shoulder of veal; then they run a cold flat iron, like a horseman's sword-blade, eight or ten inches up between the shoulder blade and the ribs, which they call boring; after that, they burn him round the shoulder with a hot iron. *Burd. Gent. Far.*

This is a very absurd and cruel treatment, and can be of no manner of service. *Bartlet's Farriery.*

BOTTS, a name given to a species of worms infesting horses and other cattle.

The botts which grow in the stomach of horses, and which are sometimes the cause of convulsions, appear to be very large maggots, composed of circular rings, with little sharp prickly feet along the sides of their bellies (like the feet of hog-lice) which by their sharpness, equal to that of the finest needle, seem to be of use to fasten them to the part where they breed, and from whence they draw their nourishment, and also to prevent their being loosened from such adhesion, before they come to maturity. The eggs from whence these botts are produced, are disposed in clusters round the lower orifice of the stomach, and are layed under the inner coat, or thin membrane of the stomach; so that when the animals come to life, they burst through this inner coat, their breech and tail strait outwards, and their trunks so fixed into the muscular or fleshy coat of the stomach, that it sometimes requires a good pull to disengage them: from the blood of this last coat they draw their nourishment, which they suck like so many leeches, every one ulcerating and purfing the part where it fixes, like a honey-comb; and they often make such quick havock as to destroy the horse.

The botts which many horses are troubled with in the beginning of the summer, are always seen sticking to the straight gut, and are often thrust out with the dung, together with a yellowish coloured matter resembling melted sulphur; they are no ways dangerous there, but are apt to make a horse restless and uneasy, and rub his breech against the posts. The season of their coming is in the months of May and June, after which they are seldom to be seen, and rarely continue in any one horse above a fortnight or three weeks. And the creature may be easily cured when they are only in the straight gut, by given him a spoonful of favin cut very small, once or twice a day in his oats, or bran, moistened; three or four cloves of garlick may also be

added to advantage. The following purge should likewise be given:

Take fine succotrine aloes ten drams; fresh jallap one dram; birthwort and myrrh powdered, of each two drams; oil of favin and amber, of each one dram; syrup of buckthorn enough to form the whole into a ball.

But the botts, which take their lodgment in the stomach, are, as has been already observed, extremely dangerous, by causing convulsions, and are seldom discovered by any previous signs before they come to life, when they throw the horse into violent agonies. The only cure for these is mercurial medicines; the following will answer the intention:

Take quicksilver two drams; Venice turpentine half an ounce; rub the quicksilver till no glistening appears; then take an ounce of aloes, a dram of grated ginger, thirty drops of oil of favin, and syrup of buckthorn enough to make the whole into a ball.

One of these balls may be given every six days, with the usual precautions with regard to mercurial physic: and the following powders immediately:

Take powdered tin and Æthiops mineral, of each an ounce; and give it every night in a mash, or in his corn.

These medicines, or any of the various preparations of antimony and mercury, should be continued several weeks together, in order to free the animal entirely from these vermin. *Bartlet's Farriery, p. 150.*

If the horse is tender and weakly, and feeds but poorly, give him the following stomach drink.

Take gentian root, six ounces; camomile flowers, two hanfuls; Peruvian-bark, two ounces; filings of iron, half a pound; juniper berries, four ounces; infuse them six or eight days in three gallons of ale, shaking the vessel now and then; after which give a pint of the clear liquor two or three times a day.

If the horse is robust, but hath worms, from full but bad feeding, give him, with his corn, a handful of rue, garlic, tansey, favin, and other such-like vegetable. Some have ventured to give half an ounce of cut tobacco with the corn, once a day, for two or three weeks.

The round worms are generally destroyed with filings of tin; joined with bitters and a purge now and then thus:

Take the filings of tin, and myrrh, of each half an ounce; make them into a ball with honey, and repeat it twice a day. But before giving this ball, give a purging ball with aloes, and repeat it once in eight days.

If any come away dead, you may conclude that they are all killed.

But of all the species, bott worms are the worst, particularly if they are in the stomach, those in the guts being rather troublesome than dangerous. To destroy the botts in the stomach, calomel should be first given, and that freely; but as the convulsions soon shut up the horse's mouth, and, usually, there are no preceding symptoms to warn you before the violent attack, therefore if botts are any way suspected, lose no time, immediately get down the following bolus:

Take calomel and London philonium, of each half an ounce; honey, enough to make a bolus; and, if possible, repeat a lesser dose, in four or five days, and a common purging ball the day following.

Botts in the straight gut are easily destroyed by giving a large spoonful of favin twice a day in bran or corn, a little moistened, and an aloetic purge at proper distances from each other.

Both common salt and saltpetre are very efficacious in cases of worms, particularly against species not yet mentioned, and that in some counties are called needle-worms; they are slender, about an inch long, of a yellowish colour. Two ounces of either of these salts may be given every night in a mash or any other convenient method, for two or three weeks.

With regard to other kinds of worms, the above medicines will also be sufficient.

You may also add three or four cloves of garlic, and a purge of aloes.

BOUDS, a name in some countries for the insects generally called weevils, breeding in malt.

BOWS of a saddle, are two pieces of wood laid archwise to receive the upper part of the horse's back, to give the saddle its due form, and keep it steady.

BOX, the name of a well known tree, of which botanists enumerate seven species, viz. 1. The box-tree. 2. The narrow-leaved box-tree. 3. The striped box. 4. The gold-edged box-tree. 5. The dwarf box. 6. The dwarf striped box. 7. The silver-edged box.

The first and second sorts grow in great plenty upon Box-hill, near Dorking in Surry, where were formerly large trees of these kinds; but of late they have been pretty much destroyed: yet there are great numbers of these trees remaining, which are of a considerable bigness. The wood of this tree is very useful for turners, engravers, and mathematical instrument makers; the wood being so hard, close, and ponderous, as to sink in water; which renders it very valuable for divers utensils.

All the varieties of the trees, or large box, are proper to intermix in clumps of evergreens, &c. where they add to the variety of such plantations: these may be propagated by planting the cuttings in autumn in a shady border, observing to keep them watered until they have taken root; when they may be transplanted into nurseries, till they are fit for the purposes intended. The best season for removing these trees is in October; though, indeed, if care be used to take them up with a good ball of earth, they may be transplanted almost at any time, except in the summer: these trees are a very great ornament to cold and barren soils, where few other things will grow; they may also be propagated by laying down the branches, or from seeds: the last being the best method to have them grow to be large, the seeds must be sown soon after they are ripe, in a shady border, which must be duly watered in dry weather. *Miller's Gard. Dict.*

Box of the wheel, the aperture wherein the axis turns.

Box of a plough, the cross-piece in the head of a plough which supports the two crow-staves. See **PLOUGH**.

BRACE, a general name for a couple, or pair of any thing, as bucks, hounds, partridges, &c.

BRACKEN, the same with brakes, or fern. See the article **FERN**.

BRAKE, the same with fern. See the article **FERN**. It is likewise applied to the place where fern grows.

BRAKE, is also a name given to an instrument often used by farriers, &c. generally called barnacles. See **BARNACLES**.

BRAKE, is likewise the name of a wooden-toothed instrument used to bruise and break the bun of hemp, and separate it from the rind. See the article **HEMP**.

BRAMBLES, in **FENCING**. Mr. Young, in his *Annals of Agriculture*, vol. II. gives the following letter from Mr. Le Blanc, of Cavenham in Suffolk, on their utility, viz. "You will be surprised that a practical farmer should venture to recommend the culture of the bramble, a plant universally looked upon as a very troublesome weed. I, nevertheless, think it worthy the attention of every man who wishes to raise live hedges in a poor sandy soil, in the shortest time, at the least expence. The idea of the utility of brambles first struck me from the following circumstances: several small enclosures were made in this parish (which you well know is a blowing sand) about eleven years ago, on each side of a narrow field-road, in which a large flock of sheep was frequently driven; on one side of the road the bank was planted with brambles mixed with the white-thorn, and a dead hedge placed on the top, as is the usual method in this country; the dead hedge has never since been renewed, and the fence is now a tolerably good one. The bramble, which is a very fast grower, not only defends the young quick from the sheep, but likewise by twisting itself through the dead-hedge, strengthens it, and prevents it from being broken down either by cattle or pilferers. On the other side of the road, the bank was planted at the same time, and in the same manner, with white-thorn only. The dead-hedge has been renewed several times, and there is at this time no probability that the white-thorn will ever make a fence. I have not been unmindful of the hint which the above observations suggested to me, but made what I think an improvement upon it, by planting two rows on the bank; the lower one of bramble

only, the upper one of white-thorn only. I have tried this method in the years 1781 and 1782, and both fences are now much more promising than I could have expected them to be if planted with white-thorn only. You will observe, that I do not recommend this plant, but in poor sandy soils, where the growth of quick-hedges is slow; where they are liable to the depredations of sheep; and where, by reason of the looseness of the soil, the ditch is no defence."

BRAN, the skin or husks of corn, especially wheat, ground and separated from the flour by means of a sifter or boulder.

Bran is a useful ingredient in a horse's diet, if discretely used, and when scalded is a kind of panada for sick horses. But nothing is worse than a continual use of bran, raw or scalded, as it is apt to weaken a horse's bowels, and thereby expose them to many disorders. *Gibson on the Diseases of Horses*, vol. I. p. 172.

Mr. Mills assures us, that a little wheat-bran boiled in our ordinary beer, will make it mantle in the cup. *Husbandry*, vol. I. p. 407.

BRANCH, an arm of a tree, or a part which, sprouting from the trunk, helps to form the head or crown.

BRANK, the same with buck-wheat. See the article **BUCKWHEAT**.

BRAWN, the flesh of a boar, boned, rolled up, or collared, boiled, and lastly pickled.

Brawn is made only of the flitches, without the legs: the oldest boars are chosen for this use, it being a rule, that the older the boar the more horny the brawn.

The method of making it is as follows: the bones being taken out of the flitches, the flesh is sprinkled with salt, and laid in a tray, that the blood may drain off; after which it is salted a little, and rolled up as hard as possible. The length of the collar of brawn should be as much as one side of the bone will bear; so that when rolled up, it may be nine or ten inches in diameter.

The collar being thus rolled up, it is boiled in a copper or large kettle, till it is so tender that you may run a straw through it; when it is set by till thoroughly cold, and then put into the following pickle; to every gallon of water add two handfuls of salt, and as much wheat-bran; boil them together, drain the liquor as clear as possible from the bran, and when the liquor is quite cold, put the brawn into it.

BREAD, a well-known food, chiefly divided into white, wheaten, and household; differing only in degrees of purity. In the first, all the bran is separated; in the second, only the coarser; in the third, none at all; so that fine bread is made only of flour; wheaten bread of flour, with a mixture of fine bran; and household, of the whole substance of the grain, without taking out either the coarse bran or fine flour.

We also meet with symnel-bread, manchet, or roll-bread, and French bread; which are only so many denominations of the finest or whitest bread, made of the purest flour; except that in roll-bread there is an addition of milk, and, in French bread, of eggs and butter also. To which may be added, ginger-bread, made of white bread, with almonds, liquorice, aniseed, rose-water, and sugar; and massin-bread, made of wheat and rye, or sometimes of wheat and barley.

The process of making household bread among us is thus: to a peck of meal they add a handful of salt, a pint of yeast, and three quarts of water, cold in summer, warm in winter, and temperate between the two; the whole, being kneaded in a bowl or trough by the fire, in winter, from it in summer, and a little yeast added, will rise in about an hour; they then mould it into loaves, and put it into the oven to bake. *Hought. Collect.*

For leavened bread, part of the flour intended for it, being made into dough with warm water and a little salt, is laid in the rest of the flour an hour or more, in which time it rises to three times the bulk; then they mix and knead the whole with more water, till it be brought into a stiff dough; which being formed into loaves, is baked in the oven: though the more usual way is to take a piece of dough kneaded, and leave it in the tub till next time, when they break it small, and mix it with the meal, adding some yeast. *Hought. Collect.*

For French bread, they take half a bushel of fine flour, ten eggs, and a pound and a half of fresh butter, into which they put as much yeast, with manchet; and, tempering the whole mass with new milk, pretty hot, let it lie half an hour

to rise; which done they make it into loaves or rolls, and wash it over with an egg beaten with milk; care is taken the oven be not too hot. *Rust. Diet.*

BREAD for horses: horses are sometimes fed with bread, to hearten and strengthen them: the way to make the same is two-fold:

1. Take wheat-meal, oat-meal, and beans, all ground very small, of each a peck; aniseed, four ounces; gentian and fenugreek, of each an ounce; liquorice two ounces; all beaten into fine powder, and searfed well: to which add the whites of twenty new-laid eggs, all well beat, and as much strong ale as will knead it up: then make your loaves like the house-bread, but not too thick; and let them be well baked, but not burnt; give it not too new; and let him have it five or six mornings together, without any other provender.

2. Take of wheat-meal, rye-meal, beans, and oat-meal, of each half a peck, ground very small; aniseed and liquorice, an ounce of each; and white sugar-candy, four ounces: beat all into a fine powder, with the whites and yolks of twenty new-laid eggs, well beaten; and put to them as much white-wine as will knead it into a paste; which then make into great loaves, and bake them well: when two or three days old, give him to eat thereof, but chip away the outside.

For race-horses, there are three sorts of bread used; given successively, for the second, third, and fourth fortnight's feeding. 1. Take three pecks of clean beans, and one peck of fine wheat; mix them together, and grind them into pure meal; that done, bolt it pretty fine, and knead it up with good store of fresh barm, but with as little water as possible; labour it well in a trough, break and cover it warm, that it may swell; then knead it over again, and mould it into large loaves, in order to be well baked. When they are drawn from the oven, turn the bottom upward, and let them cool: at three days old you may give your horse this bread, but no sooner; as nothing is more apt to surfeit than new bread. Or you may,

2. Take two pecks of clean beans, with two pecks of fine wheat, and grind them well together; then bolt and knead it with barm, or lightening, and make it up as you did the former bread. With this bread, having the crust cut quite away, and oats, or split beans, mingled together, or separately if you think fit, feed the horse as before, at his usual meals. Or,

3. Take three pecks of fine wheat, and one peck of beans; grind and bolt them through the finest bolter you can get; then knead it up with new strong ale and barm, beat together, and the whites of twenty eggs, or more, and no water at all; but instead thereof a small quantity of new milk: at last work it up, bake and order it as the former; and with this bread, having the crust cut off, adding clean oats and split beans, all mixed, or separate, feed your horse at his ordinary feeding times, as you did in the fortnight before.

BREAK, land ploughed the first time after it has lain fallow in sheep walks.

BREAKING-UP. See **SOD-BURNING**.

BREASTS, part of the bows of a saddle. See **BOWS**.

BREAST-PLATE, or **TREE**, is the strap of leather that runs from one side of the saddle to the other, over the horse's breast, in order to keep the saddle tight, and hinder it from sliding backwards when the horse goes upon a rising ground.

BREAST-PLOUGH, a small plough, contrived so that a man may shove it before him. It consists of a cutting-iron about eight or nine inches long, and having one of its sides turned up to cut the turf. This iron is fixed to a pole bending upward about five or six feet long, and forked at the upper-end, having a crutch, or cross handle, mortised into the forks. Against this crutch the ploughman places his breast, and shoves along the plough, in order to turn up the turf, its only use being for cutting up the surface of the ground in the operation called burn-baking. See the article **BURN-BAKING**, and **SOD-BURNING**.

BRECK, or **BRACK**, a breach or gap made in a hedge.

BREEDING. See **CATTLE**.

BREW-HOUSE, a house erected for the purposes of brewing.

The conveniency of water is one of the first things to be attended to in erecting a brew-house, because the frequent carriage of that necessary fluid greatly enhances the cost of the beer. The water should be soft, and if supplied from an adjacent river, it should be conveyed by a passage under-

ground, in order to its being pumped up from thence into the copper, or into troughs properly placed for carrying it where it may be wanted. If there be a reservoir for rain-water, it should be made as near the brew-house as possible.

The quality of water made use of, is a principal consideration in brewing: and to this, in a great measure, seems to be owing the superiority of the beer of some particular places. Ramsbury, in Wiltshire, is noted for good beer, which induced a brewer in a neighbouring county to imitate it; and being of opinion that the goodness of the Ramsbury beer was chiefly from a superior quality of the malt brewed there, he bought some of the best malt to be had there, but found upon trial, that the beer brewed from it, was no better than what he used to brew from other good malt. He then bought some more malt at Ramsbury, and engaged a brewer from thence, to brew this malt for him; but without success: this second brewing of the Ramsbury malt was no better than the first, which induced him to conclude, that the superior quality of the Ramsbury beer consisted principally in their water; which is softened by the chalk washed down from the higher grounds there, by rain. In confirmation of which, it is observable, that a brewer in Ramsbury removed some years ago to Whitchurch in Oxfordshire, where he continued to brew beer, and the soil of that neighbourhood, being also chalky, his beer so much resembled the Ramsbury beer, that he sent quantities of it to London, and sold it there as such.

Water for brewing is softened, not only by chalk, but by other calcareous substances, which may be obtained in many places at proper seasons. The late Mr. Owen, who kept the Rummer at Charing-Cross, London, was noted for the goodness of his beer, which he had from Mr. Gyfford's brew-house. The reason he assigned for his beer being so good was, that he laid in his stock of beer in the month of November, immediately after hard rains that flooded the river, and made the water muddy; his beer was then brewed, and as soon as it was in fit order, was all put into his cellars at Charing-cross, where he attended to its fermentation himself; and declared he knew no other reason for the good quality of his beer, but the quality of the water, thus softened by the particles of the soil, washed into the river by the first heavy rains that fell in the beginning of winter; a circumstance worthy of the notice of those who are desirous to have very good beer, which their attending to this circumstance may be a mean of obtaining, without any additional expence.

The brew-house should be so situated as to face the north, for shade and coolness. It should be as near as possible to the cellar, that the labour and expence attending the carriage of the liquor may be saved, and the danger of exposing it to either too hot or too cool an air prevented. The floor should be paved with stone or hard bricks, and raised in the middle, to give an easy discharge to the water, so as to keep the brew-house always clean.

The copper should be proportioned to the quantity brewed, and should be raised so high that the water may run from it to the mash-tub, and the wort to the coolers. For this purpose there should be either a cock in the side, at the bottom of the copper, or a brass pump should be fixed to its side, by means of which the water or wort may be conveyed through a trough to their proper receptacles.

The mash-tub should be round, not too deep, and perfectly smooth on the inside. It should have a false bottom, which may serve as a strainer, when, by turning a cock placed below, the wort may be drawn off into the receiver: or the wort may be let out by means of an upright plug, surrounded with a basket-strainer.

The receiver should be lined with milled lead, which is easily kept perfectly clean, and is not apt to contract any bad taste or sent, as wood is known to do, notwithstanding the greatest care. The best method of conveying the wort from the receiver to the copper is by means of a hand-pump.

There should be two coolers, or backs, as the brewers call them. These should also be lined with milled lead, or made of the heart of oak, rendered perfectly smooth; and placed as near as convenient to the copper.

The working vessel or tun should be placed at some small distance from the cooler. It should be round, but not lined with lead; because this would cool the liquor too much in cold weather during the fermentation.

The cellar should, as already observed, be near, if possible, and sunk much lower than the working-tun, that the beer

beer may be conveyed into the casks by a cock and hose, or some other easy method.

There must be in the brew-house an oar to stir the malt in the mash-tub, with bowls, pails, and other utensils, necessary in different operations. These, as well as every other implement employed in brewing, should be boiled in the copper, or well scalded every time, before they are used.

Too great care cannot be taken to keep every vessel perfectly clean and sweet: for if they are the least tainted, the liquor will contract a disagreeable scent. When any taint is suspected, the vessels should be well washed with a strong ley of clean wood-ashes. This ley should be put into them, scalding hot, and every joint, crevice, and smallest hollow, must be well scrubbed. If there are no ashes to be had, lime may be flaked in water in the vessels; and if this be done in casks, they may be bunged up as soon as the ebullition is over, and not opened till three days after. The more effectually to prevent the lodging of any kind of filth, the sides of every vessel should be as smooth as possible; and after every brewing, they should be washed with boiling water, and laid up dry.

BREWING, the operation of preparing beer, or ale, from malt and hops.

The usual process of brewing is as follows: the ingredients being ready, the water must be made to boil very speedily, and while boiling with the greatest violence, the fire must be immediately damped, or put out; when the height of the steam is over, the water is put into the mashing-but, to wet the malt; then so much being poured out, as to make it of a consistence stiff enough to be rowed up, let it stand thus a quarter of an hour, after which another quantity of water is added, and rowed up as before; at last, the full quantity of the water is poured upon it, and that in proportion as the liquor is intended to be strong or weak: this part of the operation is called mashing. Afterwards the whole may be left to stand two or three hours, more or less, according to the strength of the wort, or to the difference of the water; then let it run into the receiver, and mash again for a second wort, in the same manner as for the first, only the water must be cooler, and must not stand above half the time.

The two worts being mixed together, the quantity of hops that is designed may be added thereto, and the liquor put into the copper, which being closely covered up, let boil gently for the space of an hour or two; then let the liquor into the receiver, and the hops strained from it into the coolers.

When cool, the barm is applied; which done, it is left to work, or ferment, till it be fit to tun-up.

For small-beer there must be a third mashing; the water must be near cold, and to stand not above three quarters of an hour; to be hopped and boiled at discretion.

Such is the process, as commonly delivered, for brewing; but it is in many particulars so vague and uncertain, that proper explanations will be requisite.

The malt is ordered to be put into the mash-tub, when the height of the steam is over: but how is this to be known exactly? Some direct you to stay till you can see your face in the water, which is full as equivocal. Perhaps the method proposed by Dr. Shaw might answer the purpose. He directs us to put a certain measured quantity of cold water to the malt first, and stir that very well with it, so as to form a kind of thin uniform paste; after which the remaining quantity of the water may be added in a state of boiling, without the least danger. By this means, adds that able chemist, the proper or precise degree of heat, necessary to extract the virtue of the malt with all advantages, may be very expeditiously hit, or assigned, to a great exactness; as the heat of boiling water is a standard, which may at once be let down to any desired point of warmth, by a proper addition of cold water; due allowance being made for the season of the year, and the temperature of the air.

To employ only one copper in brewing is generally allowed to be bad management; because the business must, in that case, stand still in some part or the other, however well the process may be contrived. For this reason, the best and more usual method is to brew with two coppers.

The great copper, in which the water for the two first extracts receive their temperature, is built very near the mash-tub, so that the water may be readily conveyed to the ground malt. At the bottom of the copper is fixed

a cock, which being turned, lets the water run through a pipe to the real bottom of the mash-tub. This is by far the best way, because this is the most expeditious, and least liable to accidents.

When the water has been brought to a proper degree of heat in the mash-tub, the malt is run very leisurely into it, whilst another person stirs it all the time, so as to mix the whole of it uniformly with the water, and prevent any of its parts from gathering into clods. In this operation rakes should be first employed; because by their horizontal motion, less violent than that of mashing, the finest parts of the malt are well wetted, without its flour being scattered or lost in the air: but as a still more perfect penetration and mixture are necessary, oars are afterwards used, by which a thorough inhibition of the water is effected. When the mash has been sufficiently stirred, it is covered with a sprinkling of malt, and the tub itself should also be covered with sacks or other cloths to keep it warm.

After mashing, the malt and water are left untouched for an hour and a half, or two hours; and during this interval, the large copper of water is brought to a proper heat for a second mashing. The second extract is commonly mashed three quarters of an hour, and is afterwards let stand the same space of time; and the third requires half an hour, both for mashing and standing. As the first drawn wort is immediately put into the large copper, the water for the third mashing is boiled in the smaller.

Small quantities of malt brewed in large vessels lose their heat soonest, by lying thin and greatly exposed to the action of the air; and, on the contrary, a less allowance for the loss of heat is required for large quantities brewed in proportionable vessels. This is the only difference between brewing carried on in large brew-houses, and those which are made in private families. Care should be taken that the quantity of the malt be not so large as to exceed the bounds of one man's labour; nor so small as to prevent the heat being uniformly maintained. It is also of great importance never to let the malt remain with less water than will cover it.

It is the general custom in private families to brew their small-beer after their ale: but they may be assured that if they have any regard to their small-beer, it is their interest to brew it alone; for the beer thus made is incomparably better, because it then contains all the flavour of the malt, is undoubtedly more wholesome, and will keep much longer.

A correspondent of the editors of the *Museum Rusticum*, vol. IV. p. 287. has given the following useful directions for making a kind of small beer, which for cheapness, agreeableness, and perhaps wholesomeness, is greatly preferable to that made from malt. It has also this further advantage, that it may be made ready for drinking in three or four days time.

The method is this: take of water fifteen gallons, and boil one half of it in any copper or pot that may be at hand. Put the part of the water thus boiled, while in it full heat, to the cold part, contained in a barrel or cask: and then add one gallon of melasses, commonly called treacle, stirring them well together. If the vessel be new, add a little yeast; but if it has been used before for the same purpose, the yeast will be unnecessary. Keep the bung-hole open for a day or two, till the fermentation appears to be abated, and then close it up. The beer will in a day or two afterwards be fit to drink.

But to return to the management of the wort. The beer-wort must be boiled, in order to free it from particles which would render the liquor muddy and ill coloured, without adding to its strength; to extract the virtue of the hops; and to render the drink fitter for keeping.

Worts, like every other sweet vegetable juice, when once brought to ferment, are so inclined to continue their fermentation, that it is difficult to retard their progress therein, to keep their preservative qualities, and so hinder them from turning acid. Among the many methods put in practice to retard this forwardness of the worts, none promised so much success as blending with them the juice of such vegetables as are not themselves easily fermented. Hops are selected for this purpose; and experience, which has proved their wholesomeness, has also demonstrated their efficacy: for their resinous parts retard the aptness of malt liquors to ferment.

ferment. By this means they keep malt-liquors sound a longer time, and by repeated and flow frettings, give an opportunity to the particles of the liquor to be more separated and comminuted, than they would otherwise be. Fermented liquors acquire hereby a greater pungency, so that, even if they did not receive an additional strength from this ingredient, hops would be the means of improving their taste.

The aromatic parts of the hops are volatile, and a small heat disengages them from the plant. To preserve these parts in the process of brewing, the hops should be put into the copper as soon as possible, and be thoroughly heated, while the heat of the wort is at the least, and the fire under the copper has no effect there. Whoever will take the trouble of seeing this performed, will be convinced that the flavour of the hops is retained; instead of being dissipated in the air, as it always is, when the wort is first suffered to boil.

In order to extract more gradually a fragrant tincture from the hops, they should be rubbed thoroughly between the hands, and then put into a bag or fine net, so loose that the wort may be easily admitted among them, and in this state they should be placed in the receiver or under-back, so that the wort may run upon them. After this gradual soaking, during which they will communicate much of their virtue to the wort, less boiling will serve, and the beer will have their full flavour.

A correspondent of the editors of the *Museum Rusticum*, vol. III. p. 64. has made some judicious remarks on the common practice of boiling the hops in the wort. He observes that the rich, fat wort, sheaths up the pores of the hop, and, as it were, embalms the leaves, so that the beer or ale-wort can extract a very small part only of the necessary quality of the hop: but when it is put into the small beer, a fluid of a thinner nature, the pores are unsheathed; so that the latter becomes too bitter, while the former has hardly any taste of the hop. To remove these inconveniences, he proposes to soak the hops previously in a pail or two of hot water, by which means the hop will impart its good qualities impartially, and both the strong and small beer obtain a grateful bitter. And with regard to the quantity of water used in soaking the hops, allowance may be made for it in the first quantity.

When the first wort is sufficiently boiled, it is conveyed into the coolers; and if the hops are not contained in a net, it must be run through a sieve or strainer, to keep them back. If the coolers have not been perfectly cleaned from the sediment of former worts, which is very apt to insinuate itself into old or decayed wood, the wort intended to be cooled in them, will, before it is removed, contract from that sediment a degree of fermentation. This accident generally happens in a little more than twelve hours after the putting in of the wort; and therefore may be easily prevented, by not letting the wort continue so long in the coolers.

When the wort is of a proper degree of coolness, the yeast is generally put into a large bowl, and a little of the wort just warm is added to it. The yeast swims at first on the surface, but soon blends itself with the wort, and begins the fermentation. As soon as this happens, the whole is mixed with the wort in the working tun.

If the fermentation should not rise properly, a little of the finest wheat-flour sifted over the wort, so as to cover the whole surface of the liquor, will, by forming a kind of artificial head, confine the air, and soon produce the effect desired. If a greater degree of warmth should be wanted, a stone jug filled with boiling water, and put into the wort, will communicate a gentle heat to the whole, and as the liquor warms, the fermentation will come on in a gradual and proper manner.

In the course of the fermentation, it may sometimes be necessary, in order to quicken it, to beat in the yeast, or rather to stir it with a wisk, which should be perfectly clean, scalded in boiling water, and then wiped dry. It will also by this means retain some degree of warmth, which will likewise help to promote the fermentation. These measures, with an additional warmth given to the air, and warm coverings laid over the working tun, seldom fail to answer the end desired.

If the fermentation proceeds too violently, owing to the warmth of the weather, or too great quantity of yeast, the best way of checking it is, to cool the air, by giving it a more free admission, and to mix a little cold wort with the fermenting liquor. The practice of add-

ing some unctuous substance is bad, and therefore should be rejected.

Care should be taken to have the casks in good order against the time that the fermentation is completed in the tub; that is, they should be tight and clean, and perfectly free from filth or smell; for if they have either of these defects, the whole labour will be lost, because the excellency and fine flavour of the liquor will be destroyed.

The perfection of malt liquors depends not only on the proportion of the oils to the salts, and on the proportion of hops used in brewing, but also on the fermentations being carried on slowly and coolly. For this reason cool weather is best for brewing of beer intended for long keeping. If therefore the liquor be not drawn off before the fermentation has proceeded too far, some of the coarser oils will return into the liquor, and give it a disagreeable and greasy taste. On the contrary, if the fermentation has not been continued its due time, the impurities which would either have sunk down in the lees, or have been thrown up with the head, will remain in the liquor, and prevent its becoming clear and well tasted.

When the fermentation is at its height, all the dirt or foul yeast, which rises on the surface, must be carefully skimmed off.

When the fermentation begins to subside after the liquor has been drawn off into the cask, the cask should be filled up with a reserve of the same liquor taken from another vessel, but by no means with that which runs over.

When the fermentation has ceased, the cask being filled up, should be bunged close down, leaving the vent-hole open, or but slightly covered, till all motion in the liquor is subsided; and after this is over, the vent-hole should be stopped quite close. The custom of using bungs made of cork is wrong. A wooden bung should be fitted to the bung-hole as exactly as possible, and covered with a clean cloth.

BRIDLE, a contrivance made of straps or thongs of leather, and pieces of iron, in order to keep a horse in subjection and obedience.

The several parts of a bridle are, the bit or snaffle, the head-stall, or leather from the top of the head to the rings of the bit; the fillet, over the forehead and under the fore-top; the throat-band, which buckles from the head-band under the throat; the nose-bands, going through the loops at the back of the head-stall, and buckled under the cheeks; the reins or long thongs of leather that come from the rings of the bit, and being cast over the horse's head, the rider holds in his hand.

BRIDLE-Hand, is the horseman's left-hand, the right being called the spear or sword hand.

BRIM, or **BRIMME**, a word applied to a sow when she goes to the boar, which is called going to brim.

BRINING of Hay-Ricks, a practice common in America, and consists in mixing salt with the hay as they stack it.

A correspondent of the editors of the *Museum Rusticum* recommends this practice greatly, declaring that hay, which has to all appearance been spoiled by the rain, will spend as well as that made and ricked in the finest weather.

"Just before I left America, says he, I had a crop of hay, which was in a manner spoiled by rain, being almost rotted in the field; yet did this hay spend as well as if it had been got in ever so favourably.

"When my servants were making up the stack, I had it managed in the following manner; as soon as the bed of hay was laid about six inches thick, I had the whole sprinkled over with salt; then another bed of hay was laid, which was again sprinkled in the same manner; and this method was followed till all the hay was stacked.

"When the season came for cutting this hay, and giving it to my cattle, I found that, so far from refusing it, they eat it with surprising appetite, always preferring it to the sweetest hay, that had not been in this manner sprinkled with salt." *Museum Rusticum*, vol. II. p. 210.

BRITE, a word applied to hops when they are over ripe or shatter, in which case they are said to brite.

BROAD-CAST sowing. See **SOWING**.

BROAD-WHEELED Wagon. See the article **WAGON**.

BROKEN-

BROKEN-WIND, a very fatal disease to which horses are too often subject.

This disorder hitherto seems to have been little understood; but Mr. Gibson is inclined to think, that the source of it is frequently owing to injudicious, or hasty feeding of young horses for sale; by which means the growth of the lungs, and all the contents within the chest, are so increased, and, in a few years, so preternaturally enlarged, that the cavity of the chest is not capacious enough for them to expand themselves, and perform their functions.

A narrow contracted chest with large lungs may sometimes naturally be the cause of this disorder; and it has been observed, that horses rising eight years old, are as liable to this distemper, as men at a certain period of life, and, fall into asthma, consumptions, and other chronic diseases.

The reason why this disorder becomes more apparent at this age may be, that a horse comes to his full strength and maturity at this time: at six commonly finishes his growth in height; after which he lets down his belly, and spreads, and all his parts are grown to their full extent; so that the pressure on the lungs and midriff is now more increased.

But how little weight soever these reasons may have, repeated dissections have given ocular proofs of a preternatural largeness, not only of the lungs of broken-winded horses, but of their heart and its bag: and also of the membrane which divides the chest; as well as of the remarkable thinness of the diaphragm or midriff.

This disproportion has been observed to be so great, that the heart and lungs have been almost of twice their natural size; perfectly sound, and without any ulceration whatever, or any defect in the windpipe or its glands.

Hence it appears, that this enormous size of the lungs, and the space they occupy, by hindering the free action of the midriff, is the chief cause of this disorder; and as the substance of the lungs was found more fleshy than usual, they must of course have lost much of their spring and tone.

This fleshiness and size of the lungs may, in a great measure, be the cause, why the inspirations in broken-winded horses are disproportionately slow; for we may observe that they draw in their breath slowly, their flanks filling up, and rising with difficulty: but that their flanks fall suddenly, and their breath bursts forth with violence, both from the mouth and nostrils; inasmuch, that a man in the dark, by holding his hands on the horse's mouth and nose, may easily discover if he is broken-winded.

Whoever considers a broken-wind in this light, must own that it may be reckoned among the incurable distempers of horses; and that all the boasted pretensions of cure are vain and frivolous, since the utmost skill can amount to no more than now and then palliating the symptoms, and mitigating their violence.

We shall therefore lay down such methods as may properly prevent this disorder, when pursued in time; but if they should not succeed, we shall offer some remedies and rules to mitigate its force, and to make a horse as useful as possible under this malady.

It is usual before a broken-wind appears, for a horse to have a dry obstinate cough, without any visible sickness or loss of appetite; but, on the contrary, a disposition to foul feeding, eating the litter, and drinking much water.

In order then to prevent, as much as possible, this disorder, bleed him, and give him two drams of calomel, mixed up with an ounce of diapente, for two nights successively, keeping him cloathed and well littered; and feeding him with scalded bran and warm water.

The following balls are then to be taken for some time, which have been found extremely efficacious in removing obstinate coughs:

Take gum ammoniacum, galbanum, and assa. foetida, of each two ounces; squills, four ounces; cinnabar of antimony, six ounces; saffron, half an ounce: make the whole into a paste with honey; and give a ball about the size of a pullet's egg every morning.

Broken-winded horses should eat sparingly of hay, which, as well as their corn, may be wetted with chamber-lye, or fair water; as this will make them less craving after water.

The volatile salts in the urine may render it preferable to water, and may be the reason why garlick is found so very efficacious in these cases; two or three cloves given at a time in a feed, or three ounces of garlick bruised, and boiled in a quart of milk and water, and given every other morning for a fortnight, having been found very serviceable;

for by warming and stimulating the solids, and dissolving the tenacious juices, which choak up the vessels of the lungs; these complaints are greatly relieved.

Careful feeding and moderate exercise have greatly relieved broken-winded horses; and though for the first summer they have not been able to endure much labour, yet many have been found less oppressed the second, and some scarce perceptibly affected the third; and even able to bear great fatigue; and could a horse be kept constantly in the field, and taken up only when used, he might, by this management, do great service for many years.

But whoever expects to cure his horse by sending him out to graze will find himself disappointed, especially if he remain abroad after the spring graze; for on his return to the stable and dry meat, he will be more oppressed and short breathed than before, for want of the open air, and the moist food he has been accustomed to.

Horses sent to graze in order to be cured of an obstinate cough, have often returned completely broken-winded, where the pasture has been rich and succulent, so that they have had their bellies constantly full. As the ill consequence therefore is obvious, where you have not the convenience of turning out your horse for a constancy, you may foil him for a month or two with young green barley, tares, or any other young herbage.

To pursue, thick-winded horses, Barbadoes and common tar have often been given with success, to the quantity of two spoonfuls mixed with the yolk of an egg, dissolved in warm ale, and given fasting two or three times a week, especially on those days you hunt or travel.

But in order to make all these sorts of horses of any real service, the grand point is to have a particular regard to their diet, observing a just œconomy both in that and their exercise; giving them but a moderate quantity of hay, corn, or water, at a time, and moistening the former to prevent their requiring too much of the latter, and never exercising them but with moderation, as has been before observed.

The following ball may be given once a fortnight or three weeks; and as it operates very gently, and requires no confinement, except the days it is given (when warm meat and water will be necessary), it may be continued for two or three months:

Take succotrine aloes, six drams; myrrh, galbanum, and ammoniacum, of each two drams; bay-berries, half an ounce; oil of amber, a spoonful: make the whole into a ball with a sufficient quantity of syrup of blackthorn. *Bartlett's Farriery, p. 68.*

A discovery has lately been made of a cure of an asthmatic or broken-winded horse, by letting him drink freely of water in which lime has been infused; and it was first discovered by an old horse, rendered useless by his cough, being restored to health by his drinking the water that had settled in an old lime kiln. An experiment was afterwards made on a horse eighteen years old that was broken-winded; when it totally removed the complaint, and rendered him serviceable.

BROODING, the act of a hen, or other bird, sitting on a number of eggs, to keep them warm till they hatch, or produce young ones.

BROOM, the name of a plant, of which two species are natives of this country, called the common and the small broom.

The common broom is the *genista trifolia* of Mr. Ray. It rises about three feet in height, with shrubby stalks, garnished with spear-like leaves, and terminated by loose spikes of yellow flowers, succeeded by short pods, which turn black when ripe, and contain four or five kidney-shaped seeds. It flowers in June or July, and the seeds ripen in autumn. The flowers of this plant are used by the dyers to give a yellow colour; whence it is called dyer's broom, green-wood, wood-waxen, or dyer's-weed.

The small English broom, called also petty-whin, is the *genista spartium trifolium minus Anglicum* of Tournefort. It rises like the former, with a shrubby stalk, but only to the height of about two feet, sending out many slender branches, which are armed with long single spikes, and garnished with very small spear-shaped leaves, placed alternately on every side of the branches. The flowers branch out without spines, short, and have five or six yellow flowers growing on a cluster at the end. They come out in April and May, and are succeeded by short turgid pods, containing four or five small kidney-shaped seeds, which ripen in July.

This sort grows naturally upon open heaths, in many parts of England.

The twigs of broom are excellent for thatching barns, &c. being very tough, and of long duration. Ropes also, and those not bad ones, are made of the stringy fibres of this plant, of which the ancients used also to make a kind of flax.

According to Mr. Bradley's calculation, an acre of broom is worth upwards of six pounds annually, for the feeding of bees only, besides the wythes and stumps, which will pay for the rent of the land. Certain it is, that no flowers are more pleasing, or more profitable to bees, than those of broom.

But considering it as a weed, it is one of the most pernicious plants that grows upon the land; for its roots penetrate deep, and at the same time it sheds no leaves, so that it is continually sucking the moisture from the earth. The best method of destroying it, is by burning the land, then ploughing it deep, and manuring it very well with dung and ashes; or by spreading on the land chalk or marle, or manuring it with urine. If the ground be designed for pasture land, it is best to cut the broom close to the ground in May, when the sap is strong in it. By this artifice the roots are destroyed; whereas in the common way of pulling up the young plants, some strings of the roots will be left, and the least of these will grow. Foddering of cattle upon broomy land is one very good way of destroying the broom, their urine killing the roots, and their treading the land makes it less proper for the roots to extend themselves; for broom is seldom seen to grow near old paths. *Bradley's Husbandry*, vol. I. p. 181. *Mortimer's Husbandry*, vol. I. p. 308. *Mills's Husbandry*, vol. III. p. 36.

BROWN, a dusky kind of colour, inclining somewhat towards redness.

A brown horse is not reckoned altogether so beautiful as the bay or chestnut. There are also degrees of this colour, some being light, and others very dark. They have almost always black manes and tails, and often their joints are black, though not so shining as the bays, but rusty. Almost all brown horses grow gradually lighter towards their bellies and flanks, and many are light about their muzzles. The most beautiful are those which happen to be finely dappled, for the plain brown are esteemed more ordinary. Many of them are coarse, but strong and serviceable, fit for draught, for burden, or for war. *Gibson on Horses*, vol. I. p. 46.

BROWSE, branches fit for the food of goats, &c.

BRUISE, a hurt caused by the force of something blunt and heavy.

Horses and other cattle are very subject to bruises from various accidents; but as the blood is no ways affected in these cases, one general method of cure is only necessary; and that is by coolers and repellers, such as white wine vinegar, old verjuice, or compositions made with allum, vitriol, and the like, which should be applied frequently to the swelling, till the heat and inflammation is abated.

BUCK-BEAN, or *marsh trefoil*, *trifolium palustre*, a plant with large oval leaves, pointed at each end like those of a garden bean, set three together on long pedicles, which embrace the stalk to some height, and there parting, leave it naked near the top, where issues a short spike of pretty large, reddish, monopetalous flowers, each of which is cut into five segments, hairy on the inside, and followed by an oval seed-vessel. It is perennial, grows wild in marshy places, and flowers in May.

Sheep, when sound and in health, always avoid eating buck-bean; but when the symptoms of the rot begin to attack them, they search for it by instinct, and devour it greedily. Where such sheep are pastured, no buck-bean is to be found, for in a week or two they devour it all. Might it not be prudent, therefore, in husbandmen, who graze large flocks, to cultivate an acre of this plant in some morassy ground, which otherwise would not yield them two shillings the acre? Some might be cut up green, for unsound sheep, and given them with lucern, as occasion requires; and some might be made into hay, and mixed with their fodder. I cannot remember that this advice has been given by any husbandry writer. *Essays in Husbandry*, Essay II. p. 137.

BUCK-WHEAT, the name of a plant generally considered as a species of corn, though not such in fact; nor does it grow like any of the esculent grains. Its leaf, from being roundish at first, takes nearly the shape of that of ivy, but longer pointed, and much softer. Its stalk is round,

hollow, and weak, sometimes reddish, but most commonly green, and growing to the height of about two feet and a half. Lateral branches, which shoot out almost at every joint, are terminated by purplish flowers, which are succeeded by small triangular seeds, black on the outside, and white within.

Buck-wheat will thrive in any soil, not excepting even barren sands, as they are commonly termed; but grows largest in dry ground which have been well ploughed. When raised for its grain, a bushel of seed is sufficient for an acre of land, which will frequently yield fifty or sixty bushels: but when it is intended for green fodder, which is the use most commonly made of it here, some people sow three or four bushels on an acre, in order to have a thick crop. The usual time of sowing it is about the beginning of May; but if it be sowed somewhat earlier, and a warm season ensues, it will bear cutting twice in the summer. It comes up soon, and ripens generally, according to M. du Hamel, in one hundred days after sowing, so that buck-wheat sown in June is reaped in September.

When mowed, it must be left in the field several days, that its stalk may dry before it is housed. There is little danger of the seeds falling out, nor is it much injured by wet. These seeds are excellent food for pigeons, poultry, hogs, rabbits, &c. and are found to make horses thrive when given among their oats; but for these they should be first cracked in a mill; being apt, otherwise, to pass through them whole. The flour of buck-wheat is very white, and makes a good sort of pancake, when mixed with a little wheat-flour. The poor in some countries make even bread of this mixture; but it is black, bitter, windy, and not nourishing. Its straw, or haum, is also given dry to cattle: but the best way is to feed it whilst green, particularly just before it blossoms. Milch cows fed with it will yield an extraordinary quantity of milk, remarkably good for making butter and cheese: and another advantage attending this pasture is, that it will continue green in the driest time of summer, when other grasses are burnt up. It is an excellent dressing for land, where ploughed in without being mowed.

The ingenious author of the *Essays in Husbandry* tells us, that in certain lands of Brabant, called Rempen, the husbandmen raise buck-wheat in small fields near home, and place round them, under the hedges, a great number of bee-hives, from whence they draw considerable profit; for no plant affords these insects a better supply of materials for making honey. *Essay I. p. 110. Mortimer's Husbandry*, vol. I. p. 136. *Du Hamel's Elements of Agriculture*, vol. I. p. 91. *Maisons Rustiques*, tom. I. p. 624.

Mr. Marshall, in his *Rural Economy of Norfolk*, says "Buck is an object of the Norfolk culture, in a two-fold light. It is propagated as grain, and as manure; and it will be proper to view it in these two lights. However, the main intention of its propagation, whether as a crop, or as a melioration of the soil, being the same, namely, the cleansing of foul land, it will be convenient to keep the two objects in nearly the same point of view.

With respect to species, there is only one; this grain having not yet, I believe, run into any varieties sufficiently striking to have distinguishing names appropriated to them.

It is sown almost indiscriminately on all species of soils; except that light poor land has the preference: indeed it is to this species of soil that buck seems most especially adapted.

It likewise succeeds every species of crop; the state of the soil, as to foulness and poverty, being generally more attended to than either the nature of the soil or the crop it bore last.

The soil-process depends upon the state of the soil, and the intention, jointly: if the soil be tolerably clean, and the buck be intended to be plowed under as a manure, it is sown on one plowing: but, in general, the ground is broken, as for barley or peas, to forward the fallow, and secure a crop.

The seed-process is the same for both intentions; excepting that, for a crop, the seed is sown first; namely, immediately after barley-seed: and that intended to be plowed under, is sown as soon afterwards as the ground is in a state fit to receive the seed. It is universally sown above-furrow. The quantity of seed six pecks to two bushels an acre.

No vegetating process takes place: the growth of buck is so rapid as to outstrip and smother almost every species of weeds; an excellency peculiar to this crop.

The method of plowing buck under, and the after management-

nagement of buck-fallows, is nearly as for wheat. The harvest process is like that of barley, as is that of its farmery and management; except that the straw being fit for litter only, and the grain being wanted for the fattening of pigs, in autumn, and the beginning of winter, it is frequently thrashed out presently after harvest, before the live stock are taken into the yards."

Mr. Young, in his *Annals of Agriculture*, vol. I. in a letter from a correspondent; "Recommends to all persons who have horses to feed, to try the efficacy of buck-wheat, mixed with bran, chaff, or grains, either in the whole or broke in a mill: it had been proved to recover a favourite old coach-horse (he is fondest of it unground) when all other sort of food failed. It is presumed, as the grass flushes cows with milk, that the flour or meal, mixed with grains, will have the same good effect, and enrich the milk. It is surely worth trying. A bushel of it, which goes farther than two bushels of oats, even with beans, mixed with at least four times as much bran, will be full feed for any horse a week, and much less hay will do. Four bushels of the meal put up at two cwt. will fatten a hog of sixteen or twenty stone in three weeks; then give him three bushels (of Indian corn, if you can get it) of hog-pease, broken in a mill, dry, with plenty of water (for as the pease are small, so they swallow and part with them whole), and you will find most delicious meat; but it must be understood, the hog so fattened, must be in pretty good order when put up; but be assured, that eight bushels of buck-wheat meal will go as far as twelve bushels of barley-meal. I write from experience.

In regard to poultry (pigeons eat it whole with great avidity) it is a vulgar error, "That it renders the hens so fat they will not lay." If there is the least foundation for such a surmise, it is because they over-feed them.

The reluctance shewn to the cultivation here in England of this valuable grain is rather wonderful, especially considering the number of treatises on the improvements of agriculture. Yet it seems a tempting inducement, if the farmer will but reflect, "That as one bushel will be very sufficient to sow an acre, which bushel only costs four shillings and three-pence, it is cheaper than a single load of dung." And the advantages produced therefrom are three-fold, viz.

- 1st. To plough it in, which mends the land.
- 2d. If a dry summer, it is fodder for the cattle.
- 3d. If you let it stand for a crop, it may produce an equal quantity with oats, and will always sell for more money; and, farther, think that an acre of oats requires four, even to five, bushels, to sow it; whereas one bushel of buck-wheat will sow an acre. This plant ameliorates the soil so much that the farmer may have any crop after it, especially wheat, in which system it is commonly cultivated about Norwich. Now it must surely be apparent at the first blush, what a prodigious advantage it would be for the farmer to feed his teams by a crop which improves his ground and prepares for wheat, rather than by another which exhausts it, and throws him so much the further from the golden grain."

BUD, that part of the seed which first begins to sprout, or rather the leaves which first appear.

BUD also signifies the sprout from whence the branch arises. These buds in some measure resemble seeds, as under a number of scaly coverings the rudiments of the young branch are seen: but neither the lobes nor the young root are met with; because this tender stem is connected with a tree, which supplies it with the necessary food.

BUD is likewise used in some counties in England for a weaned calf of the first year; because the horns are then in the bud.

BUGLE, *Middle compound, Sicklewort, or Herb Carpenter*, the name of a low weed, with two kinds of stalks; round creeping ones, which strike root at the joint; and upright square ones, hairy on two of the opposite sides, alternately, from joint to joint, bearing loose spikes of blue labiated flowers, of which the upper lip is wanting: the leaves are somewhat oval, soft, slightly cut about the edges, and set in pairs at the joints. It is a perennial weed, infesting moist meadows and pasture-grounds, and flowers in May.

BUGLOSS, or *Viper's Bugloss*, the name of a plant whose stalks are rough, round, solid, erect, undivided, and marked with black spots: the leaves are very rough, long, narrowing to a point, and placed without any certain order. The flowers are large and spacious, of a beautiful blue co-

lour, and grow in long bending spikes. They consist of one petal divided into five roundish segments, of different sizes, and resemble a horn in their figure, expanding by degrees, from a narrow beginning. The flower cup consists of five narrow segments, and contains four rough seeds.

Bees are very fond of the viper's bugloss, and there is reason to think that this plant, assisted by the culture of a skilful gardener, may receive, perhaps, as many improvements as the auricula did. Its branches will rise to the height of three feet, and no vegetable would better adorn flower-pots in large chimnies: for if the water be changed, it continues blowing near a fortnight after cutting. Its ultramarine blue-colour, is the finest that can be seen, and the stalks are garnished with flowers from top to bottom; dyers might, perhaps, extract an useful tincture from the roots. This plant grows wild in hard brashy soils. *Essays in Husbandry. Essay I. p. 110.*

BULL, the males of the ox kind. See the article OX, and CATTLE.

The bull, kept for propagating the species, should have a quick countenance, his forehead broad and curled, his eyes black and large, his horns large, short, and black, his neck fleshy, his belly long and large, his hair smooth like velvet, his breast big, his back straight and flat, his buttocks square, his thighs round, his legs straight, and his joints short; this sort of bull is the best for breed, and makes the best ox for draught. *Mortimer's Husbandry, vol. I. p. 226.*

The bull chiefly serves for propagation; and though he may be subject to the yoke, yet there is no being certain of his working quietly; and the use he may make of his prodigious strength, is constantly to be guarded against. This creature is naturally untractable, stubborn, and fierce; and in the bulling season, absolutely uncontrollable, and often furious; but, by castration, the source of these turbulent impulses is destroyed, without the least diminution of his strength. He also grows larger, more heavy and unwieldy, and becomes more adapted to the labour for which he is designed. This operation also renders him more tractable, patient, docile, and less troublesome to others. A herd of bulls could not be either tamed or managed by human skill. *Buffon's Histoire Naturelle, tom. IV.*

BULLEN, hemp stalks stripped from the bark.

BULLOCK. See CATTLE.

BULLOCK-STALLS, or SHEDS. Mr. Marshall, in his *Rural Economy of Norfolk*, gives the description of a bullock-stall as follows: "It consists of a center building, thirty-six feet long, nineteen feet wide, and about eleven feet high to the eaves; with a pair of wide folding-doors at each end; and with a lean-to on each side, the whole length of the building, and eleven feet wide.

The center building is the turnep-house; the lean-to's, sheds for the bullocks; which stand with their heads toward, or rather in, the turnep-house; from which they are parted by a range of mangers only; having the full freedom of breathing in its spacious area. By opening the doors at each end, a sufficient degree of air and coolness may be given in the close stweather; while, behind, the eaves of the sheds are brought down to within five feet of the ground, and are boarded with rough boards (excepting an opening at each end for the bullocks to creep in at) to prevent too great a coldness in severe weather; thus preserving a due temperature.

This shed holds twenty bullocks, ten on each side, fastened by the neck, with chains, swivels and rings, playing freely upon posts, seven feet high. At each corner of the turnep-house is a triangular bin for the topped-and-tailed turneps.

In autumn, the entire building is sometimes used as a temporary barn, for buck, peas, &c. and in summer, the center part is an excellent waggon-shed: had the doors been made a foot and a half higher, it would have been an admirable refuge for loads of corn or hay in a showery harvest.

The main building is covered with reed, the lean-to's with tiles."

Mr. Marshall, in his *Rural Economy of Gloucestershire*, says; "What characterizes the bullock-sheds in that vale, and distinguishes them from those of every other, he observed, is the circumstance of each bullock having a house and a yard to himself; in which he goes loose; occupying them by turns, as appetite or amusement directs him: having a manger and a drinking trough to go to at pleasure. He, of course, eats when he is hungry, and drinks when he is thirsty. He is also at liberty to rub, or to lick himself: as well as to keep his body in a degree of temperature,

as to heat and cold. Theory could not readily suggest more rational principles.

The construction of these stalls varies in the minutiae. The water trough, for instance, is sometimes placed by the manger, in the hovel or shed: sometimes in the open pen. Other less noticeable variations may be seen in different buildings.

The plan and dimensions, which, at present, seem to stand highest in esteem; and on which several erections of this nature have been made within the last fifteen or twenty years; are the following.

The building fifteen to fifteen feet and a half wide within, and of a length proportioned to the number of stalls required. The height of the plates six feet to six feet four inches; supported on the side to the north or east by close walling; on that to the south or west by posts, set on stone pedestals. The gables walling. The covering plain tiles, on a single pitch-roof.

Against the back wall is a gangway, three and a half to four feet wide, formed by a length of mangers, three feet to three and a half feet wide, from out to out, at the top; narrowing to about fifteen inches within, at the bottom. The perpendicular depth fourteen or fifteen inches; the height of the top rail from the ground, about two feet nine inches. The materials two-inch plank; stayed and supported by posts and cross pieces; and stiffened by strong top-rails.

The dimensions of the area of the covered stalls, about eight feet three inches square; of the open pens, the same.

The partitions between the stalls are of broad rails, passing from the outer pillars to similar posts, rising on the inner or stall side of the manger; and steadied at the top by slender beams, reaching across the building; each stall, or each partition, having a beam and a pair of principals.

The partitions of the pens are gates, reaching from the pillars to the boundary wall; and likewise from pillar to pillar. When they are fixed in that situation, each bullock has his stall and his little yard. When in this each is shut up in his stall, the yards forming a lane, or driftway, for taking in, or turning out any individual.

The boundary wall of the pens is about four feet high, coped with blocks of copper-dross. On the outer side of it is a receptacle for manure: on the inner a range of water troughs, with a channel of communication for the convenience of filling them. The materials of the troughs, stone; of the channel, gutter-bricks, covered with slabs. These stone troughs, which are about fourteen inches by two feet six inches within, have a convenience in their construction, which is entitled to notice: instead of the sides and the ends being all of them pecked down to an angle, square with the bottom, one of the ends is left bevelling, sloping, making a very obtuse angle with the bottom. This simple variation renders them easy to be cleaned; either with the shovel, or the broom.

The floor is paved with hard-burnt bricks, laid edge-way in mortar; being formed with a steep descent from the wall to a channel, from three to four feet from it; and with a gentle fall from the manger to the same channel; which becomes the general drain for rain-water and urine.

At one end of the pens is a pump (where a natural rill cannot be had; for supplying the troughs of water; and, at the other, a stack of stubble for litter; which is used in the stall only; the yard being left unlitteed.

At one end of the building is a cake-house, at the other, the rick-yard; with a door at each end of the gangway to receive the hay and the cake.

In one or more instances, Mr. Marshall had seen a double range of stalls on this plan; the area between them being the common receptacle for the dung. When a number of stalls, as twenty or thirty, are required, this arrangement brings them within a convenient compass; and the two ranges, with a proper aspect, become shelter to each other.

Beside these loose stalls, there are others, built nearly on the same plan, but without gates, and on a somewhat smaller scale, in which the cattle are fastened to the manger, or the partition posts, with a long chain, which gives them liberty to rub and lick themselves, and move about in their stalls. In this case, a water-trough is generally placed at the end of every second partition, level with the manger, with a general pipe of communication to fill them; each trough supplying two bullocks. This plan lessens the expence in some degree, and prevents the bullocks from fouling their mangers.

There are individuals in the district, who have fifty, or more, of one or the other of these stalls, on their respective premises.

In the Cotswold Hills, Mr. Marshall says, each bullock has a trough; a small one for corn: a large one for hay; with a water trough, which runs the whole length of the shed, and is covered by a board; each bullock having a hole to drink at." See STALL-FEEDING.

BULLS-FOOT, the same with colts-foot. See COLTS-FOOT.

BULLWEED, *Great Knapweed*, or *Matfellow*, the name of a perennial weed common among corn; it rises to about two feet high; the stalks are round, streaked and hoary: the bottom leaves are oblong and undivided, but those which grow on the stalk are cut and divided. The flowers resemble those of the blue-bottle in shape, but are of a red colour. The seed is small, oblong, reddish, and hairy in the upper part.

BUNS, the stalks of hemp after the bark is taken off.

BURN-BAKING, or *Burn-beating*, often called *Devonshire*, or *Devonshire*, for its being long practised in that county, a method of cutting up the turf, and after drying and burning it, the ashes are spread over the surface by way of manure.

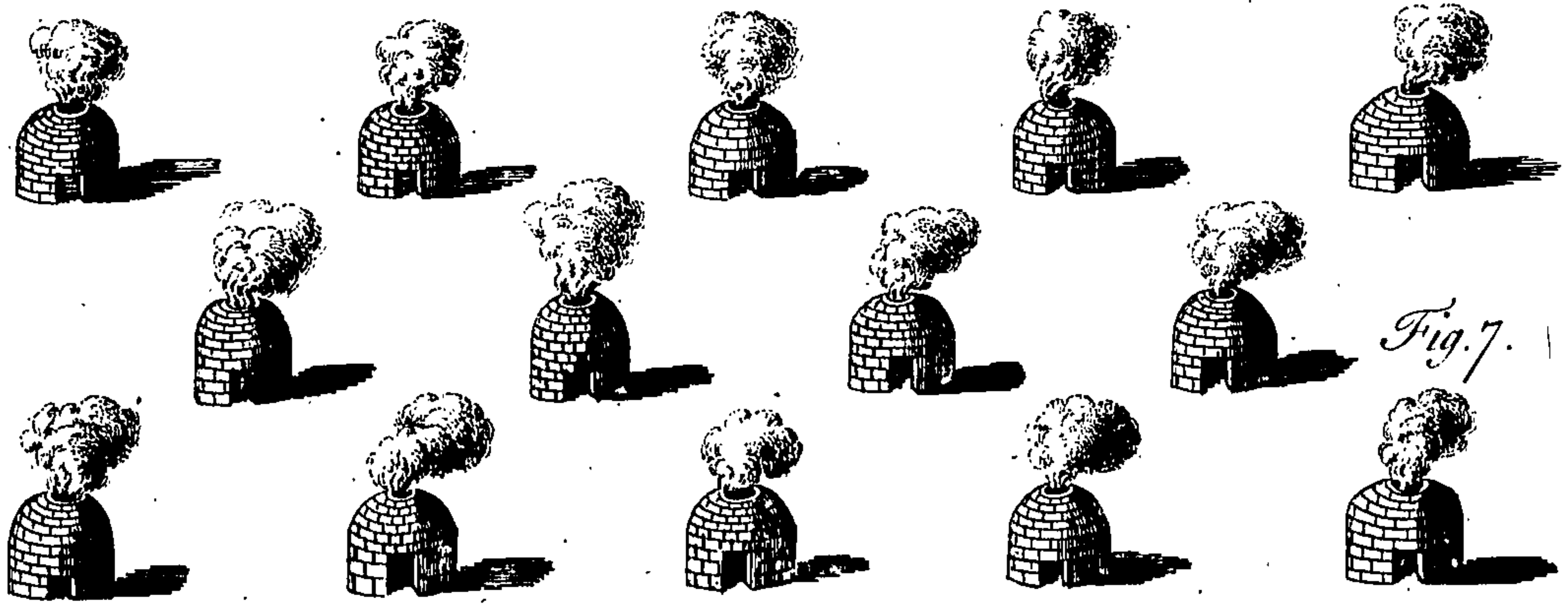
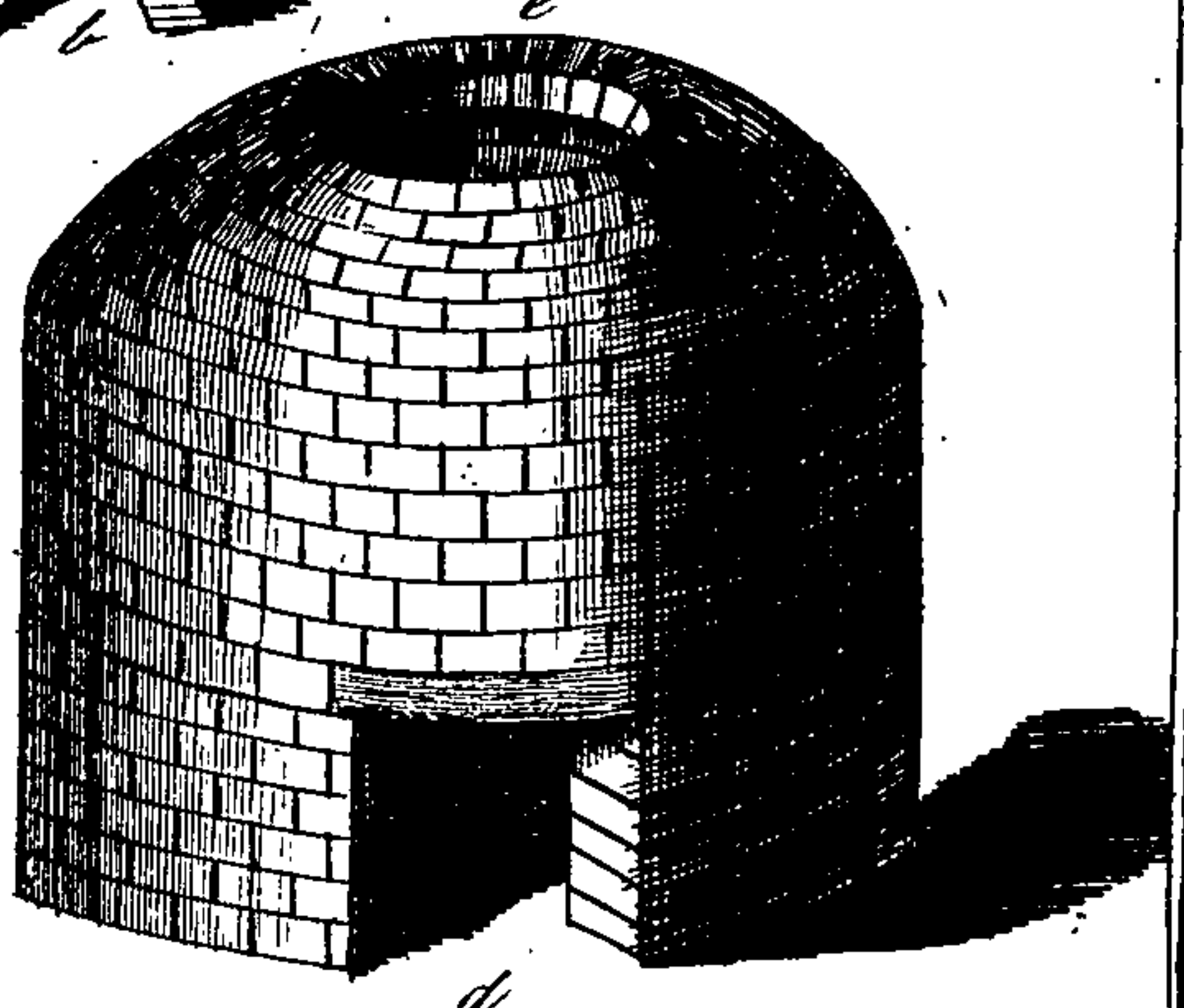
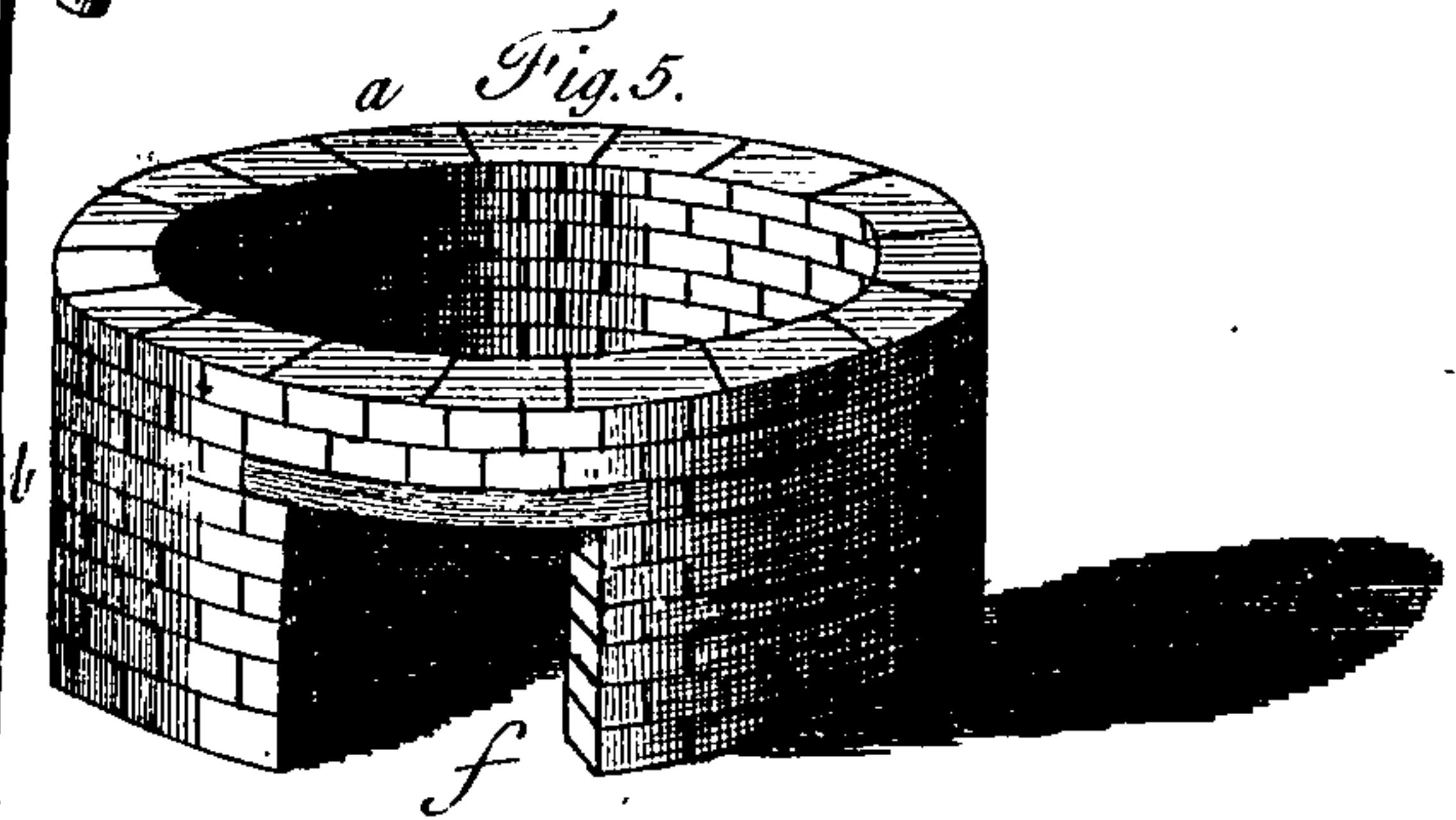
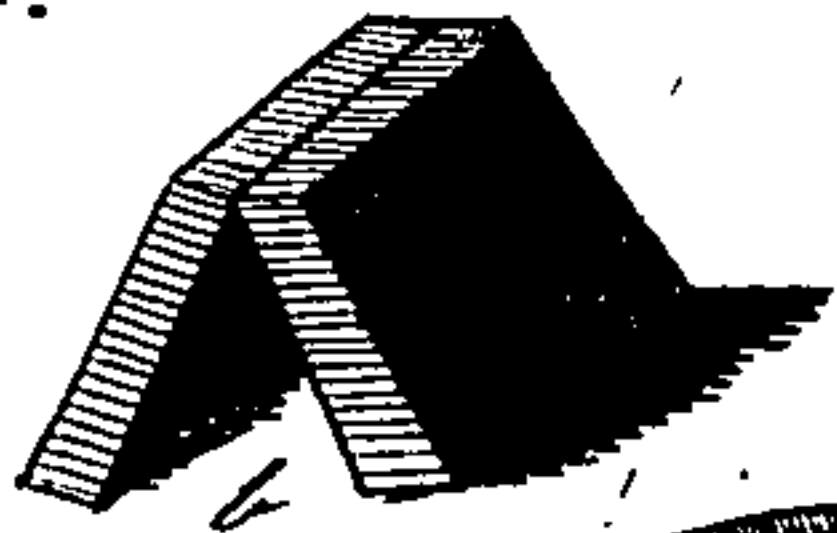
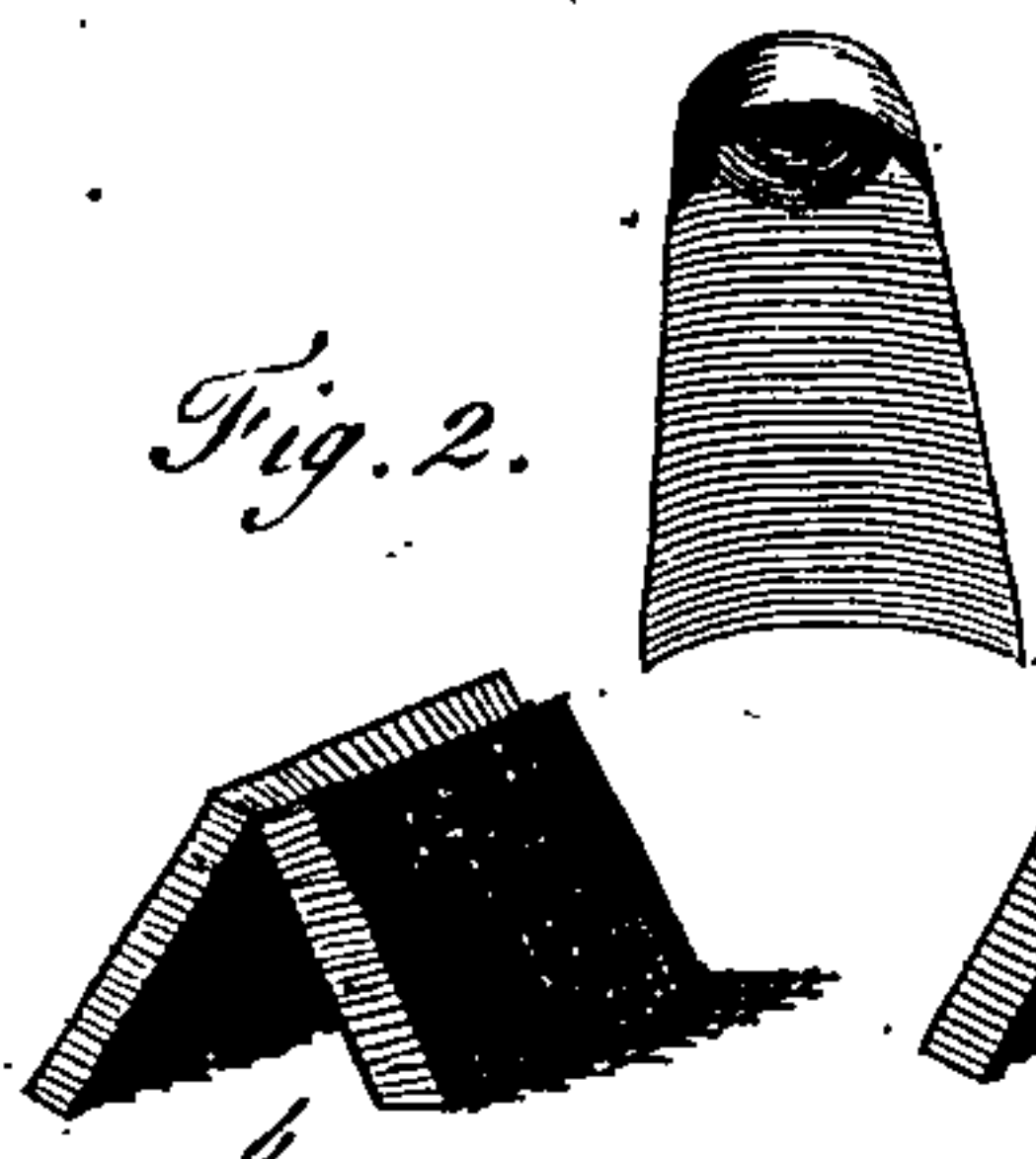
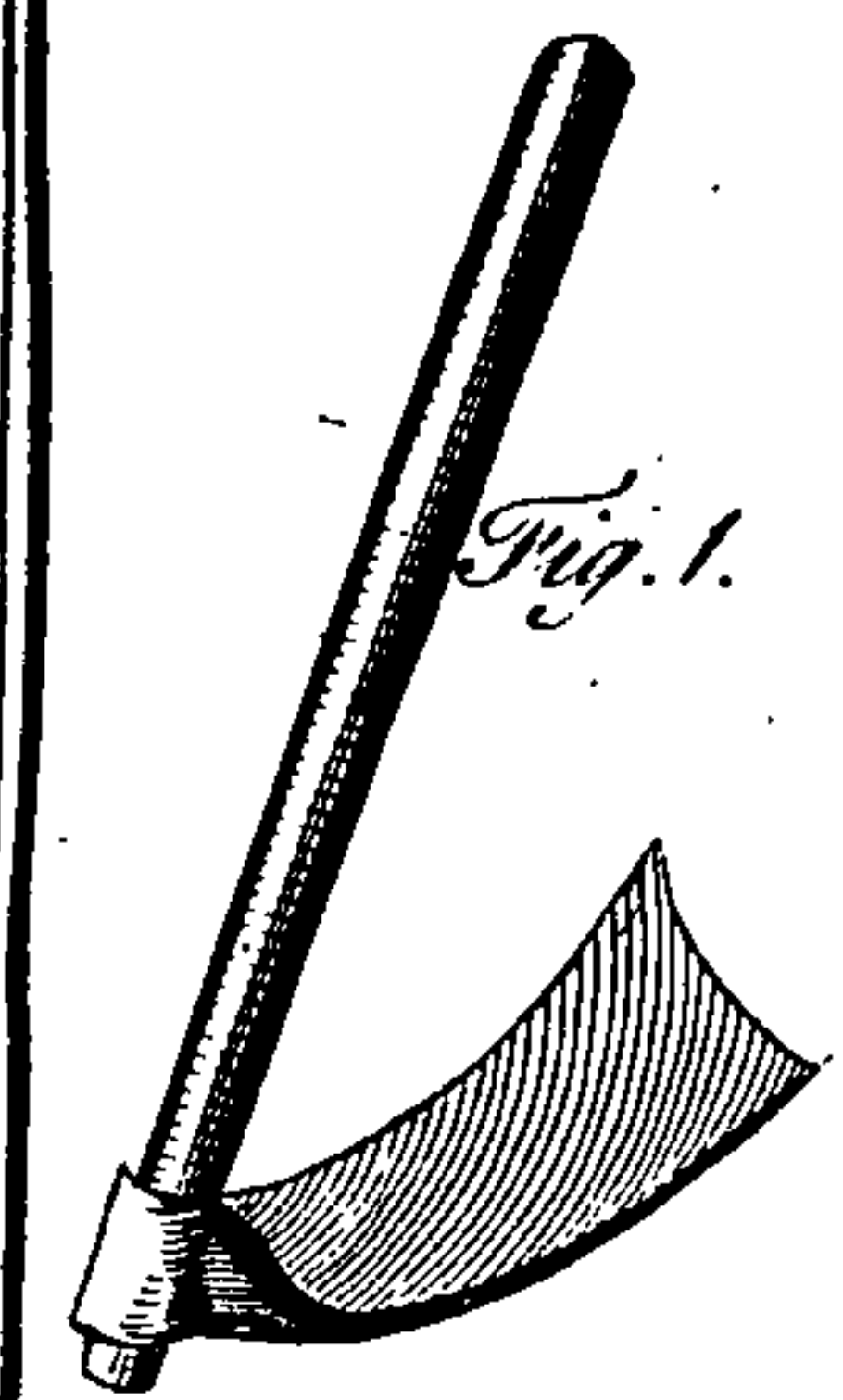
This method of improving land is very ancient. Virgil mentions it; and it has been practised time out of mind in Cornwall and Devonshire. The marquis of Tourbilly has founded his famous treatise *Sur les Défrichemens*, published in 1761, principally on the art of burn-baking. We shall here give the substance of what the marquis has delivered on that interesting subject.

When it is intended to break up any piece of waste-ground, the nature of it should be first considered, and may, in a great measure, be known from its natural produce, which is generally heath, rushes, fern, broom, furze, brambles, &c. intermixed with grass: for, from the height, thickness, and vigour of this wild growth, a proper judgment may be formed with regard to the degree of the goodness of the soil, and what may reasonably be expected from it.

When such ground is to be broken up, it will be right to begin in the winter in order to get rid of the three principal obstacles, namely, water, stones, and such large roots as the paring mattock, or beating axe, as it is called in the west of England, may not be strong enough to cut. Afterwards, about the middle of March, the paring of this ground should be begun, by a number of labourers proportioned to the extent of the land intended to be pared.

Every one of these labourers must be provided with a paring-mattock, or beating-axe, the form of which is represented on Plate II. fig. 1. Towards the edge, where it is sharpened like an addice, it should be made of well tempered steel, and about nine inches wide. From thence the iron part, which should be six inches in length, lessens in breadth towards the handle, as in fig. 2. where it is reduced to three inches. All the upper part must be made of the best iron, and should be formed somewhat hollow, with a little bending inward. It should be strongest in the middle, and of a thickness proportioned to its size, as well as to the work for which it is intended. The hole to receive the handle should be two inches in diameter, and the handle should be of wood, about three feet long, or a few inches more or less, according to the height of the man who uses it. This instrument, exclusive of the handle, should weigh from ten to twelve pounds, according to the strength of the labourer; as less weight would not be sufficient for the purpose.

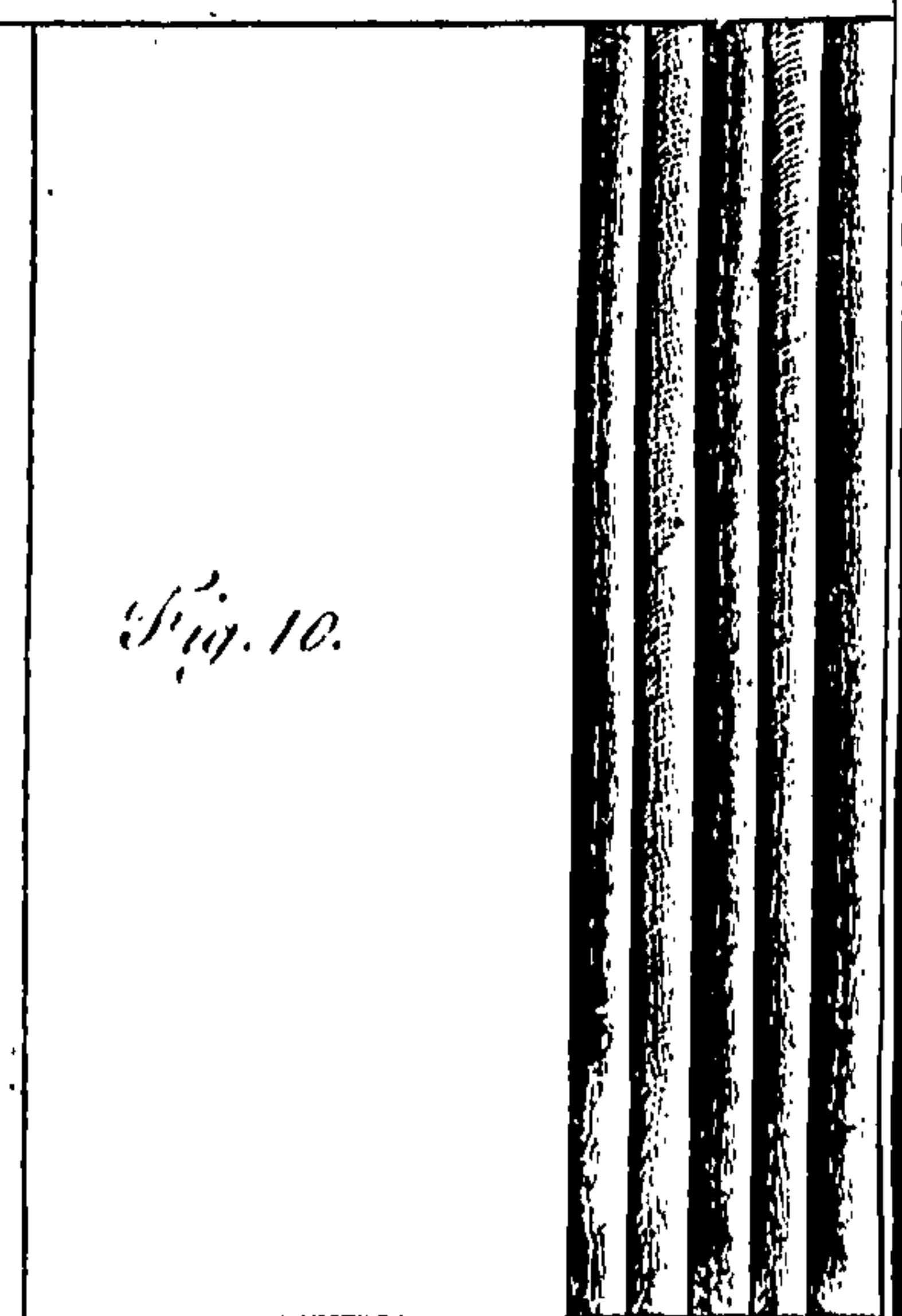
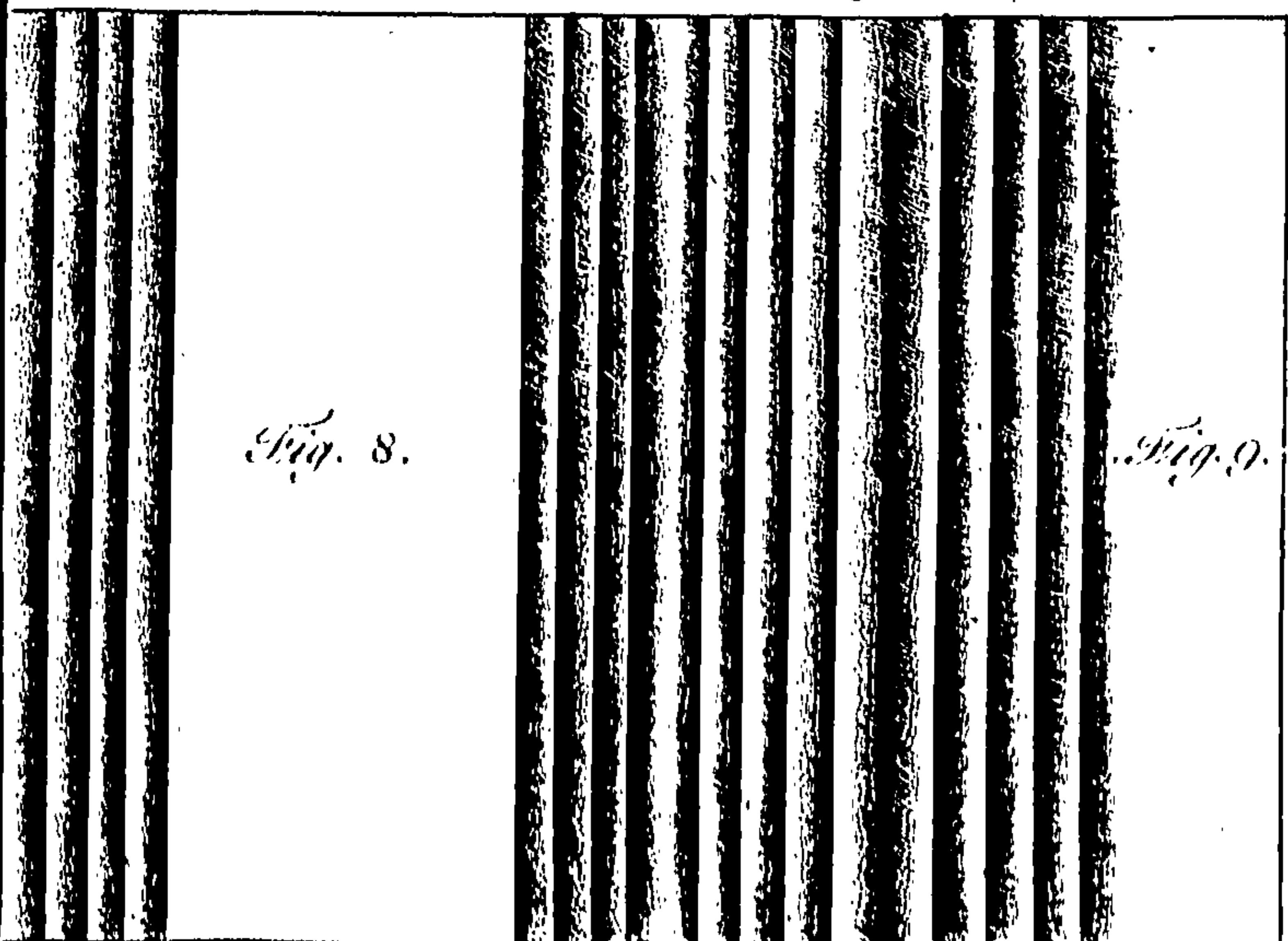
The stoutest and most intelligent labourer must be then singled out to lead the rest; for they cannot work in a row as when they dig. This leader standing in a proper posture to manage his beating-axe, must give two strokes with it, cutting into the soil, to the right, two more strokes to the left; and afterwards a fourth straight before him; by which means he will immediately raise a turf about a foot and a half long, a foot broad, and four inches thick of earth. This turf resting upon the axe as it was cut, is then, with one motion, to be placed on the labourer's right-hand, in its natural position, with the mould side downwards. (See Plate II. fig. 3. where *a, a, a*, are three tusks as cut from the soil.) All the wild growth upon his land, will, if not very large, come off with the turfs thus cut; and the more there is of it, the better it will be. The turf must absolutely be cut with a depth of at least four inches of soil; for if the ground be pared to a less thickness, the work will be badly



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badly done; because the beating-axe will not have gone under the netted roots of all the rubbish growing on the surface, which it is indispensably necessary to destroy: otherwise these roots will make fresh shoots, injure the corn, and in time choak it entirely, as has happened to me in the beginning of my undertakings.

The workmen, especially if they undertake the work by the acre, would be glad to take this turf off as thin as possible; because that would save them a great deal of time and labour. But I have experienced to my cost the imprudence of making such bargains. They must therefore be well watched; for otherwise, besides the inconvenience of not effectually destroying the wild, such thin turf would not yield a sufficient quantity of ashes for manuring the land. The business will indeed go on slower, but practice will soon render the workmen more expert.

Their leader having cut a turf, and placed it on his right-hand side, must then advance a small step, and take off another of the same size and thickness, which he must also place on the same side, in a line with the former, on the further end of which the nearest end of this should rest, so as to incline a little. He is then to proceed straight on, laying all the turfs in the same manner. As soon as he has taken up the two first turfs, the second labourer, standing on his left hand side, is to take up his line of turfs in the same manner, and place them on his right, in the void space cleared by the leader. As these advance, each of the other labourers, successively one after the other, must put himself on the left of the proceeding, at the same distance, and do the same work, following each other like reapers. Thus, if the first began at B (Plate II. fig. 10.) he lays his turfs along the line which terminates the plate; and when he has cut two turfs, the second begins at C, and lays his turfs in the space BA, cleared by the first. The third follows the second in the same manner, clearing the space FE, and laying his turfs in the space CD, cleared by the second. The fourth clears the space GH, and the fifth JK, and so on. The same must also be understood of fig. 8, and 9, which therefore require no further explanation.

When the labourers come to the end of the ground, which will likewise be in progressive order, the leader must return to the side where he first began, and resume his work close to the space already pared, the others are to follow in their regular turns, and repeat the same operation as before; for this work must always be performed in the same direction, and not backwards and forwards. Such should be the method till the whole ground is pared.

If, as it sometimes happens, there be reason to apprehend that the fods will not dry fast enough when only laid a little slanting, with the end of one just resting upon the extremity of another; they may in this case be piled, as fast as they are cut, in little heaps of three, four, or five together, according to their thickness, and the quantity of combustible or vegetable matter contained in them. The air passing between these fods, which are always laid with the heath or turfy side uppermost, penetrates and soon dries them, especially if the weather be sultry: but at the same time it would be wrong to wait till they are quite dry, because they would then burn too much, and too fast; in which case their ashes are neither so good, nor in so great quantity, as those of turf more slowly burnt. A just medium, which practice will easily teach, is to be observed in this respect.

Sometimes these turfs are set upon their ends, two and two meeting at the top, and being further asunder at the bottom, like the roof of a house, with their heathy sides outwards, as represented at *b, b, b*, (Plate II. fig. 4.) but this method, which lengthens the work, and therefore renders it more expensive, is fittest for the turfs of bogs or marshes, when cut too wet.

With respect to the roots, which I said must be got rid of before any land can be properly broken up, I meant only such large roots as the beating-axe cannot cut through, though sharpened with a whet-stone from time to time, when its edge is either turned or blunted. For with regard to the roots of smaller size, such as those of the dwarf furze, the common heath and young fern, small holly, young plants of thorns and junipers, brambles, broom, and other wild productions, which have not attained too great strength, will, without much difficulty, be cut and pared off with the turf.

But the strong roots of shrubs, bushes, &c. which the beating-axe cannot sever, must remain in the ground, though that will not hinder our taking off the turf between them to a proper thickness. The fods thus cut will indeed be often

very irregular in length and breadth; but they are the better for burning, as they contain a greater proportion of vegetable matter.

It has been already observed, that these turfs should be laid in little heaps as they are cut; these should be placed in the intermediate spaces, where the ground has been placed between the roots yet remaining in the earth. These roots should be grubbed up with a spade, pickaxe, &c. without disordering the little piles of fods. It will be sufficient if this work be finished before the time of sowing. See the article GRUBBING.

Some grub up these roots before they burn the turf, and others after, as best suits their convenience: but in the latter case they should certainly be taken up in those places where the furnaces are to be made, because it is of great importance not to stir the heaps of ashes produced by them, till the very instant of sowing. The holes also made by pulling up large roots, shrubs, &c. should be filled up so as to render the surface even. In countries where wood is scarce, these roots, stumps, &c. are carried away, and dried for fuel, especially for the kitchen; by which means they frequently repay at least the expence of grubbing them up. But in places where wood is of so little value as to render these not worth the carrying off, the best way is to burn them with the turf, the ashes of which they will both increase and improve.

The thicker any land is covered with these wild productions, the better it will prove. If it costs more than another parcel of ground to break up, and bring it into order, it will, in return, make ample amends, by producing greater crops.

When the season is not too wet, the turfs will generally dry sufficiently in about three weeks, even without being turned; but in rainy years they require a longer time, and must be turned again and again, to prevent their striking out new roots and shoots, which would hinder them from burning, as I have seen happen. Hence it appears, that this method of clearing and breaking up ground requires a longer time, and is attended with more labour and difficulty in rainy than in dry seasons. But as the turfs may be turned by women and children, the additional expence will not be very considerable.

About Midsummer, or a few days before, when the turfs are sufficiently dry, a number of women and children should be employed, in fine clear weather, to gather them all up; some with iron forks, others with their hands, and pile them up from space to space, in round heaps about ten feet high, and of the same width at bottom, almost in the shape of charcoal furnaces. The heathy side of the turf must be placed downwards, and the earthy side upwards. A small hollow should be left in the inside, in order to form a kind of chimney, the opening of which should face the wind. *a b* Plate II. fig. 5. represents a furnace of this kind partly built, where *f* is the door, or opening into the chimney of the furnace. Fig. 6. is a furnace completed, where *e* is the top of the chimney, and *d* the door. Fig. 7. represents a great number of these furnaces on fire.

It has been already observed, that this work must not be set about in rainy weather; because if the heaps of turf should unfortunately be so much wet as to imbibe the water, they would not burn, but must be pulled down and spread anew, to dry as before. They might also, in this case, require very frequent turnings, as has happened to me; which would retard the operation, and increase the expence: besides which, it might not even be possible, by frequent turnings, to dry them sufficiently, before autumn, if the rains were frequent, which must occasion a very considerable loss.

However, this last accident, though possible is very rare. It never befel me; and by inquiring of those to whom it has happened, I found that it was, in a great measure, owing to their own negligence. The best method to avoid these inconveniences is, to embrace the advantage of the first fine weather, and if it appears at all uncertain, to set more hands to work, without aiming at an ill-timed saving: for it is upon the due piling up and burning of the turfs, after being properly cut and dried, that the whole success of this important branch of husbandry chiefly depends. It cannot therefore be done too speedily. When rain is apprehended, every other business should be left for this, and all hands, men, women, and children, should be instantly employed, to dispatch it as soon as possible. Nothing requires greater diligence. The heaps should be set on fire the moment they are finished, or at least, though the weather should

seem settled, before the husbandman retires in the evening. Children may do this, by putting a little lighted straw or heath, with an iron fork, into the chimnies of the furnaces. The dry heath, grass, and roots will catch instantly, and in a few moments the fire will be so violent, as scarcely to be approached. It may then be left, after taking proper precautions to prevent its extending further than it ought: especially if it be near any wood, hedge, or heath, where it might otherwise do great mischief.

The misfortunes occasioned by fire have been so numerous and dreadful, that too much care cannot be taken to guard against them. If the situation of the land, which is to be burned be such as gives the least room to fear any danger of this kind, the furnaces should only be lighted in calm weather; lest the wind should spread the flames to neighbouring grounds, where it might be impossible to stop them till they had done irreparable damage.

If it be surrounded on all sides with woods, heath, or other vegetables easily set on fire, a row of furnaces should, in this case, be made around the land to be burned, at the distance of twenty-five, or thirty feet from the neighbouring grounds, and at least ten feet from the other furnaces, which are afterwards to be built farther within this inclosure. Care should then be taken to observe from which side the wind comes, and fire should be set to those furnaces that are situated farthest from the wind, or nearest to that side on which the wind blows. A number of men should watch these furnaces while they burn, and shovel up earth upon them, if they are so full of heath or combustible matter as to occasion too violent a flame.

The throwing on of this earth will deaden the flames, and concentrate the fire; by which means the furnaces will be consumed by slow degrees, without hurting either the outward borders of the pared land, or its inner parts, where this fire might do mischief two ways; first by spreading to, and burning the yet unpiled turfs, the ashes of which would soon lose their virtue, if scattered upon the soil in this loose manner; and secondly, by catching the other furnaces, in case they should be already made; by which means the fire would soon become so great, that it would not be longer possible to stop its progress, or prevent its extending to the neighbouring grounds.

When the first row of furnaces is thus consumed, the next row may be burnt in the same manner, and so on till the whole is finished.

The morning is doubtless the most proper time for lighting all these furnaces, because the people employed in business have then the whole day before them, to watch the fire and prevent accidents, which it might be difficult to remedy in the night, particularly during the first violence of the flames. A number of proper persons proportioned to the extent of the ground, should remain upon the spot all night, as well to attend the burning of the turf, as to hinder wicked wretches from setting fire to other places, of which there have been too many instances.

By not neglecting any of these precautions, though all of them are not necessary where the fire cannot spread to adjacent grounds, every inconvenience may certainly be avoided.

If it should be found necessary to light the furnaces in the evening, though as I have just observed, the morning is a much fitter time for it, they must be suffered to continue burning till the next day, when the violence of the fire will be abated. A few men, or even women and children, should be then sent in among the heaps, with iron forks, to give them a little stirring, and lay upon them the turf which may have fallen down. These furnaces will still continue burning for some days, during which the turfs will be slowly consumed or calcined. If any of them should be situated on wet spots, where they will not burn, these women and children must mend them, and add fresh fuel, such as dry heath, stubble, or even a little dry wood, with some of the burning turfs from the adjacent furnaces. As soon as the fire is extinguished in all the heaps, which will be then reduced to heaps of ashes, finer or coarser in proportion to the goodness of the soil, the women and children must shovel them up into little round heaps, lest they should lose their fertilizing quality, if left in the manner they fell in their burning: for all our treasures consist in the salts contained in these little heaps, and the volatile parts of those salts, which are much the best, would soon fly off, if exposed to the air. The dews at night, and the first rain which falls upon these heaps of ashes, form on their surface a crust, which hinders their being blown away by the wind, renders them impenetrable to the action of the air, and keeps in all their vir-

tue: the sooner therefore rain falls after this operation, the better. Nor would it be any injury if it should rain as soon as the furnaces are thoroughly lighted, unless it should be very violent indeed, and of long continuance, which rarely happens at this season.

When the ashes are thus laid up in little heaps, nothing more remains to be done to this ground till the time of sowing; care indeed must be taken, that neither men nor cattle approach them and break their crust. The land will from hence be freed from seeds of weeds, and other wild productions, as well as from all worms, insects, reptiles, and venomous creatures; the action of the fire of the furnaces being so strong, that it heats not only the earth, beneath them, to the depth of several inches, but likewise all the intermediate soil.

A fortnight after the usual seed-time of the country, for wheat and rye, will be early enough to sow this burnt ground. When that is to be done, a number of women and children should be sent into the field, on a still, calm day, with wooden shovels, to spread the ashes equally over all the ground, excepting the spots where the furnaces were; for these are so thoroughly burnt, that they want no farther manure, and are always observed to produce the finest corn. Some of these women and children should also carry iron forks, to break and spread such turfs as may not have been thoroughly consumed; for these having been baked or calcined by the action of the fire, will be very beneficial to the land.

Immediately after the ashes are spread, the corn, whether wheat or rye, should be sown over those ashes by a skilful sower, in not more than about half the quantity generally used for a similar extent of other ground. The ploughman should follow the sower, with his team, either of horses or oxen, yoked, to a strong plough, having two fins to the share. *See the article PLOUGH.* He should not, however, cut too deep this first year, but make only shallow furrows, going and returning, to cover the seed. Women and children, with hoes and iron forks, should then be employed to break carefully all the clods, together with every remaining bit of turf; and finally to close the tops of the ridges, which the plough cannot do with the necessary exactness in this ploughing. If several ploughs work at the same time, as is generally the case with many, the number of women and children must be increased in proportion, and there must be a sower before each plough.

It is very difficult to sow these lands with half the quantity of seed generally used in other places. The most dexterous are apt to mistake, and I have experienced the bad effect of employing only one sower for several ploughs. A man who goes before each of them will sow much more equally: nor need he even lose any of his time, because when he is not employed in sowing, he may help the women and children to break the clods. The ploughman should always proceed slowly and cautiously in this first tillage, especially if the ground seems never to have been ploughed before. If his plough should chance to be stopped by any stones or roots, which may have escaped the endeavours used to discover them by means of the borer (which should be always had recourse to as soon as the surface of the ground is cleared) the other men within call, or even the women and children, must immediately take them up with crows, and pick-axes, and carry them out of the field.

Care must also be taken not to spread the ashes out of the heaps over more ground than can be sown in the same day and the next morning, that they may not be unnecessarily exposed to the hazard of losing their efficacy: but if it should begin to rain, or the succeeding day be a Sunday, no more ashes should be spread than can be sowed and ploughed immediately. These two circumstances excepted, it will be right to spread over night what is to be ploughed in next morning; for I have experienced, that the little nipping frosts in this advanced season, will often be strong enough to freeze the ashes and bits of turf not thoroughly consumed, so as to render them unfit for spreading, till the sun has thawed them; by which means a morning's work might, without this precaution, be lost.

When the seed is sown and covered, drains should be cut with the same plough, either directly across the furrows, or in an oblique direction to them, according as the declivity of the ground may require, in such manner that they may empty themselves into the main surrounding ditches, to carry off the water, especially in the winter. Some of the men employed in breaking the clods

clods will easily deepen these drains, to whatever degree you may think proper, with an instrument shaped like a hoe, with a strong flat iron spike, about fifteen or sixteen inches long, on each side of it. This instrument is very useful, and even necessary, upon several occasions; nor is there any better for stirring the ground. It will likewise serve to complete the breaking up of such parts of the spots where the furnaces stood, as may not have been sufficiently cut by the plough; and to finish the imperfect ends of the furrows, next the head lands, where the plough could not reach, and where the grain would be otherwise exposed to the air and birds.

Though the spirit and warmth of the salts contained in the ashes, will soon render this corn more forward than any other; yet as there will not be among it either grass, weeds, or wild productions of any kind, the seeds of all these having been destroyed by the action of the fire, it will appear thin during part of the winter: but on the approach of spring, it will shoot up, spread, and tiller, so as often to become too thick at last. It always ripens about a fortnight sooner than any other corn in the country; and the finest, as already observed, is constantly found on the spots where the furnaces were erected; the effect of the fire having been greater, and penetrated deeper in those than in any other places.

As all our riches, as before observed, consist in the ashes, the more there is of them, the more the ground thus broken up will be fertilized. But all kinds of soil do not afford an equal quantity of ashes when burnt; for though the burning be performed with ever so much care, repeated experience for some time past has taught me, that only some of the earth and stones, according to their quality, are reduced into lime, or calcined, by the operation of the fire, and that other parts of them will run into glass. The soils that calcine most are undoubtedly best, and yield the largest produce of ashes; while those, on the contrary, which burn to a glassy substance, are the worst, and give the fewest ashes. Of this kind is sand; and indeed, we may judge with certainty of any soil intended to be improved by burn-baking, by previously making trials on different parts of it. If the owner cannot go thither himself, he may order some of the turfs cut with a depth of four or five inches of earth, to be brought to him, in order to their being dried and burnt. He may also have, in the same manner, in bags of paper, properly numbered, samples of the soil, or of the stones underneath, at every six inches for the surface, to the depth of eight or ten feet. These samples may be easily procured by means of the borer, already described under that article.

If the person who makes these trials be not provided with a borer, holes may be dug. They will not cost much, and he will be thereby enabled to judge what grain, trees, or other productions, each soil is best adapted to. I have often practised this method with success, for improvements which lay at such a distance that I could not immediately inspect them myself: but as the judging of lands in this manner, without actually inspecting them requires great attention and long practice, the surest method therefore is to examine them on the spot, and there make the necessary experiments. The furnaces which are the most burnt, or those which burn the fastest, are not the best; for the ashes are there too much calcined, and their quantity reduced.

I have often seen much finer corn grow in places where the uppermost turfs of the heaps, which had burnt slowly, were only calcined, and remained so nearly entire, that it was necessary to break them before the ground could be sowed, than in those places where the furnaces, after being entirely burnt, were totally converted into ashes. In general, those heaps which produce white ashes, after they are burnt, are the least valuable, and commonly yield the smallest quantity. This denotes a greater degree of vitrification than of calcination. In proportion as the ashes are yellowish, brown, or blackish, which last indicates the greater perfection, they are better in quality, and generally more in quantity. According as these different colours appear, the calcination exceeds the vitrification. I have dwelt the longer upon these different operations of the fire in the burning of land, because they are of great importance to those who break up ground in this manner, and no writers have hitherto given a sufficient distinct account of them, for want of having had the necessary experience.

I must farther observe, that no land ought to be pared again, too soon after it has been burnt; because its turf being destitute of a proper covering, would not take fire well, as I have experienced. It will be necessary to

wait till the heath or broom has shot up sufficiently, which seldom happens in less than about two years. The dangerous practice of some country people, who frequently set fire to their heaths in the spring, under pretence of bringing up grass for cattle, is so contrary to the right method of improving land, by burn-baking, that it always retards, and sometimes absolutely prevents the execution of this far more beneficial method; especially if those burnings have been too often repeated.

In countries where it is not the custom to plough in ridges, but either in broad lands, or quite flat, in order to sow afterwards with the harrow, I think it would, however, be right, to sow the ground thus broken up, at least the first year, under furrow, with the two-finned plough already mentioned; after which usual method of the country may be followed, if it be found the most proper. I advise this as the best practice, and am satisfied that none will have cause to repent the trial. It will save the greater part of the expence of ploughing; and the ashes being less exposed to the action of the air, will the more strongly retain their fertilising power. But if, notwithstanding these reasons, the common practice of the country should be still preferred, even in the first year, the husbandman, in this case, should begin spread his ashes in the manner before directed, about Midsummer; as soon as the furnaces are cooled, without leaving any in the places where those furnaces stood. Immediately after, a slight ploughing, just sufficient to bury the ashes, should be given, with the precautions before mentioned with regard to the furrows. No more ashes should be spread at any one time, than the plough can cover in the same day. A few days after this first slight ploughing, a second should be given, somewhat deeper, in the same direction, and these ploughings should be continued, each going a little deeper than the former, till the ground be loosened to a sufficient depth. Two good cross ploughings will then be of excellent service: after which a fifth ploughing a-cross them, will bring them up to the direction they were in at first. The ground should be harrowed several times between all these ploughings, with harrows heavy in proportion to the strength of the soil; and if any hard clods have resisted the force of the harrow, women and children should be employed to break them, it being necessary to pulverize the soil as much as possible. I say, as much as possible, because that cannot be perfectly completed this first year. Perhaps the spiky roller would be of excellent service here.

The same women and children will also clear away all the stones, if there be occasion. Each successive ploughing will turn the stones upon the surface; but such only as are bigger than a man's fist need be removed. If any of the stones should be too large for the women and children to remove, the carters must take them up as they pass by; and if there should chance to be any under ground so large that the men cannot move or load them, they must be broke with sledge-hammers, and other iron tools proper for this work; or if they are great rocks, they must be blown up with gun-powder; for nothing should stop the progress of this undertaking.

The time to sow the land thus broken up for the first time, will always be a fortnight later than the common time of sowing other lands in the same country, with the same kind of grain. A few days before this is sowed, it should have another light ploughing; after which it should be sowed, in proper weather, with half the usual quantity of seed, whether wheat or rye, and this seed should be covered in, either with a plough, or with the harrow. Drains should also be cut in this land, in the manner directed under that article, as soon as possible, to carry off the water in the winter. If any very large clods are left on the ground, women and children should be employed to break them. This land being thus sowed, nothing more need be done to it till harvest.

The quality of the land must determine what sort of grain will be most proper for the first year's sowing in this husbandry. If the soil be rich, it will bear wheat: if of a middling quality, it will produce messin, or a mixture of rye and wheat, consisting of a greater or lesser proportion of either, according to the nature of the ground; and if it inclines to poorness, it will produce rye. These particulars may be judged of immediately after the burning. In general, unless the soil be very excellent, I would always advise the sowing of rye the first year. There will be a certainty to success with the grain; and the husbandman will be enabled by its produce, and by that ploughings, to judge what his land will be capable of doing the next year without running any

any hazard. This has been my method. I have also experienced, that the rye does much better than wheat in all light sandy soils thus broken up. When they are afterwards enriched to a certain degree, they become fit to bear meslin, and then wheat : though, if they should never produce any thing but rye, the difference would not be great in point of profit.

As soon as the ground is cleared, a light ploughing should be given it, to bury the stubble ; and some days after it should have a second ploughing somewhat deeper, but in the same direction. When this is done, two good cross-ploughings should cut the soil to the proper depth for sowing ; and a fifth ploughing, afterwards to be given, will leave the furrows in their first direction. Between these five ploughings, which are to be performed with the plough having only one fin to the share, the ground should be well harrowed several times, and the stones and roots picked out. All these ploughings and harrowings will pulverize the earth, and mix it equally with the ashes. If this land is to remain in ridges, the above will be sufficient till the sixth ploughing, which should be given it a few days before the sowing, and should be followed by the last, performed with the two-finned plough to bury the seed : but if it be sowed in broad lands, or quite flat, for former directions in that respect are to be observed here. In whatever manner any of these new grounds, broken up with the plough, are sown, they will not require near so many hands to break the clods this second year, as were necessary in the first. With regard to the quantity of seed, a little more may be sown now, that is, about a third part less than is a commonly used in the country, of the same kind of grain, for an equal extent of land.

The lands thus brought into tillage by means of burning, become infinitely better than other grounds, and produce much greater crops. This process improves the soil for upwards of twenty years. No weeds will spring up among the corn for a considerable time ; for there are scarcely any, even now, in the lands I first broke up. The vegetable food in the earth is not therefore wasted here upon useless plants, but serves entirely to nourish the corn, which accordingly shoots with redoubled vigour, produces well-filled ears, without the trouble and expence of weeding it ; and, when threshed, is so clean, that it needs only to be winnowed. The bread made of it is excellent, and of superior quality. When in process of time these burnt-lands shall produce as many weeds as other ploughed grounds, they will then be in the same degree of imperfection ; but it will be a long while before that happens ; even longer than I can say ; for I have not yet seen an instance of it. The remedy, however, is always sure and ready, namely, to let them rest two or three years, by which time they will have acquired a new sward, thick enough to be pared off, and burnt as before. This will restore them to their former perfection, without being near so expensive as the first paring and burning : for there will be no roots to grub up here, nor any stones to carry off ; nor will it be so difficult to break the now much fewer clods. I have managed in this manner with great success, where there has been a sufficient depth of mould, lands which had formerly been in tillage, and would no longer produce corn because they were exhausted, either by too many successive crops, or too great quantities of weeds. They are now as good as any other burned land.

Worn-out meadows, which I have restored by the same means, and formed a-new with grass-seeds, have yielded great quantities of excellent hay. I have collected plenty of this seed during some of the preceding years, from meadows which were not too wet. Several of my neighbours have practised the same method with equal success : and, in a word, it is the most powerful restorative for worn-out land.

From what has been said, it evidently follows, that the paring and burning of the surface of the earth, is, indisputably, the best and surest way, either to clear, or restore the soil. It is making a most advantageous acquisition to one's own estate, the value of which is at least doubled, and oftentimes quadrupled by this means. To enrich one's self, without doing it at the expence of any person whatever, and, at the same time, to enrich the state, is surely an action worthy of a true patriot, and of a respectable father of a family. This may be done by following the method here laid down ; a method which has been long known, though very superficially. I will venture to say, that it never was carried to the degree of perfection to which

my practice has brought it ; doubtless because none applied themselves particularly to it. *Memoire sur les Defrichemens.*

A correspondent of the editors of the *Museum Rusticum* has given us the following method of performing this operation in the fens of Bedfordshire.

"About the middle of May, says this gentleman, we plough the land for burning, which is sward-land, that has not been ploughed for four or five years, or perhaps a longer time : our ploughs are what are called Dutch ploughs, with a large share ; the edge and point are very thin and sharp, and are kept so by filing : the furrows should not be more than seven or eight inches wide, and an inch and a half thick, having as few baulks as possible. When it has lain so long that the fods or furrows are dry (in which the farmer's own discretion must guide him, it being impossible to point that out by words) it must be made into heaps about the size of middling grass-cocks, each person carrying on before him as heaps about seven furrows : the work will then direct him how big the heaps should be ; they should be made as narrow at top as conveniently they can, by way of prevention against wet weather. If every person keeps his work as to the number of furrows, the heaps will rise in regular rows ; but it should be observed to keep these rows in quincunx order (as represented on Plate II. fig. 7) that when you come to spread the ashes, they may cover the ground regularly.

When it is fit for heaping, the customary way of this country is to let the burning out to people, to burn and spread the ashes, which must be spread so as to cover the ground all over : the usual price is from four to five shillings per acre ; but that, in a great measure, depends upon the dryness or wetness of the season. It would, however, I think, be most adviseable, where hands are plenty, to do this work by the day, as you may then employ as many persons as you think fit ; for it should be burnt off with all possible expedition, because if it be long in burning, it is attended with bad consequence, which in rainy weather is hard to prevent ; it is therefore very requisite to pursue the work briskly, otherwise the grass-roots which lie below the reach of the plough, when ploughed for burning, will shoot out, and become almost as full of grass, as though it had not been ploughed at all ; then, when you plough it after the burning, instead of breaking so that the seed may fall into the cracks, it will turn up as strait as clay, and then no seed can grow any where but in the seams between each furrow.

When one side of the field is cleared, and the ashes spread, you must, as soon as there is room, get to ploughing and sowing the seed. Nor must the furrows now be wider than those already mentioned, and about two inches deep ; for as fen land in general ploughs tough, rather than breaks, you will have more seams than if the furrows were made wider : the custom with us is to sow the seed as soon as possible after the land is ploughed." *Museum Rusticum*, vol. I. p. 420.

BURNET, the English name of a plant, now greatly cultivated as a green food for cattle in the winter. We have given a figure of this plant taken from a specimen gathered in a field belonging to Mr. Rocque at Walham-green, on Plate III. fig. 12.

It is very natural to think that we have in England many sorts of grasses, which are well adapted to the climate, are wholesome food for cattle, and, with the assistance of proper culture, would produce very advantageous crops both to the grazier and farmer. We have, for many years, been sensible of the great advantages that result from the culture of saintfoin : in some soils lucern has been sown with considerable profit, and the Dutch trefoil is known to be excellent, when properly managed : but these only serve for green fodder in summer : they may, indeed, be dried, and made into hay, and in that form be reserved for the cattle's food in winter ; but this, independent of the inconvenience, trouble, and uncertainty, that attend the making and keeping it in proper order is not sufficient ; the farmer has also occasion for green fodder in the winter, and early in the spring, and that on many accounts, particularly for feeding such of his ewes as will yearn early in the year, as well as keeping them from losing their flesh after they have dropped their lambs.

A plant therefore which will not only live through the winter, but will also, if possible, vegetate in that season, cannot fail of being highly advantageous, provided it be at the same time a pleasing and nourishing food for cattle. All these properties have been lately found in burnet ; it not only preserves its verdure during the hardest frosts of our

Fig. 1. an ear of Summer barley in its natural size.
raised by Sir St. Plat. 1594.



Bastard Alkanet.



Fig. 2.

A Drill for sowing Horsebeans.

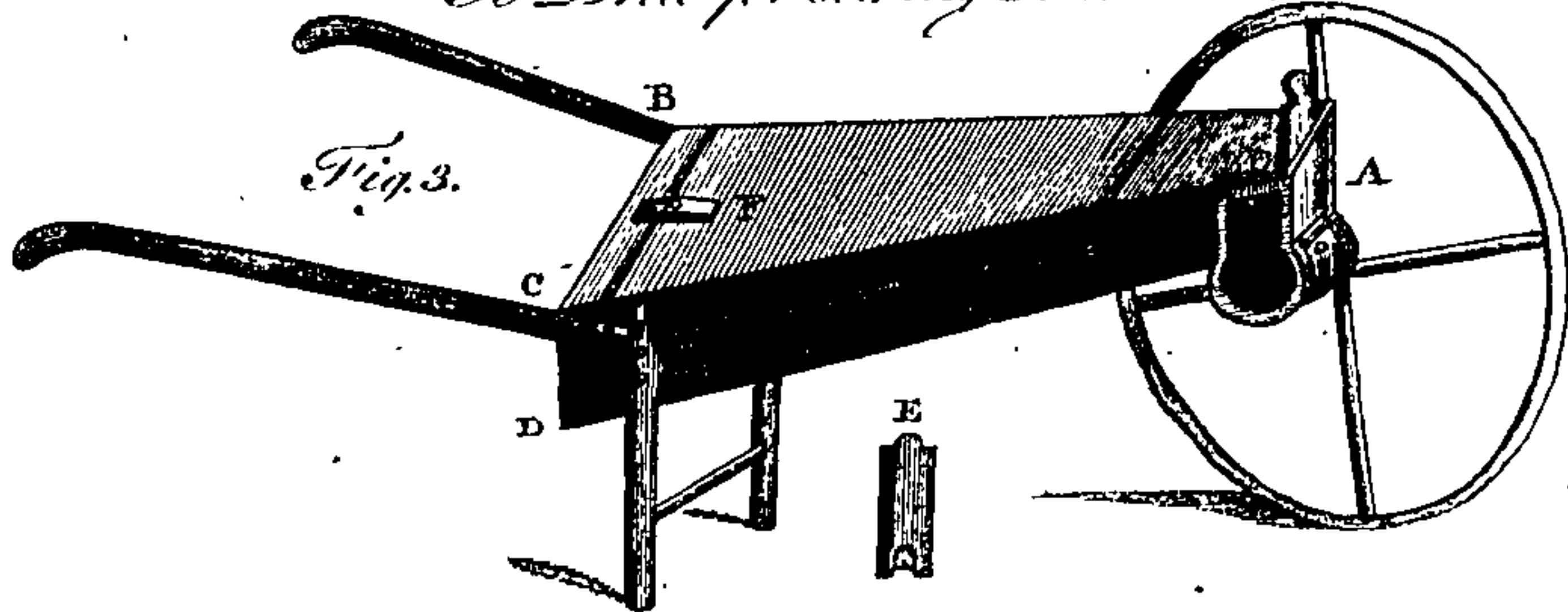


Fig. 3.

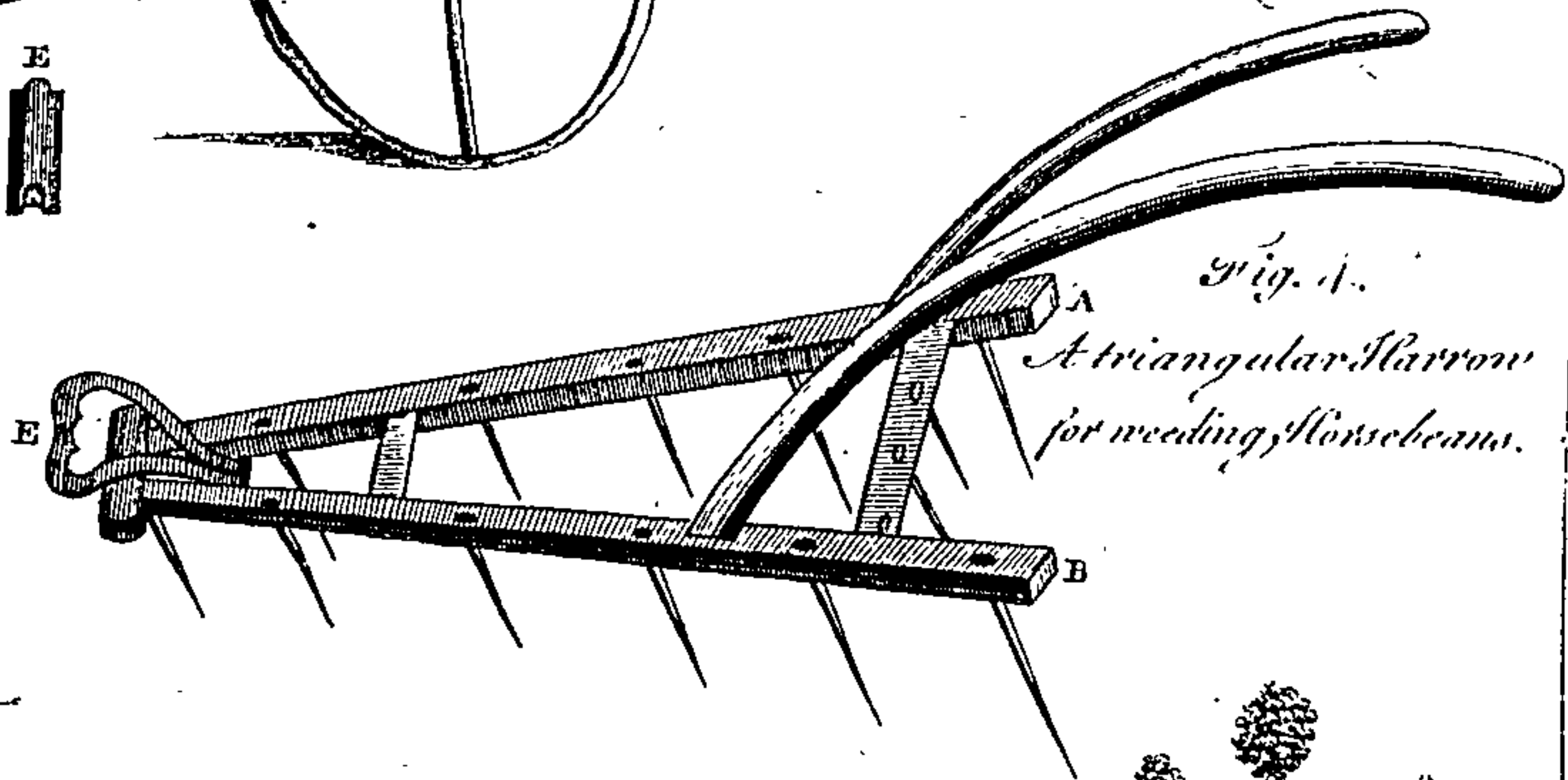


Fig. 4.

A triangular Harrow
for weeding Horsebeans.

Fig. 5.



Fig. 6.



Fig. 7.



Fig. 9.

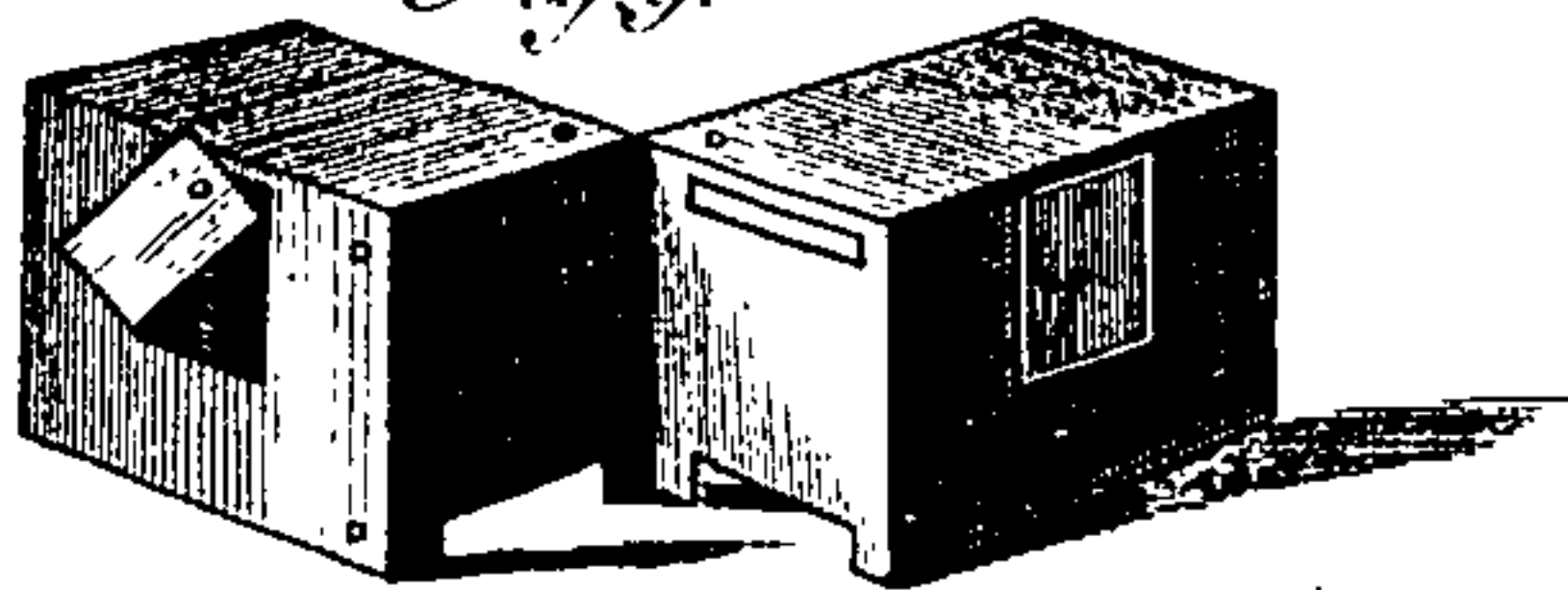


Fig. 12.



Fig. 8.

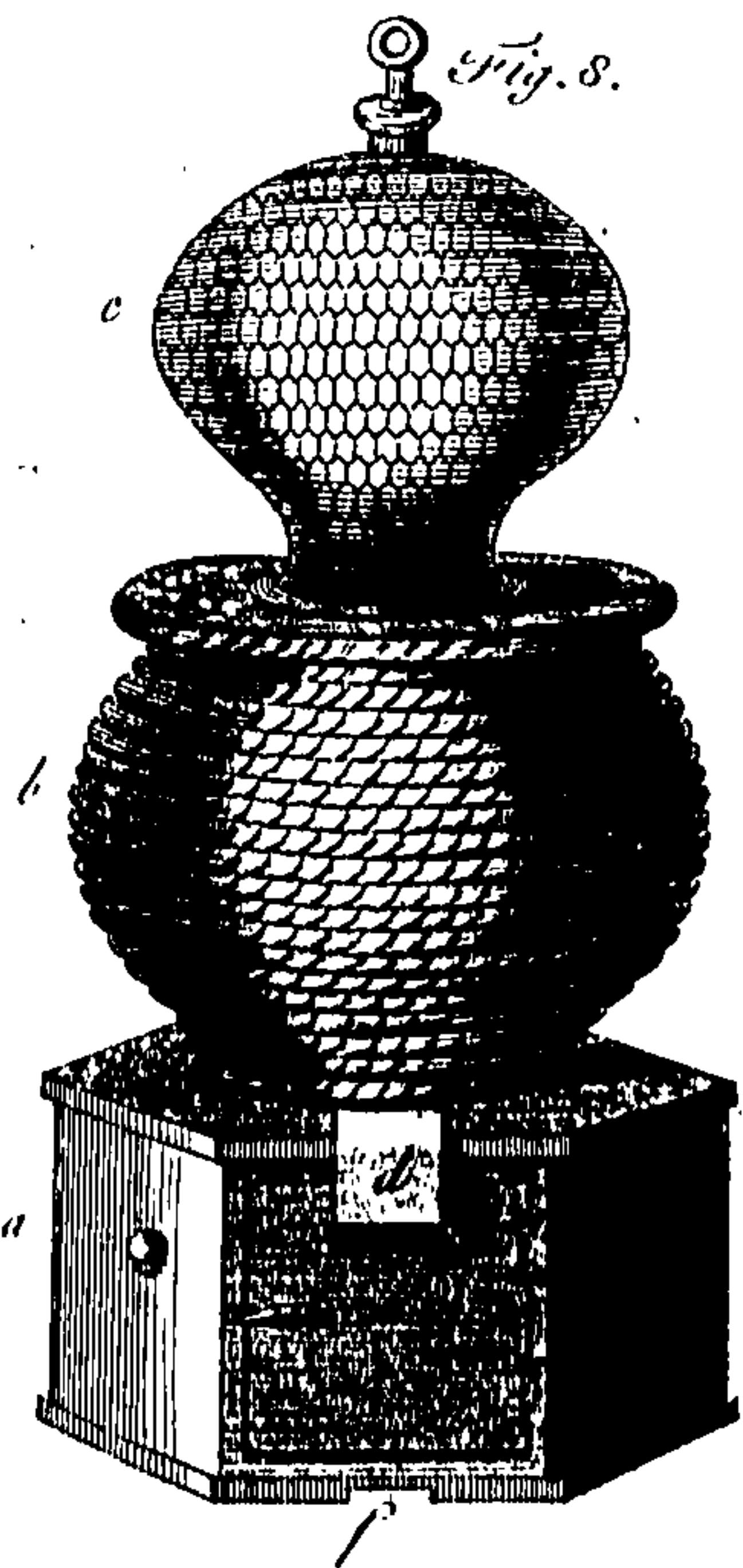


Fig. 10.

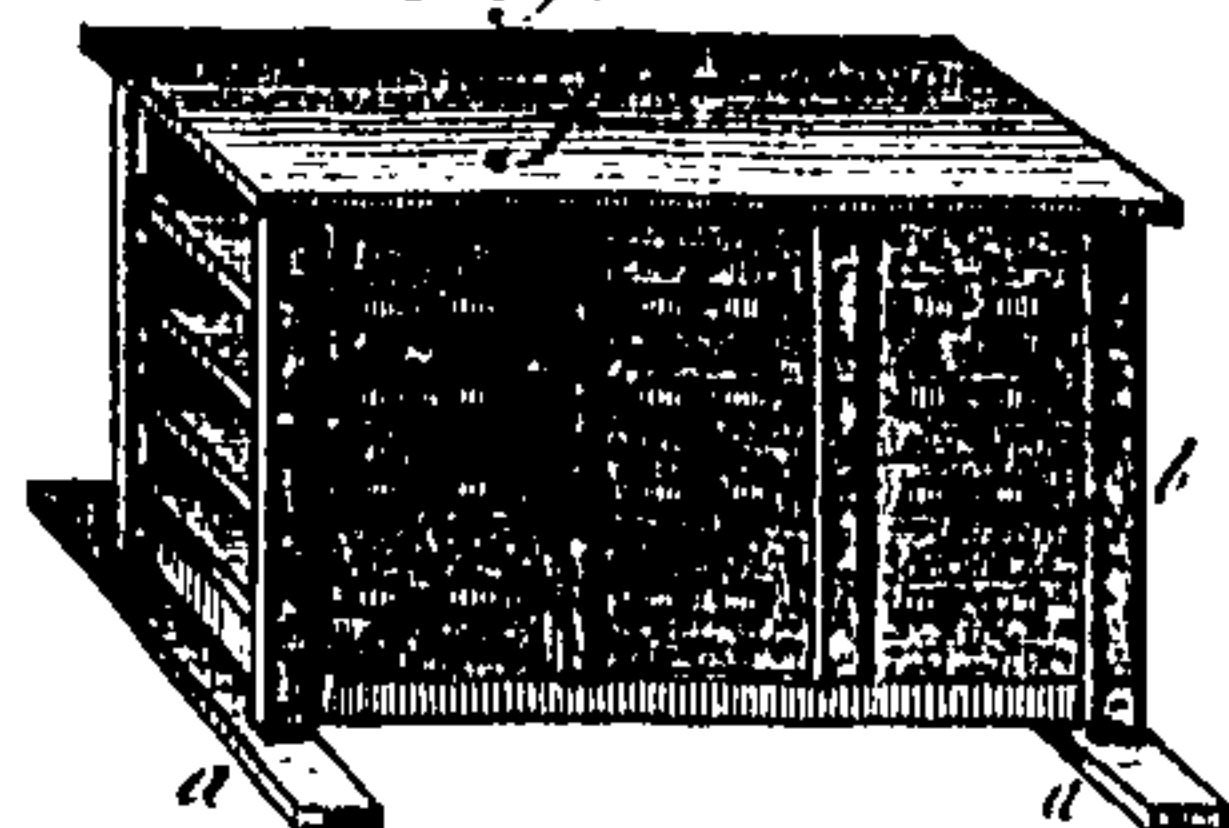
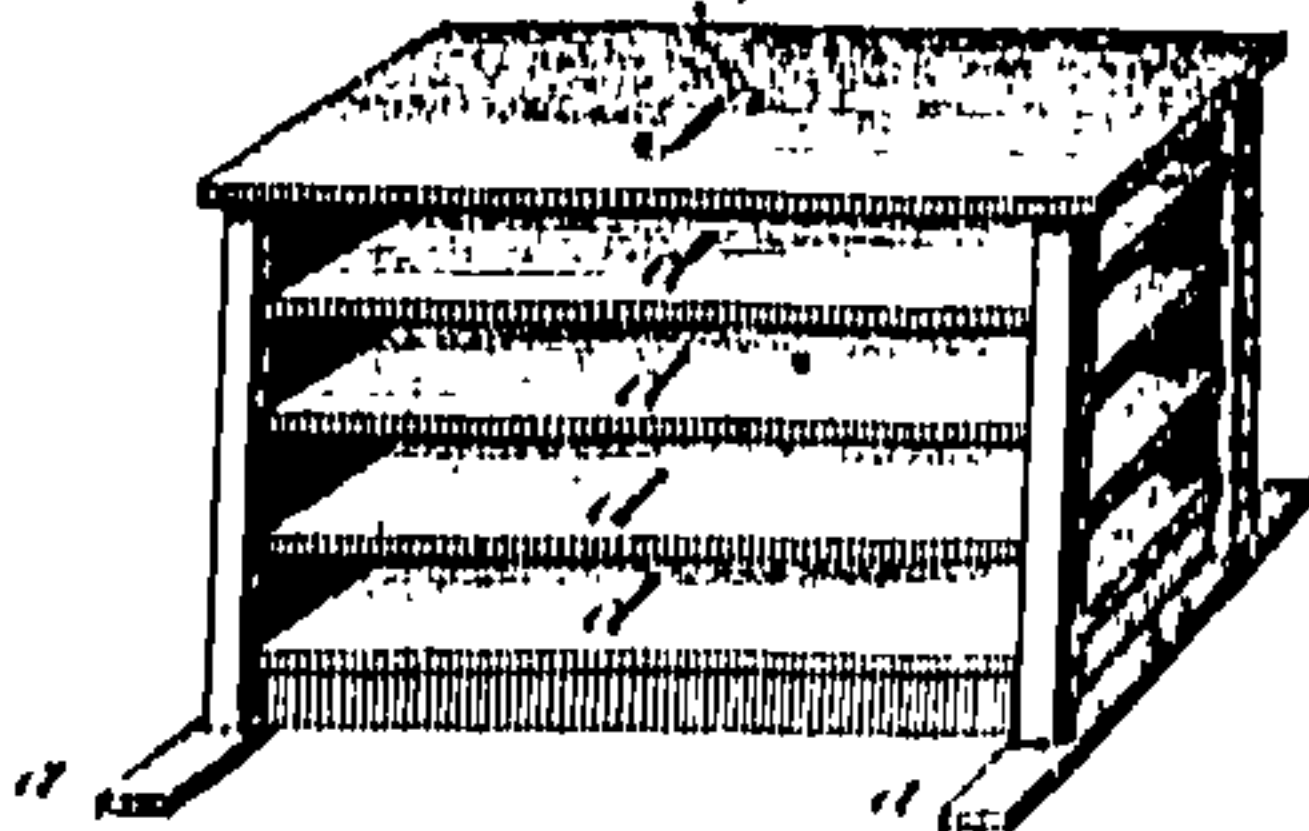


Fig. 11.



Facing Burnet.

Bent Grass.

our winters, but also increases in bulk, and grows, if the weather be all open and mild; and is now known to be an excellent food for cattle. The discovery is owing to Mr. Rocque, of Walham-green, who, at the request of the late Mr. Wyche, spent some years in endeavouring to find a plant that would prove an useful and succulent food for cattle during the winter; and, at last, fortunately discovered that burnet would answer the intention.

Mr. Rocque has also found by experience, that it will grow in the driest land: for he has planted some of it even in the gravel-walks in his garden, where every thing else is burnt up in the summer, but this never withers; one of the qualities of burnet being to continue in sap all the year. It is the opinion of many, who have seen the burnet of his raising, that if this plant is generally cultivated, there will never be a scarcity of hay in England, even in the greatest drought.

The land on which it is sown should be fine, because it is apt to shed, and it should afterwards be dried perfectly.

Burnet does not lose its leaves in drying; and though the hay made of it be sticky, it will, after threshing, be very agreeable to horses, which are so fond of it, that they never waste any. One acre will produce upwards of three loads of hay, and above forty bushels of seeds. Horses are fond of this feed than they are of oats: and Mr. Rocque is of opinion, that it is a more proper food for those who do not labour hard, because it is not of so hot a nature. Burnet bears seed twice a year, and will afterwards yield a good spring crop.

It is not only good for horses, but also for all manner of cattle, even for swine: and Mr. Rocque has experienced another virtue in it, which is, that, being stung by a wasp, the leaves of this plant rubbed pretty hard upon that part so injured, immediately took off the inflammation.

If the burnet does not grow equally every where, some plants must be drawn where they are too thick, and planted where they are thinnest: or the vacant spaces may be supplied from the nursery. If the land was not got in good order to sow the seeds at a proper season, the burnet may be transplanted at Michaelmas from this nursery, and set at nine or twelve inches distant every way, according to the richness of the soil.

The seed sown in May may be mowed at the latter end of July. That sown in June will yield a pretty good crop, and must be cut but once; and the same of that which is sown in July. The plants produced by seed sown in August should be mowed, to destroy the weeds. These mowings may either be given green to horses, or made into hay. The first spring cutting will purge horses; and Mr. Rocque believes it will also cure the grease: but it is only the first crop that purges.

Burnet should be mowed but once the first year, in order to leave it rank in the winter; and in this case it will be ready to feed in February or March, or to mow again in April.

If natural grass grows among the burnet, it may be harrowed in the same manner as lucern; for having a tap-root, the harrow will not hurt it: but it must not be ploughed, lest the roots should be broken in the ground.

When the seeds of this plant are to be sowed, it must neither be fed, nor moved, in the spring. The seed will be ripe about the middle of June, when it must be reaped like wheat, and threshed on a cloth. It should be threshed before it is too dry, because it is apt to shed, and it should afterwards be perfectly dried.

As a great deal has been written on the subject of burnet, we shall endeavour to set the whole in a fair light, by adding two letters, which were sent from gentlemen of known character and reputation, to Dr. Templeman, the late secretary to the Society of Arts, Manufactures, and Commerce. The first was from Davies Lamb, esq; and was sent in consequence of a letter sent to that gentleman by a member of the society, requesting his opinion with regard to the usefulness of burnet.

"My burnet, says Mr. Lamb, though very green and beautiful all the winter, made no great progress till the middle of April following, when I thought it absolutely necessary to feed it. I did so, but I did it too late, and kept my cattle upon it too long, from the middle of April to the 20th of May. This was a very great mistake; the burnet plants were now headed for seed, and the stock chiefly fed upon the heads, which greatly lessened my quantity of seed, as well as retarded the growth of the plants. I turned into the field, ewes, lambs, and calves,

and they all feed very greedily upon the burnet. From what I had heard of Mr. Rocque, I very much expected them to scour, but there was not the least appearance of it, and the cattle thrived accordingly.

The 6th of July I began to mow, the weather being favourable; six men and four boys threshed and cleaned the seed in seven days. I had 200 bushels of very fine clean seed, as many sacks of chaff, and seven loads of hay, from a field of seven acres and a quarter.

Satisfied that 200 bushels of seed would be more than I should be able to dispose of, I was not anxious after another crop, being rather desirous of seeing what it would perform as a pasture. Accordingly, in about ten or twelve days after the field was cleared, I turned into it seven cows, two calves, and two horses; they all thrived very remarkably, and the cows gave more, and we thought a richer milk than in any other pasture; I really expected (as burnet is so strong an aromatic) that the milk would have had a particular taste; but far otherwise: the milk, cream, and butter, were as fine, if not finer tasted, than any from the best meadows. I am satisfied, that there is no better pasture for cows, whether milch or barren, than burnet. The weather was now extremely drouthy, all our pastures were burnt up, yet the burnet flourished, and grew away, as if it had a shower every week. My stock of cows, horses, and calves, before-mentioned, pastured in it almost continually, till Michaelmas; by the middle of November it was grown so considerably, that I have again turned in six head of cattle, and if the weather is not severe, I am of opinion, it will maintain them till Christmas.

The burnet straw, or haum, is, after the seed is separated from it, a very useful fodder for horses, cows, calves, and sheep; the chaff is of great value, if mixed with any other, however ordinary chaff. I have fed all the above-mentioned stock with it promiscuously together in one field; putting the haum into racks, and the chaff into troughs, and if the haum was chopped with an engine, it would still be of much more value.

Burnet, I am fully persuaded, will prove a very great acquisition to husbandry on many accounts, but more particularly for the following reasons:

Burnet is a good-winter pasture, consequently it will be of great service to the farmer; as a constant crop it may be depended upon, and that without any expence for seed or tillage, after the first sowing: whereas turneps are precarious and expensive; and when they fail, as particularly this year, farmer is very often put to great inconveniences to keep his stock.

It affords both corn and hay too. Burnet-seed is said to be as good as oats for horses. I know they will eat it very well; judge then the value of an acre of land, which gives you at two mowings ten quarters of corn and three loads of hay.

The seed indeed is too valuable to be put to that use at present; though it multiplies so fast, that I doubt not but in a few years the horses will be fed with it.

It will bear pasturing with sheep.

It makes good butter.

It never blows or hoves cattle.

It will flourish upon poor, light, sandy, stoney, shaltery, or chalky land.

Burnet, after the first year, will weed itself, and be kept clean at little or no expence.

The cultivation of burnet is neither hazardous nor expensive: if the land is prepared as is generally done for a crop of turneps, there is no danger of any miscarriage; and any person may be supplied with the best seed by the seedsmen in the city of London, or the borough of Southwark.

I make no doubt but that burnet might be sown late in the spring, with oats or barley. A gentleman in my neighbourhood did so last summer, and it succeeded very well. I should think a buck-wheat season, which is sown the last of all corn, would suit it very well; but of this I have no experience, and could wish to have the experiment tried. A pea-field, drilled in rows, and kept clean, would make an excellent season for burnet, as the pea-crop would come off soon enough to prepare the land with two ploughings by the middle of August; after which time I should not chuse to sow it.

It very frequently happens, that every farmer who sows many acres with turneps, has several worth little or nothing; the fly, the dolphin, the black caterpillar, the dry weather, or some unknown cause, often defeating the industry and

X

expence

experience of the most skilful farmer. When this happens, as it too often does, I would by all means advise him to sow it with burnet, and in March and April following he will have a fine pasture for his sheep and lambs.

Burnet is a native of England, and will certainly perfect its seed twice in one summer; and a farmer, with a small plantation, may supply himself with seed of his own growth at very little or no expence: he may then be encouraged to make experiments in various seasons, without much loss or damage.

Thus, Sir, I have sent you a true account of the success of my burnet, and also my opinion of it. I wish what I have said may any ways contribute to dispel the prejudice, or inform the ignorance of my countrymen."

The other letter was from Christopher Baldwin, esq; of Battersea, a gentleman well known, and justly respected for his candor and fidelity.

"In the years 1763 and 1764," says Mr. Baldwin, "I made several experiments on burnet, with a view to make myself acquainted with its manner of vegetating, and the uses to which it might be applied: and having by this means acquired that knowledge I was desirous of attaining, I determined last year to lay down several acres with burnet; nor would I content myself with doing it in any one particular method: therefore in the beginning of July, 1764, I sowed about eight rods of ground with five pounds of Rocque's burnet seed. Rain falling soon after the seed was sown, the plants came up very finely, and thrived in such a manner, that I was tempted to plough up about an acre of ground and plant it that autumn, in order to see what effect the winter would have on the young plants. Accordingly, on the fourth of October I planted them in rows, about twenty inches apart, and about fifteen inches from each other in the rows. This distance, from experiments and observations which I have made, seems to me a very proper distance. These plants took very well, and through the winter thrived with surprising vigour. Last spring I ploughed the remainder of the field, being three acres, and planted it in the same manner with my plants, the whole of which, notwithstanding the uncommon drought of last summer, grew well, and the verdure of the plants was really very beautiful. No water was used; indeed it would have been a vast work in a field of that size: however, I never saw any need of it. The plants were once hoed, and stood over for seed, of which the quantity collected was not very great; but this must be attributed to the uncommon drought, for I think we had not above one shower of rain from the planting to the gathering of the seed, the whole of which amounted to about 160 pounds.

The seed being got, I was impatient to see how the cattle would take to it, as it was roundly asserted by some gentlemen, that no cattle would eat it. Accordingly, I ordered four cows and two horses to be turned into the field; the cows fed freely upon it, but the horses did not seem to like it so much at first, though in two or three days they fed well upon it. Burnet has strongly the taste of cucumbers, and I was fearful it might give a disagreeable taste to the milk; it therefore gave me great pleasure to find, in about four or five days, that the quantity of milk was not only much increased, but the flavour of the cream much superior to any I had ever had before, or ever tasted from cows fed upon the richest meadows. The cows and horses having fed down the field, it was hoed again, and then harrowed once over, which laid it very clean, nor could I find that the burnet was at all hurt by the harrow.

Here let me observe to you, that I fed my horses in the stables for about five weeks with the burnet straw, or rather haum, from which the seed had been threshed. These horses fed very freely, and thrived much upon it, though they had only half their usual allowance of oats. However, as I would by no means secrete any circumstance that may appear unfavourable to burnet, so I must tell you that I observed, when any friend called upon me, and their horses were put into the stable, that some horses eat very greedily of it, and others would not touch it. I cannot say this gave me much concern. I satisfied myself with thinking, that some horses did not know what was good for them; or to speak more seriously, I thought the novelty of the food might as much displease one horse, as it pleased another; and doctor Templeman knows, that there are some things which we loath as children, that we are fond of as men; and that there are some things which we as much dislike as men that are very wholesome food; but to come nearer to the point. It is well known some sheep and cows will not touch a turnep,

yet is any one weak enough to infer from thence, that turneps are an unwholesome or an improper food for cattle? And I was lately told by a particular friend, that he had often observed, when his horses had fed for some time on the faintfoin hay, that it was some days before they would again take to meadow hay. I should not have mentioned this circumstance of the horses, but to shew my impartiality; and I do it the more readily, as I find there are some gentlemen who are as fond of decrying, as others can be of promoting useful experiments in agriculture.

Being well pleased with the success that had attended my first experiments in the field, which I call four acres, I determined to proceed as I had intended in the spring of the year; accordingly, as soon as the oats were got off a field of twelve acres, I ordered it to be ploughed and sown with 160 pounds of burnet-seed before-mentioned. This field was sown on the twenty-sixth of August last; and no rain falling till the eighteenth of September, the plants did not appear till the twenty-eighth of that month: however, there seems to be a good crop, and I intend, as soon as they fresh up in the spring, to have the plants set out with small hoes (such as are used for carrots and onions) to about six inches apart. And in about a week after this is done, I shall harrow it with light harrows; far from experiments which I have made, this seems to me to be the best method of managing broad-cast burnet. Having nothing further to say in regard to these twelve acres, I must return to the four acre-field transplanted, which having been hoed and harrowed as before-mentioned, was laid up for winter food for my cows; but finding lately some gentlemen had again asserted, that sheep in particular would sooner feed on his quick-hedges than touch the burnet, I sent to a neighbouring farmer for his flock of sheep, and having a friend with me, we followed the sheep into the field, who fell upon the burnet so greedily, that we found it very necessary to send them home again.

Being very much vexed at these idle tales, told much to the prejudice of this (as it appears to me) excellent plant, I determined to put it to as fair a trial as I possibly could. Accordingly, I ordered in four cows, which were in a very good feed on natural grass, and had besides a large truss of oat-straw put in their cribs, every night, notwithstanding which they gave very little milk, and indeed were almost dry. These cows, I declare, had not been in the burnet above six days, before they gave much more than double the quantity of milk; nay, was I to say three times the quantity, I know I should not exceed the truth. The milk is exceeding fine, and free from all bad taste: and further, I must observe, that they soon began to leave half their straw in the cribs; so that they are now served with only half the quantity they had before. My land is a poor dry upland gravel; there are millions of acres in this kingdom of better land, that do not fetch two shillings and sixpence an acre. What a field therefore is here for improvement! Nay, I cannot but observe with amazement, the great numbers of country gentlemen who daily flock to this great city in pursuit of trifles, when they have such inexhaustible funds of knowledge within themselves, if they would properly make use of them: confident I am, I could point out methods of improvement that would surprisingly better their estates.

As the account I have now given you of burnet may appear a little extraordinary to some of the worthy members of your society, so I shall be far from being displeased at their even doubting what I have now said: on the contrary, it will give me pleasure, provided any gentleman, who have such doubts, will do me the favour to call at my house, and convince himself by ocular demonstration of what I have now said."

Mr. Young, in the second volume of his *Annals of Agriculture*, gives the following account from Mr. le Blanc of Cavenham in Suffolk, which Mr. Young vouches for the accuracy; he says, "It having been remarked, that sheep eat spontaneous burnet when it is young, though they refuse it when advancing to seed, I formed an experiment to know what probability there is of its being a proper plant to lay down poor sandy lands with. In October, 1782, sowed a space, several perch square, with burnet-seed and rye, being a part of 100 acres laid to ray-grass, trefoil, and white clover: the soil a blowing sand upon a chalk bottom, worth about 3s. 6d. an acre. It was sowed for the rye.

The 5th of April, 1784, my flock, of between six and seven hundred sheep, were turned in. The grasses were in general backward; but the burnet in its growth much for-

forwarder than the rest: for the first two or three days they did not eat it at all; a fortnight after I viewed it again, and found the burnet-eaten to the ground. June 4th, examined it again, and found it pared close. When a flock has so large a range as 100 acres, and eat up the growth of any small spot so clean, it is a far more satisfactory proof that they have no dislike to the plants growing there, than if they were confined to a small field with no other herbage; to some experiment of which sort, the notion is probably owing that sheep will not eat burnet. I am so well convinced of the contrary, that I intend sowing a much larger quantity of it."

Mr. Young, in his *Annals of Agriculture*, makes the following observations: "On three fourths of the sheep-walk lands in England, in a regular course of tillage, or permanently laid, ray-grass is the only plant used; sometimes broad clover, upon soils much too poor for it. I shall not condemn ray-grass, because I know its value early in the spring when other food is scarce; but, in the preceding experiment, my worthy friend observes (and I believe the fact is always so), that the burnet was forwarder than the ray-grass. Granting, however, the necessity of some ray-grass, is it not a very capital object to introduce other plants, not so exhausting, that shall have the same or superior qualities? Experiments and observations have been made in most parts of the kingdom, that prove the exhausting quality of ray-grass; its narrow leaf, and fibrous root, class it in this respect, as well as its botanical arrangement with corn; but the broad leaf of burnet, and its deep carrot root, indicate the contrary effect; and accordingly, in several trials that have been made, it has been found to ameliorate. The poorest soils in the kingdom agree well with it; even such as are too poor to produce any other herb. The hot pungent quality of the plant has been found exceedingly beneficial to sheep touched with the rot.

As to the trials, or rather assertions, that were for some years made against this plant, they certainly resulted from attempting to feed it when too much grown. If it is suffered to run to seed, nothing will touch it; the right and only time for sheep, is while it is in its young yellow shoot; in that period of growth I know nothing that refuses it. The greatest obstacle to its culture, is the seed being 1s. per pound: and this is owing to the mistaken idea which is common, of its not possessing the merit that really belongs to it. The price was once only 4d."

Mr. Young, in the same volume, from the Minutes of the Husbandry at Holkham of Mr. Coke, who formed an experiment, to see expressly what was the merit of burnet, says, that Mr. Coke, with the noble spirit that characterises his husbandry, sowed 40 acres, mixing a small quantity of white clover and rib-grass with it. The result was as decisive as can possibly be imagined; the field has been fully and incessantly stocked with all sorts of cattle, especially sheep, and is constantly pared as close to the ground as a favourite spot in a pasture is by horses. This proves, in the clearest manner, the value of burnet, and confirms the opinion of Mr. le Blanc, that it is one of the best grasses for sheep.

The preference which sheep give to these plants on comparison with common clover and ray-grass, is remarkable. The 30 acres first laid down in the midst of a large field, sown in the common manner, afford a constant opportunity to remark this. The flock kept almost constantly upon that piece; if they were driven into the clover and ray-grass they presently returned; it is within sight of the house, and we remarked them, during three days, to be regularly on those 30 acres. Mr. Coke assured us, he had rarely failed to make the same observation.

The following experiment on burnet was made by Mr. Pitt, of Pendeford in Staffordshire, and communicated to the public by Mr. Young, in his *Annals of Agriculture*, vol. I. The cultivation of a large stock of green food for cattle during the winter-months, is one great desideratum in the farming business; indeed the absolute necessity of having such food for the support of fat sheep, ewes, and lambs, and milch-cows, is obvious and well known, as they cannot possibly be maintained, without either green food or corn; the substituting the former instead of the latter as much as possible, is the interest of every individual concerned in the business; and very much so of the community in general.

Turneps are admirably adapted to the above purpose, yet the quantity of those which every farmer can regularly cultivate is, in general, limited, besides the casualties the crop

is subject to from flies, caterpillars, &c. as well as the very great destruction of them by severe frost, of which, with us, we have a recent instance; and they are totally useless in the case of milch-cows, from the unsufferable taint they give to the milk and its produce.

It is seldom we can have our clover and ray-grass fit for pasture earlier than the beginning of May: I have tried tares, and find them little or no earlier: cabbage would answer the purpose better, but requires a good deal of dung and labour. I have, therefore, made the following trial of burnet, but not yet with all the success I expected.

In the month of April, 1783, in the midst of a field of barley, I sowed an acre of burnet instead of the usual seeds, the remaining part of the field being seeded with clover and ray-grass; the seeds came well, and the following autumn it was pastured with sheep and horned cattle; I observed the sheep preferred the clover and ray-grass, but the horned cattle seemed to prefer the burnet; it was hayed up at Christmas, and, notwithstanding the extreme inclemency of the winter at Lady-day, the burnet was what we term good picking for cows, which, however, I did not pasture, as I mean preserving it for seed: it evidently preserves its verdure in severe weather much beyond clover, yet the clover now gains ground of it, and I expect, by May-day, will at least equal it, the burnet being apparently of flower growth, I suspect the species I have made trial of (the seed of which was procured from Holland) to be of a dwarf kind, yet some plants which I have stuck in a border of the garden are shooting out vigorously. As I think there is a probability of the plant being rendered extremely useful, I wish gentlemen, whose situation and connections give them opportunity of procuring the different species of the seed, would make trial of them; and communicate the result of their experiments:

The species I have tried, I am pretty confident; have no chance of producing a crop the first season, if sown by itself: I sowed a small quantity by itself in May, which was little forwarder than that sown with barley: I also sowed two lands, soon after Midsummer, in the middle of a field of turneps; the turneps came to a crop, but the burnet to little; of a small quantity sown in the garden early in the spring, some perfected its seed, and some not. I am now making trial of it in the following manner: I have frequently observed, running a light pair of harrows over wheat, rolling it afterwards, has been of service; upon a few acres of my clover-lay wheat, I have, therefore, scattered the seed of burnet, light harrowing and rolling it in; by preserving the stubble during the autumn and winter, I hope to have good picking for cattle, for the months of March and April, and shall afterwards plough up and work the land for turnep fallow; if it answers my expectation, I would regularly have 20 acres in this course, whereas I should lose no crop, and incur little or no extraordinary labour; my greatest doubts arise from the slow growth of what I have made trials of. If any species could be found of more luxuriant growth, I have no doubt of its being a plant highly deserving attention.

Mr. Pitt says also, in other communication: "A neighbour of mine has observed the following valuable property in burnet as a meadow grass; namely, that it preserves the hay from over-heating in the stack; and that the hay of a meadow in his possession, which contains naturally a considerable portion of this grass, always comes out of the stack of a fine green fresh colour; while his other hay, equally well made, and the same in other respects, but without this plant, shall over-heat and come out quite brown: he is so thoroughly convinced of this fact, that he has this season bought from me a quantity of the seed, to mix with the other seeds in laying down a piece of land for meadow. I have observed, that the plant itself makes very good hay, and even after threshing out the seed, is eaten as clean up by horses as the best hay or clover; but the plant is less luxuriant in its growth than the broad red clover, the product per acre not exceeding two thirds of the product of clover in the same field. I think the plant a good one to sow instead of ray-grass with clover or trefoil, being abiding, very early in the spring, extremely hardy, bidding defiance to frost, and sustaining the chilling blasts of the east-wind without fading; the trial of it on clover-lay wheat failed, it being choked by the natural grass which generally abounds in clover-lay wheat substance.

BURNING of heath, a common practice of the country people for clearing heathy ground, in order to procure grass and herbage for their cattle.

The

The fittest time for burning commons is towards the latter end of the summer, when the plants are withered. But great care must be taken that the fire extends no farther than is intended.

This care consists chiefly in clearing away all the grass, &c. on the side you would preserve from the flames, to a distance sufficient to prevent all communication. The grass, &c. cut down there should be spread upon the part intended to be burnt, which will serve to kindle the fire after it is dry.

Besides this precaution, a fair calm day must be chosen; when by kindling the fire on the side the wind blows from, you prevent its spreading any further that way, and see it gradually remove up into the heath or common. The fire should be carefully watched for fear of accidents. But if, notwithstanding these precautions, it should spread to places intended to be preserved, and no water should be at hand, the most effectual way of stopping the progress of the fire, is to dig a trench: for by throwing up the earth on the side where the fire is, you cover the grass, and thereby hinder the flame from extending any further.

BURNING of lime, Mr. Marshal, in his Rural Economy of Yorkshire, says, is essential for the farmer, and is the sheet anchor in the Vale Husbandry, where lime is used invariably on every species of soil, and is in most cases with great success. In giving a detail of this operation, the following observations will be requisite:

1. Building the kiln.
2. Raising and breaking the stones.
3. Coals and their proportion.
4. Filling the kiln.
5. Drawing the kiln.

1. *The kiln.* The materials are either limestone entirely, or limestone lined with bricks on the inside. Neither timber nor mortar ought to be used in building a lime-kiln; the former presently decays, and the latter, by alternately swelling and shrinking, bursts the walls; besides rendering them in the first instance too tight to admit a proper quantity of air: no other air-holes than the eyes at which they are kindled being made in the kilns of this district.

The form of the cavity is an irregular cone inverted. At the bottom are generally two eyes opposite to each other; the cavity being here contracted to a thin point, or narrow trough; the width, that of the eyes. As the walls are carried up, the cavity takes by degrees a circular, or sometimes an oval line; at the same time receiving, as it rises, a conical form; until having reached somewhat more than half its extended height, the form is changed to cylindrical; or is sometimes contracted towards the top. The proportion between the depths and the diameters of these kilns that of the depth, being generally about one and a half diameter of the top.

The size varies from six to forty chaldrons.

2. *The stones.* The art of raising stones can only be learned by experience in the given quarry in which they are to be raised. They are sometimes raised by the day; sometimes by the load; but most generally the entire labour of burning is taken together at so much a chaldron of lime.

The breaking of hard strong stones is a laborious part of the operation of lime-burning. On the north-side of the Vale it is done by men with large sledge hammers; but on the Malton side, where the stone is soft, women are frequently employed in breaking.

The medium size is that of the two hands; but men burning by the chaldron will not, unless well attended to, break them so small: stones nearly as big as the head are sometimes, but very improperly, thrown into the kiln; for unless the proportion of coals be unnecessarily large, the outer shell only is burnt to lime, the core remaining a lump of unburnt stone.

3. *Coals.* The Morelands for the last fifty years, have furnished the north-side of the Vale with coals for lime-burning, and for an inferior species of fuel. The seam of this coal is thin, and the quality in general very ordinary.

Before the discovery of these coals, lime was burnt with furze and other brushwood; but notwithstanding the Morelands are now nearly exhausted of coals (unless some fresh discovery should be made), the district is relieved from the apprehension of returning again to its ancient mode of burning lime. The Derwent, besides an ample supply of coals for fuel, brings an inferior kind (both of them raised in West-Yorkshire) for the purpose of lime-burning. The

eastern end of the Vale is equally fortunate in this respect, by having the port of Scarborough in its neighbourhood.

The portion of coals and stones varies with the quality of the coals, and likewise, but in less degree, with the quality of the stone: the method of burning, too, varies the proportion. Three chaldrons of lime from one of coals (the measures equal) may be considered as the mean produce. From two and a half to three and a half for one, includes the whole extent of produce of well-burnt lime.

4. *Filling.* Some kindling, and an extraordinary proportion of coals being used at the eyes, and at the bottom, the kiln is filled up with stones and coals, in thin alternate layers; those of stones five or six inches thick, with coals in proportion; the coals, if not sufficiently small, being previously reduced to a gravel-like state; in order to run down more freely between the interstices of the stones, and thereby to mix more evenly with them.

The materials are cast into the kiln with large scuttles, which are filled with stones, by means of an iron-toothed rake, composed of four teeth about six inches long, of a head about a foot long, and a handle about four feet long.

If several men be employed in filling a kiln, it is common for each man to fill and empty his own scuttle. But this is an uncertain, and therefore an improper way of proceeding. Much depends on the regularity and evenness of the layer, and the due proportion of coals; and to judge of this with sufficient accuracy, requires some experience, and a steady eye; especially when the kiln is on fire, and the cavity to be filled up is full of smoke. If more than one person be employed in this case, it is highly probable the work will be imperfectly done.

Among the sale-kilns about Malton there is an excellent regulation in this respect. The scuttles are all filled, and brought to the top of the kiln, by women and boys, who deliver them to the master, or his foreman, standing there to receive them, with his eye fixed within the kiln; by which means he is enabled to distribute the stones and coals with the greatest accuracy.

5. *Drawing.* There are two species of kilns; or rather one species used in two different ways.

A kiln which is filled, fired, and suffered to burn out before any of its contents be drawn, is called a standing kiln.

If the contents be drawn out at the bottom, while the upper part is yet on fire, the vacancy of the top being repeatedly filled up with stone and coal, as the lime is extracted at the bottom, the kiln is termed a draw kiln.

Since coals have been used in the burning of lime, draw-kilns have, until of late years, been most prevalent. But at present standing kilns are most in use.

The reasons given for this change of practice are these: first, that the lime is burnt even in standing than in draw-kilns; in the drawing of which the stones are liable to hang round the sides of the kiln; those in the middle running down in the form of a tunnel, thereby mixing the raw with the half-burnt stones. The consequence is, the outside are burnt too much, the inside too little; the stones too frequently running down to the eye in a half-burnt state. Secondly, the unevenness of surface left by this method, together with the obscurity caused by the smoke, render the filling difficult; under-burnt stones, or an unnecessary waste of coals, is the inevitable consequence. A third argument in favour of standing kilns is, that a greater proportion of well-burnt lime may be produced from the same quantity of coals. It is allowed that more kindling fuel is requisite, and, at the bottom, a greater proportion of coals; but the fire by this means getting a strong head, a less proportion of coals are required in the body of the kiln; and what, perhaps, is of still more consequence, less heat is lost at the top of this than of the draw-kiln, which is always uncovered, and too frequently hollow and full of cracks; while the top of the standing kiln, being piled up in a conical form, and closely covered with sods or rubbish, collects a greater body of fire, and keeps in the heat more effectually.

One circumstance, however, relative to the standing kiln, requires to be mentioned. The inside should be lined with brick; for every time a kiln which is lined with limestone is suffered to go out, a shell of lime peels off the inside; by which means the walls are soon impaired.

The lime is drawn out at the eyes with a shovel, and generally carried out in scuttles, or in basket measures, to the cart or waggon.

Of a living kiln the drawing is generally continued until red ashes begin to make their appearance.

But standing kilns are suffered to burn undisturbed until the fire go out; except, perhaps, when the fire is rising toward the top, and a fresh supply of air is wanted, a few shovelfuls are drawn at either eye, by which means an internal hollowness is formed, and fresh vigour given to the fire.

From these circumstances it is plain, that a regular supply of lime cannot be had from less than three standing kilns; one filling, one burning, one drawing. The smaller burners, however, have frequently only two; and for a farmer, one, proportioned to his farm, is sufficient. About Brotherton and Nottingley, near Ferrybridge, from whence vast quantities of lime are sent to distant parts of the Vale of York, particularly towards Easingwood, the kilns are very shallow and wide; the cone of materials piled above the surface, being to appearance equal to the contents of the kiln. This renders the emptying of the kiln very easy; the lime being all thrown from the surface, or through a kind of door-way in the side; not drawn out of the eyes; which are in this case of no other use than to kindle at, and to admit of a supply of air. Those kilns are much less expensive than the kilns of this district, and more convenient. But query, Do they give as much heat with the same quantity of coals as a taller more cylindrical kiln?

Cost and price. The ordinary wages for the whole labour of raising, breaking, filling, and drawing, is 18d. to 20d. a chaldron.

At Malton, the labour, if taken by the gross, is about 18s.; the price of lime-kiln coals, with carriage from the keels to the kiln, about 14s. a chaldron (of thirty-two bushels) the produce better than three for one. The whole cost about 6s. the selling price 7s. a chaldron.

At Pickering, the labour is 20d. a chaldron: the price of moor coals and carriage 16s.; of Malton coals and carriage 18s. The produce, if sufficiently burnt, three to one. The mean cost is therefore about 7s. 6d. the selling price 8s. a chaldron. The building and repair of kilns, the wear of tools, the value of the stone in the quarry, and, in some cases, the carriage of it from thence to the kiln, are drawbacks upon the profits which appear in the above calculations. If therefore the stones be sufficiently burnt, the neat profit is in this case very small. Nothing, perhaps, would increase the profits of lime-burning in this place more than the kiln being filled by the hand of the master, or some judicious person not interested in a waste of coals. It is the interest of men who burn by the chaldron to underbreak the stones, and to make up for the deficiency of labour by an increase of coals; which likewise will make up for neglect, or want of judgment in filling. Let the stones be raised and broken by the chaldron, or the kiln; but let the filling be done by women and boys; by which means industry will be encouraged, and the stones, by passing under the master's eye, will of course be rejected, if not sufficiently broken.

BURNING of land. See the article BURN-BAKING.

BURNS. are accidents that often happen to animal bodies, whereby a solution of the continuity of the parts is produced.

In burns and scalds, when the skin remains entire, let the part be bathed well, and kept wrapped up in rags dipped in spirit of wine camphorated. Salt bound thick on the part has also been found very effectual for this purpose. Indeed all saline and spirituous applications excel all others, while the skin is yet unbroke; but when the skin is separated, anoint the part, and keep it constantly supple with linseed or salad oil, and a plaister spread with bees-wax and oil. If the skin be so scorched, that sloughs must be digested out, dress the wound with the wound ointment and oil of turpentine, and finish the cure with any drying ointment.

The fire supposed to be left in the part after injuries of this kind, is nothing more than the inflammation, which is the natural effect of such causes: so that the whimsical notions and conceits concerning fire remaining in the part, is extremely absurd. *Bartlett's Parriery, p. 251.*

BURNT-CLAY, a manure proper for close compact soils, which it opens, warms, and invigorates, and thereby disposes such lands to part with their vegetative virtues.

A correspondent of the editors of the *Museum Rusticum*, tells us, that he has experienced the efficacy of this manure on wet cold land; and gives the following method of preparing it:

"I caused, says he, a labourer to dig as much clay as made a number of walls nine inches high, the same in thick-

ness, and placed at the same distance from each other, in the same parallel direction; forming a square of about three yards. These vacancies, being like tunnels of brick-kilns, I filled with brush-wood, and on that threw some cinders or small coal, of which I had sufficient quantities, living then near some collieries; after which I covered the whole square with clay about three inches thick, leaving the ends of the tunnels open, which I then lighted on the windward side: as soon as the fire had got sufficient head, I stopped the mouths of them; and when I perceived the covering was almost burnt through, I had a small sprinkling of cinders or small coal thrown on the heap, and then another covering of clay of the same thickness; and thus I went on till my fire was seven or eight feet high.

"When I found my fire was very well kindled, which was commonly about the time I put my second coat on, I used to enlarge the base of the fire, by continuing the tunnels, and by adding new ones to the sides (which were filled and covered as the others, and then lighted), till I made my fire about seven yards square; for I soon found it never burnt well in the middle, if it was too large at first.

"Care should be taken that the labourer does not put on too thick a coat at once, as it will be apt to smother the fire: besides, by confining the heat in too much, the clay was apt to run and vitrify, which was then of little use.

"As soon as the heap was sufficiently cool (for the sooner it is laid on the land the better), I put about ten large cart-loads on a statute acre, and found it an admirable manure for either meadow, pasture, or corn; for the latter it will not last longer than three crops, though longer for the two former, and with this I have made prodigious improvements; but I do not believe it will answer for a sandy soil, as it will render it still lighter.

"This manure I burnt all times of the year, though flower in the winter than summer, but always fastest in windy weather.

"This I fancy may be burnt with brush-wood, or furze only; which I apprehend will answer better between the coats than coal, as it will keep the clay more open." *Museum Rust. vol. I. p. 407.*

BURNT-grain, a distemper common to corn, and too often confounded with smut, though it is, in fact, very different, and much more dangerous.

The smut, properly so called, occasions the total loss of the distempered ears; but as the black dust is very fine, and the particles of it have no cohesion, the wind and rain carry it off, so that scarcely any thing is housed in the barn, &c.

The burnt-grain is, on the contrary, often laid in the granary with that which is sound, to which it communicates a contagious distemper, and also darkens the flour, and gives it a bad smell.

The characters of this distemper are, 1. The plants that produce burnt ears are strong and vigorous.

2. The infected ears are not at first distinguishable from those that are healthy; but when they are past their bloom, they appear of a deep green colour, approaching to blue; they afterwards become whitish, and are then easily known. As this change of colour is effected by the sun, when a number of white ears have been suddenly perceived in looking over a wheat-field, the sun's heat has been often thought to cause this distemper, or a fog preceding that heat.

3. Though all the ears produced from one grain are commonly infected, yet M. Tillet, Aimen, and myself, have met with sound ears on plants that had produced others which were infected. We have even found some ears, part of which only were vitiated, and finally some grains inclosing partly a white flour, the remainder black dust.

4. In burnt ears, the chaff, or outward coat, was commonly found, with this single difference, that when the ears were near ripe, it appeared more withered and dry than in the healthy ears.

5. The bran, which immediately inclosed the grain, is not destroyed, as it is in the smut, properly so called; but has confidence enough for the grain to preserve nearly its natural form, with a whitish look.

6. The burnt grains are shorter, rounder, and lighter than such as are uninfected: they are sometimes larger, sometimes smaller. The furrow which runs the length of a grain of wheat is sometimes totally effaced, at others is visible: the pistils at the extremity of the grains are dried up.

7. The bud of burnt-grains is not visible.

8. Till the blooming season, there is very little difference between the burnt-grain and that which is healthy: they are only a little more swelled. But in the blooming season, the infected ears assume a bluish colour; the chaff

is more or less specked with small white spots: the grains are of a deeper green, and larger than a state of nature; and, as long as they preserve that colour, they adhere strongly to the chaff. The distemper has often attacked very young ears, while yet inclosed in the sheath. The stamina on the sides of the grain are then dried up and sickly; the embryo in part takes the deep green colour above-mentioned; the infected ears have not the consistence of those that are healthy; in the same measure the distemper advances, the chaff becomes dry and whitish.

9. The grains have some degree of firmness. On opening them, which may easily be done with the nail, there appears an unctuous, dark, brown, stinking substance, not at all resembling the light dust of smutty ears; the dust of burnt grain has some cohesion, and through a microscope appears to consist of larger particles than that of the smutty ears.

10. Some time before the blooming season, the grains appear to be filled with a whitish substance, a little burnt towards the bottom, and this colour extends by degrees over the whole ear: the grain then appears divided, as it were, into equal quarters, by furrows; which disappear as the grain increases in size.

11. By what has been said, it is evident that smut infects corn much sooner than the burnt grain.

12. Grains that are much burnt are evidently incapable of sprouting. But I have had some sound grains taken from an ear greatly burnt, which, in a kitchen-garden, have produced very strong plants; and though the birds disturbed my experiment, it appeared to me that there were some sound ears among many more that were infected.

13. A part of the burnt-grain is bruised by the flail, and their black dust is scattered over the sound grain; this unctuous dust chiefly sticks to the hairy extremity of the grain near the bud; it there forms a black spot. Corn so affected, is called spotted grain: many of the grains which escape the flail remain entire, on account of their lightness; a great deal is separated by throwing, but the spotted grain remains as well as many that are burnt: and this is enough to darken the flour, and give it a bad taste.

14. To remedy this inconvenience, and make the best bread, they pass the corn through drum-sieves (*cribles a tambour*) made of pierced iron-plates, like the graters with which they rasp tobacco; the corn is then washed, and all the light grains that swim skimmed off, which are mostly burnt. The water takes off the spots, which are but superficial; for if a spotted grain is wiped, the spot immediately disappears.

With respect to the cause of this distemper, I confess we are hitherto as much at a loss as in the case of smut. Some have attributed it to dung; others to fogs; many to the heat of the sun; some to insects; others to the moisture of the land; and not a few to the seed not being ripe: but these opinions are confuted by good observations, and by experiments very carefully made. We refer to what has been said of smut.

It may seem improbable that a mere superficial dust, that only sticks to the bran, without penetrating the grain, should be so contagious as to infect all the grain it touches, with a distemper; what is more surprising is, that it should injure the organs of fructification only. Yet, however improbable this may appear, the experiments made by Mons. Tillet put it past a doubt; they shew that the farmers are not without reason cautious in avoiding to sow spotted grain.

As it would take up too much room to mention, at large, all the experiments made by M. Tillet, which are to be found in the papers published by him on that subject, I shall content myself with relating the result of these experiments, and the inferences this able naturalist draws from them.

Several writers having mentioned dung as the immediate cause of this distemper, and others having asserted that it was hereditary, all M. Tillet's experiments were calculated to clear up these two points: he was at the same time in hopes, by means of the same experiments, of finding some method of guarding against this terrible distemper.

1. The several kinds of dung had no visible effect in producing burnt-grain. The infected seed produced as much burnt-grain in the ground that was not dunged as in that which was. He did not find that dung had any effect, either in favour of, or against the distemper.

2. Dung made of the straw of infected grain, did not seem to communicate the distemper; but the infected straw unrotted seemed to communicate it. Yet the effect

was most visible when the dust of burnt ears was mixed with the earth.

3. All grain naturally spotted, whether it grew on the land, or was brought from another place, bearded wheat, summer wheat, and wheat without awns, produced a great deal of burnt-grain.

4. Picked wheat taken from the finest ears, and carefully selected grain by grain, that none of it might be infected, being sowed, some in dunged, and the rest in undunged beds, without having received any preparation, yielded little or no burnt-grain.

5. Some of this same picked wheat being sprinkled with the dust of burnt-grain, produced as many distempered ears as that which was naturally spotted.

6. The picked wheat, being prepared with lime and a solution of the sea-salt, yielded still fewer infected ears than when unprepared.

7. There were still fewer from what was prepared with lime and nitre.

8. Early or late sowing seemed to be a matter of indifference.

9. It appears, by M. Tillet's experiments, several times repeated, that the dust of burnt ears is contagious, since found wheat sprinkled with it, or sowed in rills in which that dust had been put, produced a great number of infected ears. He also found that this dust, though exposed to a strong heat, as of sixty degrees, is still contagious, unless it is absolutely burnt by the fire, when it has not that effect. Though it is kept for years, its infectious quality continues as strong as ever.

10. Some farmers wash their sacks in which they put their seed. And it appears by M. Tillet's experiments, that they are in the right; for if the sacks had any of the dust on them, it would certainly infect some of the seed-corn.

11. M. Tillet thinks he has observed, that the infected plants are more susceptible of injury from frost than others.

If this is the case, hard frosts must be serviceable, since by destroying the infected plants, they would have the same effect, as if such plants had been all pulled up. The land being cleared of these useless plants, would be better able to supply such as are sound with nourishment, and the crop would be exempted from infected ears, which are a great hurt to it.

12. The black dust so contagious, is not so to rye or bere; but the dust of darnel is pernicious to wheat.

13. Smyrna wheat is less subject to this distemper than other grain; but summer wheat is greatly injured by it.

It must be allowed, that the knowledge which has been acquired of the cause of this distemper, has put the curious observers in a train of finding proper preservatives. In fact, as the dust of burnt-grain infects all the grain it touches, it is probable that every method should be deemed efficacious, that is capable of taking away this dust, provided the virus has not from its first contact affected the interior part of the seed intended to be sowed. In this case the several sieves which we have recommended to be used in the preservation of corn, and the washings with fair water, which in many places is used on spotted grain, may be mentioned as efficacious preservatives, as well as lime-water which our farmers use, the strong brine used in some provinces of France, and the solution of arsenic, of which some persons have made such a secret: all these preparations should be of service, and, according to M. Tillet's experiments, they are so: yet they are often insufficient. This point, therefore, merited to be cleared up by particular experiment, and with all necessary care. M. Tillet set about it with spirit, and the following are the inferences that may be drawn:

1. The effect of the black dust on the seed is only superficial, till it is put into the earth, not at all affecting the interior parts.

2. Therefore every means that can tend to clear them of the dust, must be of service to keep them healthy and free from the distemper.

3. Grain perfectly free from this, and from rottenness, will yield no distempered plants.

4. Grain blackened with this infectious dust, may be made healthy by clearing it of such dust.

5. Sifting seed, and washing it in several waters, lessen, it is true, the effects of the contagion; but this is not sufficient, as many infected plants will be produced, though the seed was washed in several waters.

6. Lime, which is more efficacious than water, is not always

always enough so. I shall observe, on this occasion, that seed was formerly limed in a manner different from what it is now. The seed was then put into baskets, which were plunged into lime-water very hot. The seed was stirred in the baskets, and all that swam on the water was taken out with a cullender; by this means they got rid of the infected grain; and the good seed was better cleaned, than by only throwing, as they do now, lime-water on a heap of seed, which is then stirred with a shovel, or by only mixing the seed with the slacked lime reduced to powder.

One of our farmers, a careful man, being obliged one year to sow spotted seed, he limed it by immersion, in the manner above described; and the year following had no burnt-grain.

Some experiments made in the county of Caux, by M. de Gouffreville, have been published; they evince the good effects of lime used in the manner we have mentioned. And what is still a farther confirmation of this is, that whenever our farmers sow seed that has not been limed, their fields are amazingly infected.

7. It is a good precaution to wash spotted grain in several waters; but it should be soaked in brine, and this brine should be absorbed by lime by immersion, as we have described.

8. A strong brine of sea-salt is very good, and may be employed to great advantage in countries where salt is a merchandize.

9. One part of nitre to nine parts water is more efficacious than sea-salt; this, therefore, should be used where nitrous earths abound.

10. Strong alkaline lyes are still better; salt-wort, potash, ashes of tartar, lyes of common ashes much impregnated with salt and human urine, or cows urine alkalised by putrefaction: of these various articles such may be chosen as are most common. For instance, in Normandy ashes of sea-wrack, which are very cheap there, may be used. This, which is rejected for dying and lyes, as being more impregnated than alkaline with sea-salt, may be advantageously used in the preparation of seed.

11. As it is evident that seed picked with care yields very few infected grains, it must, of course, where a farmer has spotted grain, be of great advantage to him to change his seed, in order to procure what is uninfected.

12. M. Tillet's process may be comprehended in what follows: if the seed is spotted, it should first be washed in several clear waters, till the black is quite got off; it should then be put into the steep. If it is not spotted, soaking it in the following liquor will be enough. Make some lye, such as is used for linen, in a bucking-tub, putting four pounds of water to every pound of ashes. If one hundred pounds of ashes are used, and four hundred pounds of water, there will be two hundred and forty pounds of lye, to which must be added fifteen pounds of lime, which will be enough to prepare sixty French bushels of wheat (between sixteen and seventeen bushels English measure). When this steep is to be used, it must be heated as hot as you can bear your hand in it; the seed, being put into baskets, must be plunged into it, and stirred with a stick; the baskets must then be raised and kept up by sticks on the edge of the bucking-tub for the lye to drain: the seed being thus prepared must be laid on the floor of the granary till it is dry enough to sow. If it is prepared long before it is wanted, it must be, from time to time, stirred with a shovel to prevent its heating; with this precaution it may be kept a month, or even a whole year.

We prepared some seed in this manner at M. Taponat's, near Rochefoucault in 1760; and in 1761 we saw with pleasure that the corn so prepared was uninfected; whilst in the neighbouring fields, a fourth, a third, and even half the crops were spoiled by this distemper.

All the trials that have been made evince that acrid substances are proper remedies for this distemper: I also believe all the steeps to be good; but prefer M. Tillet's as being more acrid, and least costly. I imagine lye that had been used for linen might do, only strengthening it with some sea-wrack, and putting twice as much lime. I know this lye to be very acrid, but cannot answer for its efficacy in preserving corn from being burnt, because for several years past we have scarcely had any of our grain so infected.

13. Several farmers in different provinces have used a solution of arsenic to prepare their seeds. Great complaints have been made in all quarters of it. Among others, a

physician published an *Essay* to shew of how much importance it was to prohibit the use of this poisonous steep. He there enumerates all the accidents that have happened to the sowers, and to the men that made the preparation, of which himself was a witness. Since M. Tillet has given us a method simple and innocent in itself, but little costly, and of great efficacy, to clean spotted grain, it is to be presumed that no body will use this pernicious drug, from which such melancholy consequences may ensue, if by accident any of it should be mixed with the meal, and if the light corn is given to the poultry or cattle; besides, this poisoned seed must kill all the partridges and pigeons that eat the uncovered grain.

As some people are fond of making objections, it may, perhaps, be urged, that if the black dust was so infectious, this distemper would make from year to year such progress, that in the end we should have nothing but burnt-grain. But we need not be apprehensive in this respect; and a year in which much corn is infected, succeeds one in which scarcely any burnt-grain was to be met with. Scarcely any was to be found in the crops of 1754, 1760, and 1761.

In reflecting on this objection, which has some weight, I think I have found an answer to it in M. Tillet's observations, which is, that hard winters, past all doubt killing the distempered plants, stop its progress.

It may also be said, that if this distemper is only caused by the infectious dust, how can it at first get footing in a province that was before unacquainted with it?

It is readily allowed that this distemper may be attributed to other causes besides the black dust: but M. Tillet's experiments incontestably prove this dust to be contagious: and his researches supply us with the means of lessening considerably, if not entirely extirpating this distemper: thus we may have larger crops, better bread, and corn more proper for keeping. What a satisfaction must it be to a man to have made a discovery so useful to his fellow-creatures, whose chief food is the several sorts of grain! We shall soon see whether habit, supineness, and ill-judged economy in the farmers, will not prevent them from reaping any benefit from M. Tillet's labours, who yet proposes to them simple and cheap methods of attaining an end which to them ought to be of infinite consequence. *Du Hamel's Elements d' Agriculture, vol. I. p. 134.*

Mr. Young, in vol. III. of his *Annals of Agriculture*, has inserted a letter from a correspondent, who says, "I beat down some hedges to throw three fields into one, and consequently ploughed across the old grass borders. The whole field was sown with wheat at Michaelmas. There was very little burnt wheat in any part of the crop, except on those old borders, and there a great deal. It seems that the cause of the distemper can only be discovered by making many observations. I simply state a fact, and leave others to reason upon it." Mr. Young further says, "A friend of mine, who was remarkably attentive to the distempers of corn, conceived that the smut was owing to a damage in the root of the plant. Indeed other experienced farmers classed burnt wheat as a species of smut: now, if the cause is to be looked for in the root, the foregoing observation is exceedingly in point, for an old grass border would almost to a certainty abound with the red worm, which eating the roots of the wheat, would destroy some, and damage other plants, and might consequently occasion the black ears. I may remark, that Mr. Varlo, in his *System of Husbandry*, assigns the smut to worms, and gives various instances strongly proving it."

BUR-TREE, a name given in some counties to the elder-tree.

BUSHEL, a measure of capacity for dry things, as grain, fruits, pulse, &c. containing four pecks, or eight gallons, or sixteen quarts.

A bushel, according to a statute made in the twelfth year of Henry VIII. is to contain 2,178 cubic inches, or eight gallons of wheat; the gallon of wheat to weigh eight pounds troy-weight. Mr. Ray tells us, that a bushel in Warwickshire is equal to two strikes, or two bushels, statute, or Winchester measure.

The French bushel consists of four quarters, and the quarter of four litrons, each containing thirty-six cubic inches. Consequently the bushel contains 576 French cubic inches, which, according to Mr. Greaves's calculation, is nearly equal to 615 English inches. The French bushel therefore is to the English bushel, as 615 is to 2,171. That is, the French bushel contains one peck, a quart, and two

two cubic inches nearly. It must however be observed, that the French bushel for oats is double that of any other grain.

BUTCHER'S-BROOM, or kneec-holly, the name of a plant common in woods in divers parts of England.

BUTTER. Mr. Young in his *Annals of Agriculture*, vol. XIV. has given a treatise on butter and milk, and on the traffick of salt butter, translated from the *Memoirs of the Royal Society of Agriculture in the generality of Rouen in Normandy*; which, as it has been highly approved, we shall here insert:

"The trade with foreign markets for butter to supply the great towns, and to export to our colonies abroad, being very considerable in France, it is natural to wish, as much as possible, to contribute towards bringing this article to perfection in this kingdom; and as Normandy, from being in possession of very good pasture land, on which vast numbers of milch cows are maintained, is capable of producing a great quantity of excellent butter, it has appeared essential to us to treat on the subject.

All the people of Normandy know the defects found in their butter, but few of them are sensible that these defects are much less to be imputed to the quality of the milk, than to the management of the dairy. One district only has acquired this knowledge, and none of the others have profited from its example, during the many years it has enjoyed this advantage.

By following the method observed in the district of Bray, which I am now about to describe, the butter would be delicately sweet and good throughout the year, and would become an interesting article of domestic concern, because it would then be proper for salting, and in a state for keeping during whole years; and by this method obtain a preference in the sale of it, to all other butter differently made, which would be a saving to the kingdom of considerable sums of money now paid to foreigners, who supply us when our ports are open, with a great quantity of very indifferent butter.

OBSERVATIONS made at MERVAL on the METHOD of making BUTTER in the DISTRICT of BRAY:

The milk is deposited in vaulted, deep, cool cellars, nearly such as are constructed for the keeping of wine, the temperature of which, both in winter and summer, is from about eight to ten degrees, by M. de Reaumur's thermometer; some are paved with common square earthen tiles, and others with common bricks. When they are apprehensive of the heat penetrating into these cellars, the air holes are stopped, during the heat of the day, with a wisp of straw; the same method is observed to prevent the cold penetrating during a frost. The door as well as the air holes should be placed so as to open either to the north or the west; the entrance is frequently made through an apartment of the house, in which a fire is never lighted.

Cleanliness is thought so essentially necessary in these cellars, that they banish from them all wooden utensils, planks, &c. lest they in time should rot, and occasion a smell in the place. Not the smallest appearance of dirt is to be seen, either on the roof, or the sides of the air holes, or on the floor; to preserve which cleanliness, the bricks are frequently washed; no person approaches these dairies but in wooden shoes, which are always taken off and left at the door by the people who have the care of the dairy, and whose business it is to put upon you the shoes proper for entering the cellar; the least smell then, excepting that of fresh milk, would be detrimental to the butter, and looked upon as a want of attention in the servants. Cleanliness is held so essential to the perfection of butter, that in Saxony and in Bavaria, when the cows have lain in a stable, they rub and wash them before they are milked.

The vessels into which the milk is poured are earthen pans, scalded with boiling water, to cleanse them from the stale milk, which may have been incorporated into the earthen ware of which they are made. This rancid milk is an invincible sort of leavin, but well known, from repeated experience, to be destructive of the new milk by its acidity. The size of the milk-pans is fifteen inches wide at top, six inches at bottom, and six inches deep. These dimensions are taken on the outside of the pans; a greater depth would be hurtful, and more width would be inconvenient. Each pan contains four quarts of milk: they are placed on the well-cleaned bricks of the cellar-floor, whose coolness prevents the milk from curdling; to answer which end, and to hinder it from turning sour in summer, before the cream is

taken off, and freezing in winter, so as to render it too difficult to procure butter from cream so frozen, are the great objects to which every thing tends in these cellars. The milk is carried in wooden pails, or in earthen vessels, into which it is milked, to the dairy, from whence all brass utensils are banished, as dangerous: it is left to remain in these pails for about an hour, until the froth and the natural warmth of the milk have subsided, then it is poured through a sieve, to prevent hairs or any other filth from entering into the pans, in which it is set. The pans, thus filled and placed on the bricks, are left for four and twenty hours, and often for a less time; they are then skimmed; to delay the skimming a longer time would be wrong, for the cream would lose its sweetness and become thick, and the milk from whence it is taken be curdled and sour, which is absolutely against the goodness of the butter. In skimming it they proceed as follows:

The dairy-maid lifts the pan gently from the floor, and places the spout of it into a large pitcher made for holding eight or ten quarts, and with the end of her finger raises the cream just at the spout, so as to let the milk from underneath flow into the pitcher through that opening, by which means the cream remains by itself in the pan: all the pans set at the same time; the cream is then collected into other pitchers to be churned.

If the season requires the cows to be milked three times a day, the same process as above is likewise observed thrice in that space of time, when the milk has been deposited for four-and-twenty hours in the pans.

It is to be observed, that from the milk-pans being only six inches deep, the particles of butter rise more speedily to the surface, and are sooner formed in the course of eighteen or twenty hours, more especially when the temperature of the air in the cellar prevents the milk from being coagulated.

If the weather is tempestuous, very sultry, and threatens a storm of thunder, the milk is apt to curdle and become sour, which should be prevented. The dairy-woman, as soon as the most distant thunder is heard, hastens therefore to the cellar, has the air-holes stopped, cools the bricks by sprinkling them with water, and skins those pans on which the cream has begun to set, for on such extraordinary occasions the cream usually appears in twelve hours time.

By pouring off the milk from the cream, in the space of four-and-twenty hours after it is set, the butter-milk in the cream cannot have acquired any acidity, since the skim-milk remains perfectly sweet, and is of so thin a fluid that no part of it rests with the cream to turn it sour, during the four or five days it is kept in the cellar before it be churned.

Those who are acquainted with the general custom of the Higher and Lower Normandy, in the management of their dairies, will easily judge that the earthen pans, large enough to hold from nine to ten quarts, usually made use of there, cannot be so cool as those employed in the district of Bray; and that the custom of pouring the milk still warm into them must tend to heaten, instead of cooling, and prevent the particles of butter in the milk from rising soon enough to skim the cream before the milk becomes sour; that likewise the custom of exposing these great pans to extreme cold and great heat, without paying any attention either to the smell or to the cleanliness of the place, must militate still more strongly against the goodness of the butter, and that the suffering the milk to curdle, and grow sour before it be skimmed, by leaving it in the pans for five, six, and often eight days, are methods of destroying both the milk and the cream so effectually as not to derive any advantage from them.

It is a known fact, that acids destroy visibly greasy particles, by giving them either the consistency of soap, or reducing them to water; it is likewise acknowledged in the district of Bray, that the cream taken off, when light, new, and sweet, from milk which still retains its sweetness, produces a greater quantity of butter in proportion, than when it is suffered to remain and grow stale, or curdled sour milk; it not only lessens the quantity, but is likewise prejudicial to the quality, by being greasy, not keeping fresh, and totally unfit for salting: the principal object of our enquiries.

We are well acquainted with several districts of this province, in which the butter made, is good, and delicately sweet in autumn, and at the beginning of spring; but it becomes greasy and bad in summer, because the temperate coolness of the spring and autumn naturally operates nearly in the same manner as is effected on the milk, by industry, the whole year, in the district of Bray: on the return of the

the summer, the founes of the milk spoils the butter, makes it not worth purchasing, notwithstanding the excellence of the feed; it is from hence to be presumed, that if a better method were adopted, they would not be deprived of the advantages which might reasonably be expected from that fine season, when the pastures become infinitely better and more luxuriant. We know a farm, whose principal return was in butter, and which formerly, when it was occupied by intelligent people, produced butter of a superior quality, and sold as such even in the district of Bray; this farm having passed into other hands, less intelligent on this article, and the farmer's wife having imbibed all the prejudices she had been taught in the district of Caux, and adhering strictly to them during the nine years of their lease, the butter from thence was sold during that period on the footing of the very worst, and for a third part less than that of their neighbours; but neither this loss, nor all the remonstrances of the proprietor of the farm, could prevail on her to change her method of proceeding. For the last eight years this same farm has been in the possession of a skilful and laborious man, who follows the best plan, in consequence of which, his butter immediately regained its credit, and is now ranked among the best sorts in the market of Gournay. It is from this last-mentioned farmer that we have taken the account here given of the management of the dairy. This anecdote proves the advantage to be gained by judicious management, independently of the soil, however good that may be in itself.

All skim-milk is sent out of the cellar, lest it should prove hurtful to the other milk, but the cream is kept there, four, five, and sometimes eight days, before it is churned, notwithstanding which, they acknowledge, that the less time it is kept, the nearer the butter is to perfection.

In large farms, where the cream is in too considerable quantities to be confined to the common churn, they make use of a machine called a *serene* or churn; it is a barrel three feet long, by two and a half round in the middle, measuring it on the outside: at each end is placed an handle fastened on by means of an iron cross which supports them; these handles rest upon a wooden tressel made for the purpose, of a convenient height, for the women to turn with ease the churn. The iron crosses on which the handles rest, and which are fastened at each end of the barrel, serve to prevent the being obliged to pass an axis through the inside where iron would be improper: these handles are made three feet long, to allow of two or three people working together, when the quantity of butter in the churn requires so much assistance.

The inside of the barrel is furnished with two small shelves, each four inches high, fastened to the staves of the barrel, representing the interior view of the machine; but in the opposite side, the shelf reaches from one end to the other of the barrel, being fastened to the staves by the ends. These shelves are made sloping at the extremities, that the fluid may with more facility run off the slope when the churn turns round.

An hundred pounds of butter may be made at a time in a churn of the above dimensions: there are some larger, as well as some of a smaller size: it matters not in fact what implements are used in the making of butter, since they cannot influence its quality, provided the proper attention is paid without interruption to the business; the churn is used to accelerate the work by making a great quantity at a time; any other machine that would answer the same end, might as well be employed for the purpose.

The cream being poured into the churn, the opening, which ought to be at least six inches wide to be convenient, is then closed with a bung wrapped round with cloth dipped in lye, as will be mentioned hereafter; over the bung they pass an iron peg, which goes into two strong iron staples fastened to the barrel, so as to stop it closely: four or six people then turn the barrel, until the butter is made, which is done in an hour's time in summer, but lasts for several hours in winter. This work costs but little, for the farmers' servants make the poor women in the village assist them, for the trifling recompence of the butter-milk.

It is easy to conceive that the cream must soon be churned by the action of turning the churn as it falls, each time twice, from one of the small shelves to the other; the butter is known to be made when it falls in lumps: the butter-milk is then poured from it through a hole, that had been stopped with a wooden bung of about an inch in diameter; by this same hole, they pour through a tunnel a pail of cold water, and having bunged it up again, they continue to

turn the churn in order to wash and cool the butter; this work is repeated three times, if they wish to have the butter well cleansed, and it is suffered to remain some hours in the last water to cool, and to increase its hardness, when the heat of the weather makes it requisite.

The butter being sufficiently cleansed, they open the large bung hole, from whence with the hand they draw the butter out in balls, from two to three pounds, which they form into lumps of different weights, even as far as to fifty pounds, by heaping it up on linen cloths washed in lye for the purpose. The largest lumps are the most valuable, because they are kept thereby better for exportation; they decorate this merchandise with small pieces of wood carved, and mark it with wooden spoons.

The natural whiteness of the butter during the winter months is unpleasant to the seller, to the buyer, and still more disagreeable to the consumer; a method, however, has been found out, for giving it the same yellow colour it has in summer, without making any change in the quality of the butter, or giving it the least taste.

A great quantity of the leaves of the marigold flower are gathered, either of the double or single sort; they are both equally good when fresh plucked; as they pick them, they throw the flowers into a stone jar, which is covered up, and deposited in the milk-cellar, where, after standing some months, these leaves become a thick liquor that retains all the colour of the marigold: with this liquor they colour their butter during the winter, by putting a small quantity of it with the cream, when they fill the churn; custom teaches the quantity necessary to be used of this liquor; it must depend much on the degree of colour you wish to give your butter; it remains fixed, for the butter never loses it; the flowers of marigold have not any unwholesome quality in them being considered as cordials; and sudorifics, the very small quantity used in this process cannot have any sensible effect.

On the cleanliness necessary to be observed in the making of butter.

Butter sticks not only to every thing it touches, which is not exactly clean, but it likewise does so, to whatever has been well washed, and even scalded with boiling water, unless the cloths, utensils, &c. have been washed in lye, made either of fine ashes or of green nettles so mashed as not to sting: this last is most frequently used, and each time any vessel, cloth, and other utensil has been employed about the milk, cream, or butter, they are washed in this lye, before the using of them again; nay even the mistress of the dairy, who commonly has the charge of handling the butter in taking it out of the churn, to make into lumps, is obliged to rub her hands and arms with the lye, to prevent the butter from sticking to them.

The use made of the skim, and butter-milk.

The milk that remains after yielding the butter, consists first of butter-milk which feeds the poor people, and is made into soup, for the labourers, and women servants of the farm, and serves also to moisten the bran which is given to the poultry in the yard, &c.

Secondly, the skim-milk.—This is given to nourish the calves, is made warm, and mixed with an equal quantity of water, but the milk being deprived of its rich particles, occasions amongst the calves a languid disorder, of which great numbers formerly died; but a remedy is now found out for it, by restoring the sick calves to their mothers, who by suckling, soon bring them back to their former vigour; this is, however, an expensive remedy, because it deprives the farmer of the butter he would otherwise reap from the milk.

It is said, that by mixing the skim-milk, with an equal quantity of water in which turneps, parsnips, and such like sweet and nourishing roots are boiled, prevents the disorder, and fattens the calves, the juice of these plants supplying in some measure the want of the particles of butter taken off with the cream.

We think this experiment may be very safely tried: but it is necessary to inform the country people, who in general make use indiscriminately of copper vessels for heating the skim-milk given to their calves, that this milk being disposed to turn sour, draws from the copper a corrosive quality, likely to hurt the animal and even to prove fatal to it. It is much safer to use earthen vessels or iron boilers, from which no inconvenience can arise. With regard to the remainder of the skim-milk not used for the calves, it is turned

ed as soon as possible into curds, before it becomes sour, and then made into common cheese for the servants of the farm, and to sell to the poor people: moreover the whey from the cheese is mixed with whatever skim-milk is left, and serves to feed the hogs.

On the salting of butter.

The object we have in view is to render the butter proper for salting, and by such means to introduce it as an article of commerce, not only in the interior of the kingdom, but to make it such with the other countries of Europe, and to extend this branch of trade beyond the Tropic.

The process we have explained in the foregoing pages, gives all the necessary qualities to be desired for the butter being kept; but to ensure the keeping, it must be properly salted; to accomplish which, much depends on the quality and quantity of salt used, and the vessels into which it is put after being salted, and on some other circumstances.

The farmers not being accustomed to sell their butter ready salted, carry it to the markets of those towns where the consumption is greatest; there each person provides himself with the quantity of fresh butter he wants; the buyer distinguishes the good qualities of that made in the district of Bray (whose management of the dairy I have explained) from what is made in the district of Caux; he gives a good price for the first, and rejects the last, which is consumed fresh in the interior parts of the country. The butter should be salted, as soon as possible; all delay being prejudicial to it. They wash it until the water no longer appears milky; the grey salt, such as is distributed by the Gabelle, ought to be used, and not white salt, which is reputed bad for all sorts of salt provisions: the grey salt is put into an oven to dry; it is then pounded; the butter being washed and spread out, an ounce of this dried and pounded salt is sprinkled on each pound of butter, which is then worked up until it is well incorporated, and put into stone jars of different forms; the jars having been first scalded with boiling water, in order to be cleansed from any remains of the former butter that may have insinuated itself into the pores of the stone; after the scalding, they are scoured with lye, as mentioned before in speaking of the utensils, &c. employed about the butter.

These jars contain from twenty to thirty pounds; the salted butter is pressed down in them, and filled within two inches of the brim: it is then left in that state seven or eight days, during which period it diminishes, and shrinks, so as to leave a space between that and the sides of the jar, into which the air might gain admittance, and would spoil the butter if it was left in that situation; to prevent this accident, they prepare a brine of common salt and water, made strong enough to bear an egg, for it would be risking much to make it weaker; the brine being left to settle, is then drawn off clear, and poured on the butter in such a manner as to fill up the space between that and the jar, and to dispel the air from it; to effect which the brine is poured in by degrees, a little at a time, and the jar gently moved. They augment the quantity, until it rises an inch above the butter, which is thus secured on all sides from the air, unless it should float in the brine, in which case the lump must be increased, so as to keep it by its weight down, and preserve every part of it from spoiling by being exposed to the air.

These are the methods observed in salting of the butter we keep throughout the year at Rouen; it is used in the first families there, and employed with success in the preparations made for the most delicate tables.

All butter salted in this manner, and kept in stone jars, with a sufficient quantity of brine, would have the same advantage with this of the district of Bray, of which we are speaking, because the principal cause of its keeping proceeds from the cleansing it entirely of all the acidity, from the sour milk, and the potting it in good stone jars, well scalded and scoured in lye, (as we have already recommended) that cannot communicate any bad quality to the butter.

When this merchandise is to be sent to a distance, the brine cannot be preserved during the journey; in order therefore to replace it, salt is laid an inch thick over the top of the butter, which answers very well for a short space of time, so that well-made butter sent, when salted, from divers districts of Normandy to Paris, or into the neighbouring provinces, would be very good although it arrived without the brine.

The case is not the same with butter destined for shipping; it is difficult to carry a great quantity of it in jars because of their being brittle; from hence comes the method of putting it into kegs of wood, but whether it is put in wooden or earthen vessels, it is equally impossible to keep it covered with its brine in the hold of a ship destined to sail beyond the Tropic.

To remedy these inconveniences, particular attention ought to be paid in preparing the wooden kegs, to preserve them from the fermentation of which they are so susceptible, when exceedingly heated in the hold of the ship, as for the sap to give and change the quality of the butter, so as to make it greasy in spite of the salt. The same fermentation in a little time shrinks the staves of the keg, the brine then runs out, and the butter spoils immediately; a remedy for this may possibly be found, and it would, without doubt prove a most advantageous discovery, as it would probably tend to the preservation of all the provisions embarked on the sea, upon which depends, in a great measure, the success of navigation, and the health of the navigators. The bad quality of these provisions has been more destructive of mankind than all the shipwrecks and battles ever were: but this subject demands reflections and experiments very foreign to agriculture.

To preserve the butter during the navigation, it must be pressed down into pots, covered with salt, and guarded from any air coming to it; a vessel of a conical form, or one quite a cone, from whence it might easily be slipped out in a lump, after it has contracted itself into that form, would be such as I should prefer; for the whole lump being then done over with salt, and forced down again into the pot, might keep without brine, because the cone being placed on its point downwards, the butter would sink more and more into it, from the heat of the ship's hold, by which means the only void space would be on the top, which would be covered with salt: tubs made of wood, in like form, would answer the same end, provided the fermentation of the wood they are made of could be prevented.

In general, to judge from the nature of the soil, and from the animals fattened there, the greatest part of the pasture land in Normandy appears preferable to that in the district of Bray. If, by means of some encouragement, the method of making good butter could be introduced into those districts where it is now so ill made, the salt butter that is brought from Isigny, and from some of the other districts of Normandy, would not be left for the use of the common people only. It is to be presumed that such butter would then become the basis of a commerce, most lucrative to the possessors of extensive pasture grounds, since at this present time there is not a milch cow which does not bring into its owner a clear yearly profit of fifty livres. Besides the advantage to be gained from the rise in the value of butter, and in the fattening of calves and of the cows, it is well known that the feeding of bullocks is not nearly so profitable to the grazier as the keeping of milch cows would be. This advantage would last until the quantity of butter was in proportion to the demand made for it; and let what would happen afterwards, it is a branch of trade that must always be an interesting article of agriculture, by putting us in a situation not to employ any longer foreign aid for our supply."

The great demand for this treatise, and the general wish to follow the method we have here explained, makes us hope that in time it will prove of much utility to the farmer and the labourer, as well as the proprietor of farms. See the article DAIRY.

BUTTER-BUR, or *pestilent wort*, the name of a weed resembling colt's-foot in many respects; but the flowers are purple, and grow in a thirfe. The leaves come out after the flowers decay; and are like those of colt's-foot in shape; but three or four times as big. It infests meadows and pasture grounds, where it proves a very troublesome weed. See the article COLT'S-FOOT.

BUTTER-FLY, the name of a numerous, and well known-class of insects.

M. Duhamel has frequently noticed and made drawings of a species of small insects, some of a bright red, and others black, found in great numbers in the ears of wheat. He suspected that they fed on a sweetish juice which is in the ear whilst green: and M. Tillet, who was immediately of opinion that they might do considerable damage to the grain, followed them very arduously in all their metamorphoses, of which he has given a full account in a memoir that

that gained the prize of the academy of Bourdeaux for the year 1755.

The inhabitants of a considerable part of the province of Angoumois have, for thirty years past, sustained an hitherto irreparable loss, by an insect which begins to devour their corn, even in the ear, before it is reaped. This scourge deprives them annually of their most promising crops. It appeared at first only in a few hamlets, but soon made a rapid progress, and has now spread to the lands of upwards of two hundred parishes. Famine and the most fatal epidemic diseases have often taken rise from less beginnings. Messieurs Duhamel and Tillet were deputed by the Academy of Sciences at Paris, of which they were members, to enquire into the nature of this insect, and the means of preventing and curing that dreadful calamity occasioned thereby. They jointly published a small treatise on this subject, from whence we shall extract the following remarks so much the more readily, as their means of prevention and cure in this particular case may be equally applicable to the injuries done to corn by insects in general.

This insect is most generally known as a butterfly, very much like the moth which preys upon woollen cloths, or the false moth, which is found in great quantities in the granaries of all countries, and which feeds on corn. M. de Réaumur, whose accurate inquiries into nature nothing could escape, has minutely described both these insects.

The butterflies which proceed from the wheat caterpillar are often smaller than the false moth. Some of them are however, larger, and longer shaped: but, that excepted, they are much like them: they are likewise of the class of four-winged phalænæ or night butterflies: their wings are long in proportion to their breadth, which is almost equal at the upper and the lower end. The colour of the upper wings varies; being sometimes of a light, and sometimes a darkish greybrown, but always shining when exposed to the sun. The position of these wings, of which the edges are close set with long hairs, is horizontal when the insect first settles after having flown; but soon after those edges incline downward. Its head (Plate V. fig. 24, 25, 26.) is furnished with two antennæ (fig. 27.) the joints of which, nicely fitted into each other, lessen gradually up to the point. Its eyes are almost as large as those of the false moth. Between the antennæ are two beards, (fig. 28.) which proceed from the lower part of the head, and rise up above it; and likewise between the antennæ is a tuft of hairs, which turn up backward.

These insects do not take any food while they are in the state of butterflies, as will be proved by several experiments; nor do, or indeed can they, prey upon and destroy corn during that time, as is the general, but mistaken opinion in Angoumois; for they have not even organs capable of doing it the least injury. Their only function then is to procreate their species.

The males of these butterflies seem, in general, to be larger than the females: but they cannot well be distinguished with certainty, unless they are seen coupled together, which, according to the very nice and careful observations of Mess. Duhamel and Tillet, never is but in the night-time, or in a dark place. Their copulation then is like that of the silk-worm butterfly: the body of the male and that of the female then form one straight line; their heads are turned different ways; the ends of their wings rest upon each other; and their conjunction lasts several hours. The abovementioned gentlemen, with many other witnesses, saw great numbers of them in this situation, both upon heaps of corn in granaries, and upon ears of corn in the field. They caught two of them in the act of copulation, and put them into a glass covered over, where they then separated, but were found joined together again next day, in the evening.

As soon as the female is impregnated, she lays her eggs in great numbers. Messieurs Duhamel and Tillet put a male and female, coupled, into a glass vessel, and, watching them carefully, saw the female, soon after her separation from the male, deposit her eggs, sometimes on one spot and then on another, in heaps of 60, 80, or 90 together. These eggs are squirted out, as it were, commonly by three, four, or half a dozen, and sometimes thirty at once; and at each squirt of this kind the female changes her situation. Those which were inclosed in glasses cast some of their eggs upon a few grains of corn deposited at the bottom of those glasses, and, finding themselves cramped there, laid others on the sides of the vessel. The eggs are accompanied with a viscous

matter, which makes them stick to the places they are laid in; and this cohesion soon becomes very strong.

These eggs, as may easily be imagined from the size of the mother and the great number which she lays, are so extremely small that one of them would drop through a hole made in a bit of paper with the point of the finest needle. When examined by a microscope, they look, as in fig. 4. not unlike the nymphs commonly called ants eggs. They are streaked length-wise, and appear rough or curdled. When first laid, they are white; and afterwards they become red, as if tinged with carmine; owing to the colour of the caterpillar within the egg, of which the shell is very thin and transparent, as is evident after the caterpillar has left it.

By means of the thinness and transparency of this covering, the caterpillar may be seen within the egg, as at *b*, fig. 5. At first, it is bent, as in fig. 6: some time after, it wriggles itself into the situation represented in fig. 7; and then makes a hole through the end of the egg, and comes out there, as in a fig. 8. This opening remains at the end of the empty eggs, as at *c*, in fig. 5.

It is with great difficulty that the caterpillar gets its two legs out of the egg; but after he has extricated four or six of its legs, it soon draws out the rest of its body. At its first issuing from the egg, this caterpillar looks like a bit of hair about a quarter of a fifth part of an inch long.

These caterpillars generally come out of their eggs on the sixth or seventh day after they have been laid. Some say they have seen them hatch at the end of four days. The temperature of the air will undoubtedly influence this variation. They are red, as was said before, whilst in the egg; but that colour goes off by degrees after they are hatched, and they soon become almost white.

The female butterflies which are upon the ears of corn in a field, endeavour to place themselves in such manner as to lay their eggs close to the place where the grain is fastened to the stalk. Fig. 1. represents some of them at *a*, in the attitude of thus laying; in which case their eggs are deposited near the bottom of the grains, toward the stalk: but it often happens that, in their hurry to lay, they scatter their eggs in other places, as represented upon the husks in fig. 2 and 3.

As soon as the caterpillars are hatched, they set about making their way into the grain, in order to feed upon its flour. If the eggs have been laid in the granary, after harvest, and upon the grains themselves, they generally creep into the furrow *a* of the wheat (fig. 9. and 10), and there weave a slight web *b, b*. They then tear a hole in the skin or rind, range round them the particles of the bran thus separated, and wriggle themselves into the mealy substance which is to be their food. The hole through which the caterpillar entered can then no longer be perceived, but by a little heap of bran which lies upon it, as in fig. 11. This small quantity of pulverised bran, which is a sure sign that a young caterpillar has got into the grain, may easily escape the notice of those who have not observed it before; but when once known, it is easily distinguished.

When the eggs are hatched upon the ears, in the field, the young caterpillars soon find means to glide in between the chaff and the grain, and in that situation they pierce the latter, as was said before, generally in the furrow, but sometimes at the pointed end, which is a little hairy.

To set this in a yet clearer light, it is to be observed, that, in most kinds of wheat, three grains of corn adhere, or are fastened, at the same height, to the spike or stalk which traverses the ear, as at *b, b, b*, fig. 1. in such manner as to form a sort of triangle, or flower-de-luce. Each grain is covered with three concave coats or husks, the smallest and thickest of which is represented by fig. 2. and 3: their inner husk is covered by a broader, but thinner; and this grain is covered by a still larger, from which arises the beard, when there is one. Over all these there frequently is a fourth tegument, or very thin membrane, more or less wide. All these husks lap over each other like the scales of a fish, and envelop the grain. The end *e* (fig. 9.) is uppermost, and the end *f* rests upon its supporter. The germ is at the end *f*; and the extremity *e* is covered with a hairy down.

The young caterpillar finds means to creep under all these scale-like coverings, and to get at the grain, which, after having wove a slight web of only a few fine threads, either to cover itself, or to hold by, it attacks, sometimes at the upper end *e* (fig. 9), which is very soft in green corn; and sometimes, if it has crept in at the lower end, it lodges in

in the longitudinal furrow of the corn, and there begins to mine, in the manner before related.

As the husks of barley are harder, and stick much closer to the grain, than those of wheat, it is almost always at the point *d* (fig. 12.) that these caterpillars slip into that corn, by means of a small opening generally perceptible in that part.

To conceive how these small caterpillars, which are hardly able to pierce the rind or bran of wheat, can glide into barley by means of the opening before mentioned, it is necessary to consider the organization of this grain. It is formed of two lobes *c, c*, fig. 12. which are partly separated by a furrow in its middle, and partly covered by a tegument *a a*, which fits exactly close and adheres strongly to the lobes *c c*, and terminates in a long awn or beard *b*, of which only part is represented in this drawing. The two lobes *c c* are again covered with their proper tegument, which ends in two small appendices at *d*. Here generally is a chasm or opening, through which the caterpillar penetrates to the mealy substance.

To trace this caterpillar in its further progress after it had crept in at this opening, and consequently disappeared, Messieurs du Hamel and Tillet tore off the appendices *d*, fig. 13. and found, that after having wove a slender web, it had immediately begun to attack the lobes of the grain of barley, as was evident from the bran around it. After it had made its way intirely into the grain, and was buried there, they saw nothing but the little heap of bran it had thrown up, over the hole through which it entered.

Notwithstanding the industry of this insect, it seems highly probable that the young ones meet with great difficulties in their attempts to get into the grain; since very many of them die before they can effect a lodgment in the mealy substance. This number is so great that it might induce one to wonder how such quantities of corn can be destroyed by these caterpillars, if one did not consider the vast fecundity of the female butterflies. But the sequel of this account will shew, that if prodigious numbers of them did not perish, it would hardly be possible to save a single grain of any kind of corn.

The people of Angoumois were strongly of opinion, that the mischief occasioned by this insect was peculiar to the corn of their country, and that what was brought to them from other places always escaped unhurt. To clear up this point, Mess. Duhamel and Tillet put into different glasses wheat of the growth of other provinces, and with grains, in each glass, some of these butterflies actually coupled. They soon saw the female lay her eggs upon these grains, and afterwards beheld the caterpillars hatch and make their way into the grains. Their farther observations proved, that the principal cause of the spreading of this evil is, that the insect itself, which multiplies exceedingly, is conveyed to other parts with the corn in which it is inclosed.

The caterpillar inclosed in a grain of corn preys upon the mealy substance of that grain, till it has eaten it all; by which time the insect has attained its full growth. Whenever a grain was opened (fig. 19.) in which the caterpillar was not full grown, a deal of flour yet remained; but when this insect was full grown, there remained only the skin, or bran, so destitute of flour, as not even to discolour clear water. Hogs, though very greedy creatures, and fond of bran, would not touch these hulls when given to them unmixed; but they eat them readily enough when mixed with other food.

M. de Réaumur suspects that when these caterpillars have consumed all the flour, they eat the excrements which they had voided whilst young. At least it is certain that, upon opening several grains in which the insect was young, a number of small white pellets, like eggs, was found near the caterpillar; and a half-grown caterpillar being taken out of a grain, and laid upon a piece of glass at the focus of a microscope, it was seen to void a quantity of excrement very white, smooth, and oval; and when the caterpillars were ready to be metamorphosed in the spring there remained only a very small portion of dark brown excrements, quite different from the white that were observed at first.

The length of the corn-caterpillar, when full grown, is very little more than the twelfth part of an inch; and its thickness is, at most, equal to half the circumference of the grain that contains it: its body is smooth and entirely white; it is thickest towards the head, in which one may perceive its mouth, two large eyes, and two kinds of horn: the head is a little browner than the rest of the body. This

caterpillar has sixteen legs, of which the eight intermediate and membranous are only small prominences, so minute as not to be distinguished even with the help of a microscope, unless the insect be laid upon its side.

Our authors make here the following digression, to shew the difference between this insect (fig. 23.) and the false moth (fig. 31.); it being the more important to distinguish them, as they are very much alike in many respects, and often blended together in the same granaries.

The false moth proceeds from a small caterpillar, the body of which is smooth and whitish. It has sixteen legs, does not lodge in the grains of corn, but contrives to fasten several of them together with a web which it spins, and with which it makes itself a dwelling-place like that of common caterpillars. This dwelling-place, or sheath, in which the caterpillar of the false moth usually abides, is generally in the middle of the little heap of grains which it has collected for its food, as in fig. 30: but what distinguishes it from the caterpillar of the true moth, it can quit this sheath at any time, to eat the grains around it, one after another. It generally attacks several grains at once, and always without order, eating sometimes of one, and sometimes of another, so that several are gnawn when not one is wholly consumed. When these insects are very numerous in a granary, all the grains upon the surface of the corn are linked together by a web, so as to form a crust which is sometimes three inches thick. This caterpillar turns into a chrysalis, or aurelia, in a grain which it has hollowed, or in the sheath of its web, and issues from thence, in the month of June, in the form of a butterfly. When a heap of corn is stirred in which there are many caterpillars of the species of this false-moth, those insects crawl up the walls: but they soon return to the heap, and, by the very next day, cover it all over with a new web.

The insect which desolates many parts of Angoumois is more sparing of the mealy substance of the corn, than the caterpillar of the false-moth; for the former seldom consumes more than the contents of a single grain. Nothing is more uncommon than for it to pass from one grain to another, even though it be immediately contiguous. It eats the flour in such manner that the skin or rind of the grain, which is entirely emptied, looks whole and sound: but the least pressure then easily reduces it to powder; and it rises up to the surface of water more or less quickly, according as the insect has left in it more or less flour.

As heat hastens the metamorphosis of the insect, it is not unusual to find, in very hot weather, some of these caterpillars transformed into aureliæ, before they have consumed the gross excrements before-mentioned, or even eaten all the mealy substance of the grain. In this case, the aureliæ are very small and produce only small butterflies. The same happens to other insects of this kind. Silk-worms eat but little when they are sickly, and, if that sickness continues, they are metamorphosed sooner than others which are healthy; but then their cocoons always are small. If a field caterpillar be shut up in a box before it has attained its full growth, it will, after having fasted some days, be converted into a small aurelia, from it will issue a butterfly smaller than others of the same species. In like manner, when one sees among the corn caterpillars some larger than others, it may reasonably be presumed that this difference proceeds from there having been a greater quantity of flour in the grains on which they fed, than in those which were the nourishment of smaller flies; or from their having been of a stronger constitution. It likewise appears that some of these caterpillars are so much more voracious than others, that the flour of one grain is not sufficient for them. M. Duhamel put several of them into a box of flour: they thrived there, and seemed to grow larger than in their common way of feeding in the grain.

In general, they are metamorphosed much sooner in summer and when the air is warm, than in winter, or in cold weather. It may likewise be observed, that the mealy substance of a grain is more completely consumed when the metamorphosis is slow, than when the contrary happens.

The sagacity of M. de Réaumur was requisite to discover a singular circumstance relative to the working of this insect, and of which Mess. Duhamel and Tillet have been witnesses. The caterpillar, exactly inclosed in its grain, foresees, or acts as if it knew, that, in its future state of butterfly, it will be deprived of the organs necessary to pierce through the rind of bran which forms its prison. However, whether it has or has not that foresight, the fact is, that the caterpillar, before it is changed into an aurelia, makes in

this covering of bran a small trap *a* (fig. 21.) which remains shut. Messrs. Duhamel and Tillet could not easily discover it at first; but after some search, a little spot whiter than the rest, about as big as the head of a small pin, and somewhat prominent, shewed them where it was. They then, upon lifting up this trap (fig. 22.) with the point of a fine needle, could see the chrysalis in the inside of the grain, and could also, sometimes, close the trap again so exactly, as not to leave the least appearance of a hole.

When the caterpillar has attained its full growth, and formed its trap, or outlet, it weaves a cocoon, and is afterwards metamorphosed, within the grain, into an aurelia, (fig. 20.) which seems at first to be divided by ringlets (fig. 14.); but when the butterfly is formed within the aurelia, its wings may be discerned through the membranes which cover it, as in fig. 15, 16, 17, 18. The above-mentioned accurate observers opened some of these aureliæ in an advanced state, and took out of each of them a butterfly greatly rumpled and benumbed. When one of these caterpillars first issues out of an egg, and when a full grown one is taken out of a grain of corn, the body of each, then seemingly more at ease, dilates, so that one can hardly conceive how it could be contained in so small a space as that from whence it came. The case is different when one opens a grain in which there is an aurelia; for it is easily seen that this occupies little more than half of the inner capacity of the grain which incloses it, and that the caterpillar, in forming a cocoon, has divided the grain into two spaces or cells, in the largest of which, being somewhat more than half, the aurelia is lodged, whilst one sees in the other nothing but its excrements. The aureliæ are therefore small in comparison to the caterpillars that were metamorphosed into them. Nor is it less surprising how a butterfly just come out of the aurelia could be contained within that covering.

The butterfly, being entirely formed in the aurelia, breaks the skin of it at the end, opens with its head the little trap which the caterpillar had made on the outside of the grain, and comes out at the little hole which was covered and shut by that trap. The mealy substance of the grain has, by that time, been so far consumed, and the outside husk or bran rendered thereby so light, that the butterfly, after having disentangled its wings, takes its flight, and sometimes carries away the empty hull. As soon as the butterflies are out of the grains which contained them, they couple, and the females lay their eggs in the manner before related. Such is the circle of their life.

This insect, like all others of the same species, remains, as was said before, a longer or shorter time in its different states, according as the temperature of the air is more or less favourable to its several changes. It is known that an aurelia of a caterpillar, which generally produces a butterfly in eight days, will continue three months in the state of an aurelia, if it be put into an ice-house, and that the butterfly does not, in that case, come out, till after it has been removed into a much warmer air. For this reason one cannot fix precisely the time within which the caterpillars are transformed into aureliæ, nor how long they remain in this state: it can only be said, that they come out of their eggs very soon when the air is warm, and that they sometimes continue long in the state of caterpillars, as well as in that of aurelia, if the weather be cold: to which may be added, that both caterpillars and aureliæ, of different sizes, are seen in the field in warm weather; that butterflies are seen to issue out of corn from harvest till the end of September; and that caterpillars of various sizes may be found in the infected grains, during the whole winter.

"In the middle of May 1761," continue Messieurs Duhamel and Tillet in their account of this insect, "when we arrived at la Rochefoucault, there were many caterpillars in the corn, very few aureliæ, and not many butterflies. The weather was then very dry, and the nights were cold. On the 21st, the wind changed to the west; and in a few days after it began to rain, and continued so to do till the end of the month. During this time the thermometer was at from 13 to 14 degrees of Reaumur, or from 56 to 58 of Fahrenheit.

"In the beginning of June, we found in the grains of corn many more aureliæ than caterpillars; and on the 5th of that month, the air being then become pretty warm, we saw numbers of butterflies. By the 15th, they were increased so prodigiously in the closets where we made our experiments, that they perfectly darkened the day, and flew into our mouths if we opened them. We could then find but very few caterpillars, except in the corn which had been laid in cool places. We believe that the duration of the

life of the butterflies is, in general, a fortnight or three weeks; though some of them have lived a month in our glass vessels. The sequel will shew that the whole circle of the life of this insect may be completed in less than fifty days, when the air is warm.

"The coming out of the butterflies is generally denoted by a great heat in the heaps of corn, or in the sheaves, according as the grain is laid up in one or other. It was such as to make the liquor in M. de Reaumur's thermometer rise to 25 and 30 degrees (from 62 to 71 of Fahrenheit) when the outer air was at 15, (35 and a half of Fahrenheit). This heat certainly accelerates the hatching of the insects; for prodigious multitudes of butterflies issue out of the heated corn in a few days after the ferment has taken place.

"The coolness of autumn interrupts their propagation; and no more butterflies appear from that time, till the warmth of spring begins to be felt. But, may not the heat, which favours the multiplication of these insects, be produced by the creatures themselves when assembled in vast numbers? This is very possible: for it is well known that there is a considerable warmth in well stocked bee-hives; and that corn greatly infested with weevils or moths, is also very hot. We shall hereafter have occasion to observe that no sensible heat is perceived in heaps of grain in which there are but few caterpillars, and that the heat abates after most of the caterpillars have been changed into butterflies. It sometimes happens that, through some cause or other, the heat goes off soon, and at other times it lasts three weeks or even a month. Perhaps too this great heat of corn full of caterpillars may proceed from the moisture which those insects occasion, and from thence may arise a fermentation capable of hatching the eggs, of making the caterpillars grow, of hastening their transformations, and of bringing forth the butterflies, at the same time that it damages the corn, which thereby contracts a bad smell. It is certain, that when the harvest is wet, and warm rains fall at that time, the corn heats very soon, and then these insects make an extremely rapid progress. The heat which the corn contracts is doubtless very favourable to that progress, and the insects certainly may then attack the grains softened by the moisture, more easily than they can those which are hardened by drought. Accordingly, in 1760, a year in which the heat was great, and the air very dry, the corn in Anjou kept cool so long that many of the inhabitants of that province thought there would be but few insects, and that the great heat of the sun had killed most of the caterpillars. They flatter themselves with the same hopes whenever these insects do not appear in great numbers quite so soon as usual, and imagine that few or none of them will come afterwards: but in that very year, which they thought so fatal to insects, we saw butterflies come out of the ears of corn while they were in the reapers hands; we saw still more fly about the sheaves laid up in barns, and an inexpressible multitude upon the surface of corn deposited in granaries, though neither of these grew very perceptibly till about the middle of September. In 1761, the corn was so much heated on the 8th of September, that though the outward air was of the same temperature as that in the vaults of the observatory at Paris, Reaumur's thermometer placed in one of those heaps rose to 53 degrees, (131 of Fahrenheit's). The great heats of the summer had therefore only deferred the evil, and perhaps lessened it a little. But this dreadful scourge returns every year. These caterpillars, inclosed in their grain of corn, and sheltered in barns or granaries, are screened from the vicissitudes and rigour of the air which destroy other insects that are exposed to them.

"Let us now review our insect in all the seasons of the year, in order to try to find under what circumstances it may be attacked with most advantage.

"At harvest-time, we saw butterflies come out of some grains, which were already empty and entirely consumed, before they were reaped. Doubtless these first butterflies couple and lay their eggs upon the other unreaped ears, and probably part of those eggs are destroyed by the action of the flail, when the corn is threshed and cleansed soon after its being cut: but as the caterpillars are hatched very speedily in hot weather, and many of them can, as in fact we saw them, enter into the corn that is reaping, and shelter themselves there, they will do all their mischief, if speedy care be not taken to stifle them, as we shall hereafter observe.

"The reaped corn is laid up in sheaves in barns, till the husbandman can find time to thresh it, which is sometimes sooner, and sometimes later. The corn thus piled up, heats; and the transformations of the insects inclosed in it are then

the sooner effected. When any of these piles of sheaves were stirred in our presence, we saw butterflies come out of them, and the grains from which they issued were empty of flour, and absolutely spoiled. The moment these butterflies are out of their prison, they couple, and lay their eggs upon the ears which they find in the barn. Part of these eggs, and of the young caterpillars, might certainly be destroyed by the flail and winnow, as we said before, if they were used speedily.

"Many peasants in the country we are speaking of, make all the haste they can to thresh their little crops, which they generally do upon a very dirty floor made in a hurry in the open air. They winnow and cleanse their corn as soon as it has been threshed; and the empty grains are then partly separated from those that are full, by the wind, which carries the lightest away with the chaff.

"As the dirtiness of the floor on which the sheaves are threshed, fouls the grains of corn, these people wash them, and thereby take off such of the remaining light grains as swim upon the water. They likewise separate the grains of which the caterpillars have eaten so much of the mealy substance as to render them specifically lighter than the water: but the grains of which the caterpillars have not eaten much of the flour, sink to the bottom with sound ones: and the caterpillars devour those infected grain after they are softened by the water, much sooner than those which are thoroughly dry.

"Most of these peasants knowing the ill fate that will attend their corn, sell it as soon as possible to dealers, who carry it into the neighbouring provinces, and with it the contagion. This is the real cause which spreads the evil. Others have their corn ground immediately after harvest; and this is the best method they can take, though not without its inconveniences: for, in the first place, there are not mills enough in the country to grind immediately the whole produce of the crop; secondly, the meal of corn gathered in a wet harvest will not keep long; and lastly, though the friction of the mill-stones undoubtedly destroy almost all the insects, it is not certain but that some of them may escape, and in that case they will thrive, and go through their several metamorphoses, first into *aureliæ* and afterwards into butterflies, in the flour, as we have experienced in the manner before related.

"Several of the inhabitants of the country in question lay their corn up in granaries, in order therewith to pay their rent, which in general, is not due till the beginning of October. From these heaps of reserved corn, issue multitudes of butterflies, which, as we have observed, couple and lay upon that corn an immense quantity of eggs, from whence proceed caterpillars which get into the grains, and devour their inside during the whole winter.

"It is highly probable that, in mild and moist autumns, some of the first hatched caterpillars may be changed into butterflies early enough to produce a second generation before winter; nor will this seem surprising to those who know how rapidly warm weather makes these insects go through all their metamorphoses. But, independent of this it is certain that butterflies are continually seen to come out of all the heaps of wheat, barley, and rye, in Anjou, during the whole summer, and till the autumn begins to grow cold; that numbers of live caterpillars are found in the grains during the winter; that many *aureliæ* are found in them towards the end of May; and that prodigious multitudes of butterflies issue from them as soon as the weather begins to be hot, that is to say, towards the middle of June.

"Thus we see that there are, in a manner, two flights of butterflies; one which appears from harvest time till the weather grows cold in September, and the other which appears in June, and lasts till harvest. The former, in our opinion, proceed partly from granaries in which corn of the preceding year has been laid up with young caterpillars in it, and partly from the eggs first laid upon the ears, towards the end of May, or upon the new reaped corn; so that the second flight begins just as the first flight ends.

"A circumstance well worth observing, and which will be more particularly noticed hereafter, is that most of the butterflies of the summer flight remain in the granaries, fast clung to the threshed corn, upon which we have seen them couple and lay their eggs. It looks as if these butterflies knew that there then no longer is in the fields any corn fit to feed their posterity. On the contrary, those of the spring flight endeavour to get out of the granaries, and do in fact get out in vast numbers, through the windows, to

spread in the fields, and lay their eggs upon the yet green corn."

That this is really the case, and that these insects are of the species called *phalænæ*, appeared evidently from several very accurate observations, made by Messrs. Duhamel and Tillet, and of which it may be sufficient to mention here only the following.

In June 1761, they went, at different hours of the day, into granaries where there were heaps of corn infected with these insects. While the day lasted, they perceived a multitude of butterflies which stirred a little upon those heaps, but did not quit them. When they returned into the same granaries a little after the sun-set, they saw those butterflies rise from the corn, and fly to the walls, where they settled for a while; after which they took their flight in vast numbers, through the windows, and went off with such rapidity that they soon got out of sight. If Messrs. Duhamel and Tillet went back into these granaries at ten or eleven o'clock at night, they no longer saw so great a number of butterflies, and those that did remain seemed to be less agitated.

To be still more perfectly acquainted with some circumstances of the life of this insect, they put different sorts of corn into small closets, in September 1760, after having pasted white paper all over the walls and ceiling. In the beginning of June 1761, these closets swarmed with butterflies, which seemed to be pretty quiet during the day, and were seen to be greatly agitated towards the setting of the sun: but they could not get out of the closets, because the windows were closely shut. On the 9th of June, towards eight o'clock in the evening, one of the closet-doors being opened, a prodigious number of butterflies immediately issued out, and, with surprising swiftness, traversed an opposite granary, without making the least stop, though several heaps of wheat lay in it. They bent their course directly to an open window of the granary, at some distance from the closets, and instantly hastened out. Several people, who were present, followed them with their eyes, till the ridge of a barn near forty feet off, and the decline of the day, prevented their seeing them any further. Our observers returned to the same closet at about ten o'clock at night, and then found the remaining butterflies very quiet, scarce one of them attempting to fly out.

These observations prove sufficiently that this species of butterflies is nocturnal, and that those of the June flight have a different instinct from those which do not appear till after harvest. These last remain upon the corn in the granary, and there couple and lay their eggs, from whence proceed caterpillars which penetrate into the grains as soon as they are hatched. The June caterpillars, on the contrary, act as if they knew that the blossoming of the corn is past, and that its ears are fitted to supply their posterity with necessary food. They seldom leave the granary before sun-set, unless dark clouds chance to beguile them earlier, in which case numbers of them become the prey of swallows and martins, which fly about the windows.

As these little insects fly very swiftly, and rise to such a height that the eye cannot follow them long, especially when the dusk of the evening begins to come on, Messrs. Du Hamel and Tillet were obliged to try several methods before they could be certain what became of them. The caterpillars which they found in the grains of standing corn made them conclude that the butterflies, when out of the granary, flew directly into the green corn, and laid their eggs upon its yet tender ears: but none of the country people, of whom they inquired, had ever observed them in the fields, or could give any satisfactory account of them. Another well attested circumstance, which strengthened their conjecture, was their being assured by persons of undoubted credit, that the corn which grows nearest to villages, farm-houses, barns, or buildings used for granaries, is always much more damaged by insects than that which grows at a distance from any habitation. Their own observations confirmed this fact; and their experiments, dictated by reason, soon proved that they had conjectured right.

Desirous to know what was become of the swarms of butterflies which they had seen go out of the granaries in June 1761, they searched all the neighbouring fields of every kind of corn, and beat even the surrounding hedges, at all hours of the day, to no sort of purpose: not a butterfly could they find, excepting a few dead and dried ones entangled in spider webs along the outside of the corn. This

very circumstance led them to the discovery they were in quest of: for, rightly reflecting that these insects, which neither they or any other persons had been able to find in the fields in the day time, must certainly be of the phalænæ or nocturnal kind; they, without farther delay, set out with a candle and lanthorn, repaired to one of the corn-fields which they had visited in the afternoon, and, in the night between the 5th and 6th of June, soon descried a great number of the very butterflies they were seeking for, upon the beards of the ears of wheat. They returned to the same spot early the next morning, and could not then find a single one.

From that time they saw and shewed to whoever chose to see them, a great number of these butterflies upon the standing wheat and barley. Some were upon the beards, and others had made their way to the point of the grain. Scarce an evening passed without their seeing some coupled. Though every circumstance concurred to prove, and indeed left no room to doubt, that these butterflies were the same as those which infested the corn in granaries; yet, to be thoroughly convinced, and to convince others, in this respect, they took some of them from off the ears of corn in the field, examined them with a microscope, and found them to be of the very same species. A farther demonstration of this resulted from the following incidents. M. de Taponnat, one of their friends in Angoumois, had, in a small granary, several heaps of wheat differently prepared, which he kept by way of experiment. Messrs. Duhamel and Tillet observing numbers of caterpillars in two of those heaps, advised him to put that corn into an oven properly heated, in order to prevent the dispersion of the butterflies, which they knew would otherwise infallibly proceed from thence: but this was neglected. On the 21st of June, about seven o'clock in the evening, they visited this little granary, and found upon the corn a multitude of butterflies in great agitation, and of which a considerable number soon flew out of the windows. They took leave of M. de Taponnat, assuring him that this flight of insects would soon light upon his standing corn. When they were gone, M. de Taponnat had the curiosity to step out, to see whether any great quantity of butterflies still continued to issue from his granary; which he could easily do, as the window was very low. He was amazed at the numbers he saw fly out at that one window; being, as nearly as he could compute, about fifty in a minute. He observed, that they directed their flight towards a field of wheat not far off, and thereupon went thither with five or six other persons, all of whom saw them arrive in swarms, proceeding chiefly from the granary. They saw many of them light upon the ears, and on their running a cane gently over the awns, beheld them rise by dozens at a time. M. de Taponnat was so struck with this sight, that he ordered the window of his granary to be shut the next day, and his corn to be put into an oven properly heated as soon as possible.

A clergyman in the neighbourhood, who had a little barley infested with these insects, could not be persuaded to do the same, though his whole quantity was but a few bushels. The consequence was, that a multitude of butterflies were soon seen to proceed from the window of his granary, and spread so thick over an adjacent field of barley, that not an ear could be found without several of them upon it.

These facts confirm all the former remarks of our accurate inquirers, who, after observing that the fittest time to find these butterflies upon the ears of standing corn, is about half an hour after sun-set, continue thus:

"On the 10th of June about eight o'clock in the evening, we visited the fields around la Rochefoucault, and then perceived only a few butterflies upon the ears of the corn: they were greatly agitated; and we soon after saw numbers of the same species arrive on all sides, but chiefly from certain mills on the banks of the river.

"Those that were upon the corn flew away as soon as we approached them with a light. This was probably the time of their arrival. Towards nine o'clock we renewed our search, and saw many of them cling to the ears, either actually coupled, or seeking to couple. The light did not affright them then, and we had time enough to examine them with a microscope. We found fewer of them towards midnight, and could not see any early the next morning. It is not to be supposed that the dispersion of these butterflies happens always regularly at the hours before-mentioned; for we have observed several variations, which depend on the warmth of the air; and they commonly settle upon

the corn earlier when the sun is overcast with clouds just before its setting.

"As we have not ever met with these butterflies in the day time, it may be asked, where they then retire to? This question deserves an answer. We have searched for them in vain in hedges and among the blades of corn. Light certainly incommodes them; for when we exposed to the sun vessels in which some of them were inclosed, they hid themselves in the shade formed by creases of the paper at the bottom of those vessels, in such manner that we were sometimes puzzled to find them again. One day that the sun shone very bright, we took two crystal cups, into one of which we put a few grains of wheat with some butterflies, then covered it with paper, and placed it upon its bottom in a garden exposed to the sun. We put some butterflies into the other, but not any corn; and placed it close to the former, with its bottom uppermost, that the butterflies might receive the full heat of the sun: and lastly, we set one of M. de Reaumur's thermometers upon the ground, just by these cups. When the liquor had risen to from 45 to 50 degrees, (from 112 to 124 of Fahrenheit's), we saw that all the butterflies in the cup where there was not any corn, were dead: in the other, only some were dead; because most of them had found a shady shelter, either by making their way into the grains, or by hiding themselves under the paper cover. We knew before, that these butterflies are greatly agitated, and flutter very much when they are exposed to the sun; but we could not tell whether that proceeded from pleasure or pain. The doubt is now removed; and we are of opinion that they retire to a cool or shady place during the day time, and that their smallness prevents our finding where they are hidden, which may perhaps be in woods or thickets, in crevices in the barks of trees, or in the earth."

That the caterpillars which produce first aureliæ, and then these butterflies, can, and frequently do, live under-ground, that they can pass the winter there inclosed in the grain with which they are sown, and even undergo their several metamorphoses in the earth, so as to arise from thence, in the form of butterflies in the spring, has been demonstrated by the following experiments:

In May, 1761, Messieurs Duhamel and Tillet planted, in a garden pot, corn in which they knew there were caterpillars. They buried it an inch deep, watered it carefully, and saw that, notwithstanding plentiful rains had fallen upon it, those caterpillars changed into aureliæ just as if they had been in a granary. These aureliæ produced butterflies, which, weak as they were when first hatched, soon made their way out of the ground.

To be the more certain of their power, with respect to this last article, the same gentleman put some thoroughly dry, and well pulverized earth into a glass vessel, then layed upon that earth a layer of corn in which they knew there were aureliæ, and covered this with equally well dried and pulverized earth, at least half an inch deep; after which they tied a paper over the vessel, to keep in the butterflies, in case they should pierce through the upper mould. In effect, they did pierce through it, coupled, and laid such quantities of eggs as covered its whole surface.

To see whether these insects would rise as easily from underneath a stiffer earth, and what effect their being buried deeper would have, a wooden box was divided into three partitions, and filled with common mould taken out of a kitchen garden. Corn known to be infested with these caterpillars was planted an inch deep in one of these partitions, two inches deep in another, and three inches in the third. All of them were then covered with a glass frame, and butterflies soon appeared in each of the divisions; but they were far the most numerous in that where they had been buried but an inch deep. In another trial, a number of infested grains were covered with a still stiffer earth, wetted, and pressed down; and not any butterflies appeared there. At their first coming out of the ground, they are rumpled, as when taken out of a chrysalis: but after resting a moment, they shake their wings, set them right, and soon take their flight.

That some of these butterflies can, and do come out of the ploughed ground which has been sowed with infested seeds, is certain: but Messieurs Duhamel and Tillet are thoroughly satisfied that their number is but small, that most of the caterpillars sown with the grain perish before they can reach the surface of the earth, and that the butterflies which proceed from granaries are the great source of the increase of this insect: for, say they, the grain which contains

tains a young caterpillar will grow, if its germ has not been damaged; and as its mealy substance is consumed by the plant, the caterpillar must die for want of food. Besides, as it proved by the last mentioned experiment, the butterflies cannot pierce through a close and hardened earth; which generally is the case of ploughed land that has been exposed to the winter rains.

After observing that the two sexes sometimes unite a second time after separation; that the female deposits her eggs almost immediately after they are fecundated, in small parcels of from 6 to 30, and that each female lays in all from 60 to 90; adding to this, that there are generally three flights in a year, one at the latter end of May or in the beginning of June, a second in August, and a third in some of the subsequent months, during which a fourth also, and even a fifth have been known; we may, from the following calculation, form an idea of the astonishing multiplication of these insects, and consequently of the ravages which they must make where they have established themselves.

Every female produces from 60 to 90 eggs, of which 75 is the medium: but let us suppose the number to be no more than 70. Let us suppose also, that of those 70 eggs, one half only produces females, which makes the number 35. This multiplied by 70, the number of eggs laid by each, gives for the second brood, from a single insect, 2450: the half of this number, supposed to be females, is 1225, which multiplied by 70, gives 15,750 for the third brood. The half of this number, being 42,875, multiplied by 70, gives for the fourth brood, 3,001,250; and the half of this, 1,500,625, multiplied by 70, gives 105,043,750 for the fifth brood: so that supposing five broods in a year, each female butterfly of this species that exists in May, produces, before the May following, no less than one hundred and five millions, forty-three thousand, seven hundred and fifty individuals of the same kind.

It is not agreed whether these insects prefer wheat, barley or rye. The observations and trials made by Mess. Duhamel and Tillet seem to prove, that they attack indifferently which ever lies most convenient for them; and that they do not spare maize, when it is stripped of its stalk and laid up in a granary, where they can come at the soft inside part of the grain; or even oats, though it be the common, but mistaken opinion of the people of Angoumois, that this last grain is a preservative of others, especially of barley, when sown with it, or intermixed in the same heap.

M. Tillet inclosed several ears of standing oats in a wide mouthed glass bottle, and put into it some of these butterflies; after which he covered the mouth with a piece of fine

linen. The butterflies coupled there, laid their eggs upon the ears, and several caterpillars which proceeded from those eggs, actually introduced themselves into the grains. A manifest proof that, though the pendent positions of the grains of oats, whilst growing, may be inconvenient to the female butterflies, many of whose eggs may be washed or blown off, more easily than from other corn, before they are fixed by the viscous matter which fastens them to the husks; yet the corn caterpillar can live upon oats. What is still more extraordinary is, that grains of wheat, barley, rye, and oats, were mixed together in a glass vessel, into which some of these butterflies were put: and the oats were damaged by caterpillars, as much as any of the other grain: though it is certain that these insects do but little mischief to oats in the granary; happily for the poor people who make bread of this corn.

In guarding against these insects, the farmer has three objects: 1, to preserve his grain for seed; 2, to keep it, for food and market; and, 3, the total destruction of the insects.

To preserve the corn for seed, it should be threshed out as soon as possible, in order to prevent the transformation of the caterpillars brought from the field, which otherwise soon become butterflies; whose prodigious number of eggs would exceedingly increase the evil. For want of this precaution, two thirds of the store of seed-corn has frequently been destroyed.

The seed should either be dried in an oven, in which the heat should be strong enough to kill the caterpillars, without destroying the vegetative power of the grain; which will be properly effected by 124 degrees of heat on Fahrenheit's thermometer, or soaked in a strong lye of wood-ashes and quick-lime, heated to such a degree that the finger can just bear it. Let the corn contained in a basket be stirred in this lye, and the grains skimmed off that float on the surface. When the corn has been thus soaked for about two minutes, the basket which contains it should then be lifted up, and suspended by two poles, till the lye is drained off. The grain should then be spread very thin on the floor of a granary to dry, while a second basket-full is prepared in the same manner. The corn thus steeped, and well dried, will keep a year and continue fit for sowing.

By following the above directions, corn may be preserved from the ravages of these or any other similar insects that prey upon it. *Histoire d'un Insecte qui devore les Grains de l'Angoumois.*

RUTTER-JAGS, flowers of the wild trefoil.

C.

CABBAGE, the name of a plant well known, and of which there are several species cultivated.

Cabbages have lately been cultivated for the food of cattle, and by several experiments found to produce a very large increase when managed according to the principles of the New Husbandry. M. de Chateaubieux has been very particular in relating the success of his experiments, which we shall therefore give the reader.

"I began, says this curious gentleman in a letter to M. Duhamel, by retrenching the dung; though the spot I chose for my first trial had not received any for several years. It had indeed been well prepared by ploughing the preceding year, when one half of it bore barley, and the other oats. I now made it into a bed, the middle of which was directly over the last year's furrow. I ploughed this bed on the twenty-fifth of September, 1751, in the same manner as if

it had been intended for wheat. I planted on it a single row of white cabbages, which I watered to make them take root the better. The length of this bed was one hundred and sixty feet, and its breadth six feet seven inches.

"That I might be able to make a just comparison between the cabbages of this bed, and those of the kitchen, I planted a spot of ground in the latter, the same day, with the same sort of plants. This spot had been extremely well dug, and plentifully dunged by the gardener, who took all possible care of these plants during the summer, and weeded them as often as was necessary.

"Instead of cabbaging, most of them ran up in height: upon which I plucked them up, and planted others in their stead.

"I bestowed the same care and culture on my row of cabbages in the bed, as if they had been wheat.

"On

"On the ninth of March, 1752, the alleys were stirred with the plough. On the twenty-fifth of April, I gave them a second stirring with the cultivator. On the third of June they had a third stirring with the plough: and on the twentieth of July, I made my gardener hand-hoe them. for fear the plough should damage several stalks of wheat which grew on the next bed, and were bent, but not lodged.

"These cabbages were never watered, except once, which was at the time of planting them; and yet they were always crisp and firm, even in the hottest days. By this easy and expeditious culture, they attained all the perfection that could be desired; and surpassed those of the kitchen-garden, as much in goodness, as they did in bulk. Most of them weighed between fifteen and eighteen pounds, and the smallest between eight and ten. The weight of all the plants which grew on this bed, was 840 pounds."

The circumstance of the cabbages continuing firm and crisp in the hottest weather, is remarkable. Mr. Baker, in the following experiment upon cabbages, makes the same observation. This is the effect of good and deep hoeing, and is taken notice of by Mr. Tull as the constant effect of horse-hoeing, and is so in some measure of hand-hoeing, when well performed and deep. The earth being made fine by good tillage, imbibes the dews, and when hoed deep, retains them: they penetrate deeper into the loose open soil in the night, than the sun and air can exhale them in the day: the roots of the plants are thus refreshed, and the earth is kept cool in hot weather, which greatly promotes their health and growth: for heat and moisture are principal agents in vegetation: this appears agreeable to reason, and is confirmed by experience. It is an observation of great importance in agriculture. It is so to farmers, who by good hoeing may keep their crops in health and vigour in dry hot weather, when the unhoed crops are parched and stunted by it. And it is no less so to gardeners; who by diligent and deep hoeing, might save themselves much of the expence and trouble of watering their plants. It is proper, however, to take notice, that this good effect of hoeing, is in consequence of the earth being fine, loose and open. Hoeing of close, dry, hard earth, does not open and pulverize it at once, nor until it has been well broken and exposed to the air, and vicissitudes of the weather. It is this that pulverises land beyond what is practicable to be done by hoes, ploughs, or any instruments of husbandry; and for this reason, those who would obtain the full benefit of hoeing, should be careful to keep their land constantly in good tilth; and when interrupted by the rains and snow in winter, they should be careful to take the first opportunity of dry weather to renew the tillage, which will undoubtedly prepare their land to receive the benefits of hoeing, which are very great, besides subduing the weeds.

The intelligent and careful cultivator Mr. John Wynn Baker, in a report he made to the Dublin Society, tells us, that he also cultivated cabbages after the manner of the New Husbandry, on a piece of ground that had bore potatoes the preceding year. It was manured with a compost of lime, earth, and dung, perfectly incorporated. On the sixth and seventh of July 1764, he planted one row of cabbage-plants on the middle of every ridge, of about an acre of ground, the plants in the rows being two feet from each other, and the rows five feet asunder. On the sixth of July a fine rain fell, and more on the eleventh and twelfth, which saved the expence of watering, and secured life to the plants.

On the seventh of August, the cabbages were horse-hoed, by taking off, at one furrow of the plough, only one side of each ridge, close to the plants: in this manner they remained till the twenty-fifth, when the plough was run along in the same furrow; by which, with the first furrow, the soil was ploughed about twenty-one inches deep. This being finished, the earth was immediately returned back to the plants, which afforded them fresh nourishment; and in order to give their roots time enough to penetrate this fresh earth, which by the horse-hoeing, was become very fine mould, they were suffered to continue in this state until the 12th of September; when they were again horse-hoed, by taking off the other side of every ridge; and on the twentieth the furrow was deepened in the same manner as the former, the mould immediately returned to the plants. On the eighteenth of October a small furrow was thrown up to each side of every ridge, which finished the culture, and restored the ridges to the form

in which they were when the plants were put upon them.

The plants all grew luxuriantly; and in the hottest weather were infinitely more brittle in their leaves, than any in the neighbouring gardens; which is a certain indication of health in these kind of plants.

The horse-hoeing was so effectually destructive to the weeds, that the expence of weeding was a mere trifle.

On the eighth of December, Mr. Baker cut one row of these cabbages, they then beginning to decay, which is indicated by their bursting. The number was two hundred and fifty-eight, and they weighed sixteen hundred weight, three quarters, and twenty-one pounds; which, at an average, is seven pounds and near six ounces for a cabbage.

The produce upon an acre, on weighing this row, which was five hundred and sixteen feet long, amounted to twenty-three tons, four hundred, two quarters, and fourteen pounds; which Mr. Baker observes is, at least, from ten to seventeen tons less than the product would have been upon an acre, could he have obtained the large, late, Dutch cabbage.

The ingenious Mr. Randall, in a treatise lately published, entitled *Semi-Virgilian Husbandry*, has given us the following method of cultivating cabbages according to his newly proposed system, which is nothing more than the New Husbandry, executed by the ordinary implements.

The soil on which the cabbages are to grow, is supposed to be a loam in good heart; and as the *Semi-Virgilian Husbandry* requires only that the soil should be made exceeding fine, without the assistance of any dung, therefore the land destined for these cabbages must be thrown up to be fallowed, that it may enjoy all the advantages of a winter and summer fallow, so as to be exquisitely well prepared for the reception of the plants about Old Michaelmas.

As cabbages extract their nourishment from a considerable depth, as well as from the surface of the soil, it will be necessary that the land should be double trenched during the time of fallowing.

The loam, immediately after harvest, is to be turned up, and the workman is to go as deep as he can with his plough, another plough is immediately to follow in the same furrow with a higher earth-board, which will cast the mould over, and bury the stubble, if it was not before, by some other method, destroyed: in this manner the field will, as it were, be turned upside down, double spitted more than a foot deep, and the stubble will be sooner rotted. The harrows must then make the ground as fine as the season will at that time permit.

The next thing to be done, when the weather will admit of it, is to double-trench the land, and lay it up till the spring in sharp ridges.

Here Mr. Randall makes a very sensible and useful observation, namely, that the teams must not be suffered to go upon the ground till it is first tried with a spade, to see whether the soil is dry enough to the depth it was ploughed before; for treading the ground in any season of the year, when it is not in order, or sufficiently dry, is a very destructive practice. The standard in this case recommended, very properly by Mr. Randall, is, when the mould crumbles or feels mellow between the finger and thumb, instead of adhering, so as to judge by the touch, whether the parts will give way to the tread, or whether the earth be in such a state of cohesion as to be padded under the horses feet.

The following directions are given for performing the ridge-work, or laying up the soil for the winter.

The ploughman is to begin in any part of the ground he pleases, and go one bout, throwing the furrows in such a manner, that they may form a little ridge. When this is done, the horses must turn to the left, and the share-point be put to the end of the trench; then go another bout in the manner already mentioned, the horses again turning to the left, and continuing to go on in this manner, till the piece of ground is ploughed throughout. If the plough begins close to a hedge, it may save some little trouble in going over more ground than is necessary; and where it can conveniently be done, the plough should cross the path the horses went in the first operation, as this cross-ploughing is often a means of stirring the baulks made by a former ploughing.

The first bout should be drawn out as straight as possible, as the rest will depend upon it; and if the hedge is not straight enough to allow this, the ploughman should begin at some distance from it for the advantage of a straight line, leaving the skirtings near the hedge to be last finished. The land will now lie in gentle rising ridges and regular valleys, ready for the third operation.

In this the ploughman is to go the very same ground over again, with the same plough, or one a little wider and higher in the earth-board, and throw the mould over the right and then over the left side of the first ridge, going four inches and a half, or five inches deep, and turning off, as before, continually to the left. This trench-work requires four horses to a plough; and the second team, in the first operation, if the ground be hard, and has not been stirred for a long time, may require five horses, but not more.

The ground will now lie in sharp ridges, and deep trenches; and if the work be well executed, the bottom of the hollows or little ridges, will be near twelve, or at the very least nine inches below the basis of the ridges, or surface of the ground, and about eighteen inches wide; and the distance from the top of one ridge to another will be near three times and a half the width of the plough, as it runs in the ground after the horses: the breadth of the ground, which each ridge stands upon, being about fourteen inches.

In this situation the land is to remain till the month of February, when the first opportunity that occurs in that month, the ridges and the whole ground being of a proper dryness, is to be seized for the next operation.

In the first place, a pair of ox-harrows, or the heaviest of all, in many counties called drags, are to be yoked together, and the cattle are to go a-breast, not in a line; but two on one side, and two on the other, and to walk in the trenches, having a ridge between them; by which means the harrows will move on the crown of one ridge, at the centre; and the outward parts, when well guided, will reach to the top of a ridge on each side that which divides the cattle. The harrows, which are to go only once in a place, will greatly reduce the soil, and pulling down the ridges, the soil will be in a manner level, yet not so even but that the ploughman may with ease discover where the ridges stood. The ploughman is now to proceed in the same manner as when he threw the ground into ridges, keeping the plough-sharp along the crown of a ridge, which will be visible enough after once harrowing. When he has gone one bout, which must be on the tops of two ridges, the furrows will be turned to the right, and lie pretty flat on that part which was a trench before: thus proceeding throughout the field, the whole will again lie in single ridges, and single trenches; but if the weather permits, as soon as this operation is performed, the soil must be double trenched, in the same manner as the second ploughing of the second operation, when it is laid in ridges for the winter; thus the whole field will again lie under the double work of high ridges and deep trenches.

We are now to suppose the ridge-work brought forward to the latter end of the spring, or the beginning of the summer, when weeds begin to grow plentifully.

The ridges must, at this time, be pulled down as before, with heavy harrows; but instead of going once, the servant must go twice in a place, and then use the lighter harrows, and afterwards the finest of all, in order to prepare the ground in such a manner, as to induce a large crop of weeds to grow: but if the weather will permit the horses to tread on the ground without spoiling it, the weeds must not be suffered to grow more than a plough can bury by going the usual depth; and when the weeds are turned down, another plough is to follow, and to cover the furrow of the first, after which the land is to be harrowed down again as level as possible, in order to prepare it for yielding another crop of weeds.

When the second crop of weeds is got to a tolerable height, it may be proper to try, with a spade, whether the first weeds, which were turned down to the bottom of the second statum, are sufficiently putrefied: if they are, the land is to be ploughed as before; but if they are not, the weeds now growing must be turned down by one ploughing by such a depth only as to bury them, and the land must be afterwards levelled with a loaded bush-harrow.

We may suppose, that by the middle of August, the weeds first turned down will be rotted; therefore at that

time the third crop of weeds may be turned down by the double spitting, already mentioned, and left in this condition till there is occasion to make use of the land.

Just before the time of planting the cabbages, the land must be laid as level as possible, and by frequent harrowings it will not be inferior to a garden for fineness.

The ground being now ready to receive the plants, it will be necessary to point out how they are to be raised and transplanted, which cannot be better done than in Mr. Randall's own words.

"The ground on which the cabbage-seed is to be sown, must be exceeding fine, in great heart, and absolutely clear of weeds, otherwise it will be difficult to raise the plants in perfection; and, in order to this, the richest and cleanest piece of ground must be fixed on, immediately after the same harvest, when the fallow for cabbages begins, and the nursery for the plants must have all the advantages of fallowing equally with that which is to receive the plants; and about the middle of July the cabbage-seed is to be sown: but as husbandmen are unacquainted with the manner of sowing this seed, it will be necessary to employ an honest gardener to perform this business as it ought; and the same person may be also employed to prick out the young plants upon another piece of ground, in great heart, and clear of weeds, lest they should draw one another before the season arrives when they are to be transplanted out for good and all, on the ground whereon they are to stand for a crop: one perch will raise plants sufficient for more than an acre of cabbages, from two ounces of seed, but it is better to have a great choice, as there will be some puny plants in the nursery, let the gardener, or those who prepared the ground, take what care they can; and the seed must be procured from Scotland, as the Scotch cabbage-seed is the properest for this vegetable, when designed for the use of cattle, as they will grow late, and to an enormous size, when they have all the advantages of ploughing among them, during the time of their growth.

"If the gardener is diligent, the expence of thus pricking out the tender plants, at six square inches, on about six perches and a half, will be about four or five shillings; but if the owner can depend upon the nursery's being clear of weeds, though the weather be very growing, there is a much cheaper method of raising the plants: for if the gardener, with the above two ounces of seed, to be sown on six perches and a half, takes care to set out the plants with a small hand-hoe, before they begin to draw one another, he may hoe up the puny, and leave none but the stoutest plants, at a proper distance, suppose six inches, asunder, rather under than over. While he is doing this, he may assist the plants he suffers to stand, by giving them a little mould to their stems, and checking any weeds that appear; by this means, the plants will grow to perfection, and need not be removed till they are transplanted out for the crop: and if the gardener sows the seed, and leaves the plants on the same ground, about six inches asunder, one perch will transplant twenty-five, and consequently, six perches and about a half, will transplant an acre, from two ounces of seed on six perches and a half, and set out at six inches from each young plant.

"When the plants are thus raised on the nursery, by either method, pricking them out, or setting them out with the small hand-hoe, and the season is arrived for transplanting them on the ground they are to stand on to be cabbages, the next business is to consider the distance they are to stand from each other, when transplanted; and here we must first observe, that gardeners usually set them about two feet and a half from each other throughout the piece of ground allotted for that purpose; and, during their stay on the soil, they only hand-hoe and earth them up, when on the bed they are transplanted upon, without ever giving themselves any farther trouble about them, being no ways anxious to make them grow to the largest size which they are capable of.

"In an acre there are 4840 square yards, which is about sixty-nine yards and a half every way; but in order to proportion an acre in a piece of ground, if the length be measured, and the above number of square yards in an acre, be divided by the length, the quotient is the breadth, and both divisions multiplied together will give 4840 yards. Now, as gardeners plant their cabbage-plants at two feet and a half asunder, this is allowing six square feet and a quarter for each plant, and makes the number of about 6970 plants on an acre; and plants set in two rows, at two feet asunder, and the plants set two feet

feet from each other in those rows; and then measuring out four feet and a quarter from one of those rows, and setting two rows more in the same manner, and so on throughout the ground; when the plants are set in this manner, the number of cabbages will be about 6970, which is the same as the gardeners raise on an acre, and the liberty of ploughing on one side of every row, or in the interval, and horse-hoeing between the narrowest rows, or the partitions.

"When the proper season arrives, about Old Michaelmas, or a little after, and the plants are to be set, as above, first one row the length of the ground, at two feet distance from each other; and, when this is done, then another row in the same manner, at two feet distance from the last; and, when this is done, another row must be planted, in like manner, at the distance of four feet three inches from the last; then another row of plants, at two feet distance from the last: here, then, one system will consist of one partition of two feet, and an interval of four feet and a quarter, and of two plants to each system: for four feet and a quarter, added to two feet and then multiplied by two feet, the distance of the plants in the rows, gives the parallelogram for two plants, or twelve feet and a half; and this, divided by two, gives six feet and a quarter; which is the gardeners distance, in their practice of cultivating these plants, or raising about 6970 cabbages on an acre, which is 2130 more than can be raised when they are planted in square yards throughout the acre.

"The ground being thus planted, we are now to conduct these vegetables through all the stages of their growth, and to help them to nutritive principles in the state of their greatest exigency; and, in order to this, at the beginning of winter the ground must be taken good care of; not only to keep it dry, but also to drain off the chilling wets from the bed of plants, which, as was said before, contains two feet. The first thing, then, to be done, at the approach of winter, but when the soil is dry, is to throw the intervals up into a sharp ridge, at two bouts, twice in a place, and as deep, each time, as the plough can go; this ridge-work, and double spitted, may be performed very well at two bouts, as it will allow nine inches in the middle of the interval, when the ploughman begins to turn the mould of the first bout on; and then, at the second bout, he will reach within three inches of the plants, if he measures the ground as he ought with his plough, in leaving nine inches, to turn the first furrow on, and keeps exactly nine inches in the second bout, from the land side of the first: however, he must so manage his two bouts, as to come no nearer than three inches on the beds of plants, whilst he is going the second bout.

"This operation being over, the ground will then lie in the following form: there will be a high two-bout land in the interval, taking up five furrows in breadth, or three feet nine inches, reckoning nine inches for the breadth of the plough, as it runs in the ground; and there will be a drain, on the outside of each bed of plants, nine inches wide, and, it being double spitted, or twice in a place, near a foot deep, at least cut so with the plough, though some mould will unavoidably fall back again, notwithstanding the care the ploughman may take to prevent it: and from the edge of the land side of each drain, or the breadth of each bed of plants, there will be two feet and a half of ground, which through the winter, will be kept very safe from too much wet by means of those drains; which is of great consequence to the plants, as much cold moisture brings on such a condensation and contraction among the component parts of this vegetable, that all the expansive principles in the spring and summer cannot unbrace; by which a dwarf state of the plant necessarily ensues.

"About the latter end of March, or the beginning of April, if the ground be dry, the ploughman is to go once in a place in the drain, or open trench, in order to deepen it still more, and to stir the mould; and the ploughman need not be in any pain for the fibres of the roots though he cuts or disturbs some of them in this operation: for as the fibres, which have stretched out into the bed, are undisturbed, he may cut off the outermost as near to the roots as he pleases, without doing any harm, unless he lets the plants down into the trench.

"When this operation is over, he must immediately throw down the ridge, by turning it back again, and leave an open trench in the middle of the interval, which may be done, very conveniently, at two bouts, without

overthrowing the mould upon the plants; but he must remember to go twice in a place with his plough, to keep the ground double spitted, which is of great consequence to the plants, and therefore he must not think of omitting it: after this operation, the soil will have a double trench, in the middle of the intervals, the width of twice the breadth of the plough, and about twelve inches deep, if some of the earth did not fall back again; and there will be mould, the quantity of what is thrown out by the plough, in double spitting, lying between the plants and this open trench, and which will be thrown pretty near the roots of the plants; which mould is to continue there till the wants of this vegetable require us to make an alteration, when we have paid some attention to the partitions, and also to the plants themselves.

"About the middle or latter end of April, if the ground is dry, the horse-hoe must be used in the partitions, and the ploughman must go as deep with it as he possibly can, in order not only to disturb the young weeds, but also to stir the earth, in the most effectual manner, within the reach of the fibres; but, immediately before this operation, the hand-hoe is to be used in the rows, between plant and plant, to check the weeds and refresh the mould about the roots, and the hoer must strike his instrument as deep as he can; and when the weeds, any time after this, appear above ground, in the partitions, or among the plants, the horse-hoe and hand-hoe must be used as before, but generally so timed, to be about a fortnight or three weeks after any alteration has been made in the intervals, that the fibres may have time, in either case, to heal again instead of being disturbed all at once.

"About the beginning of May, the ploughman is to draw the heavy harrow, and then the finer, over the intervals, in order to pull the mould into the open trench, level, and make the whole interval fine, and to prepare it for a ploughing. These harrows, being the same formerly mentioned, will do this business very well, without doing any harm to the plants; and if there be a good weight laid on them, they will do great execution, in pulling down the earth into the trench, and making the ground exceeding fine; which last article is of importance, as the plough will, in future operations, turn down this fine surface to a depth where the lower horizontal fibres will meet with it, and find plenty of nourishment therein.

"When the harrows have done their utmost, the ploughman is to go one bout, and throw up a ridge in the middle of the interval, if the ground is dry, and to double trench, as before; and in order to come near the plants, he may leave the breadth of about two furrows, on which to turn his bout, and then he will reach within six or seven inches of the plants with his share: when this is performed throughout the ground, the harrows must immediately be used as before, and then the ploughman is to turn all the mould towards the plants in two bouts, and double trenching, by which there will again be an open deep trench in the middle of the intervals: and about a month after this he is to use the harrows again, if the plants do not spread too far into the intervals; if they do, he must level the ground with his plough, or the horse-hoe, and then go one bout, and turn the mould on the breadth of a furrow and a half, still going twice in a place; and then the ridge, and open furrow, on each side, will contain about two and thirty inches, or the breadth of three furrows and a half, and he will have gone within nine inches of the stems of the plants, which is near three inches farther off them than before.

"In this form the ground is to lie a month, unless the season be very growing, and the weeds make a bold appearance; in that case, it may be necessary to disturb them sooner, by turning the ridge back again into the open trenches, and leaving the interval open in the middle, as formerly; and about Lammas, or a little before, the ploughman is to throw down the mould, into the middle open trench, and make the intervals level and fine, and this is the last operation arising from ploughing; the ground being now to remain, without disturbance, any farther than what ensues from the use of the horse-hoe, in the intervals, after the ground is made level, as before summer is over, there may come up some weeds, which must not be suffered to appear with impunity. It is presumed, that due care has been taken throughout the season of the partitions, and be-

between plant and plant in the rows, and likewise on the outsides near the plants, in the intervals, where the share and coulter could not reach without doing damage; and therefore, when the vegetables shut out the horse-hoe, in the partitions, or where the plough could not, or durst not, reach, the hand-hoe was to have done its office, to supply those wants, in the best manner it could.

"There is another method, which we have not mentioned, to transplant this vegetable on the ground it is to grow into a cabbage, which is cheaper; and it is this: those ploughmen, who can draw out a very straight furrow, set off first, and the persons, who are ready with the plants, put them into the trench, so made with the plough, at their proper distance from each other; and when the ploughman has gone the first bout, within the compass of three feet and a half from the share-point, he is to go another bout, to turn the mould into the first open furrow, so as not to bury the plants in this operation: and he will have gone these two bouts, one to open the ground for the reception of the plants; and the other to give them mould, by the time the people have supplied the furrows with plants, so that they may be all ready to start together again when the team returns to the head-land, from making his second bout.

The plants, on this occasion, must be placed upright in the trench, standing against the right-side of it, which may be done if the plough cuts the ground true, and the mould be well scooped out; and this will shew care in the person that holds it, and that his instrument is a good one. There must be a person to carry a gage, divided into two feet, in each division, ten feet in length, which will contain six points, the two ends, and four intermediate ones numbered from one to six; which division and points signify, that a plant must be placed in the open trench, directly against one of those figures, as the gage lies upon the ground, when the man who has the care of it, lays it down in a straight line, according to his office. In order to shew how the plants are to be ranged, in a most regular manner, exactly at two feet from each other, in the rows, we will suppose the ploughman to be just setting off to go his first bout: in this case the gager is to stand with his instrument, which may be a square piece of wood of about three inches over, or twelve in the girth, and numbered 1, 2, 3, 4, 5, 6, facing the right-side of the plough when it sets off; he must lay his right-hand just beyond figure 4, and his left just beyond figure 3, and, holding it in this manner, he will poise the gage very well, and lay it down, take it up, and remove it, without trouble to himself.

"Now, by standing about five feet, on the right side, from the place where the plough enters, and two persons with plants in their aprons, and a woman with a basket full behind him, standing on the left side, in this posture of the people, the plough is then to move on, and when the ploughman has passed by the end of the gage, the gager is then to lay it down, but in such a manner, that the end, number 1, may touch the place where the plough entered the ground, and the end, number 6, may lay in the right edge of the trench, on the mould turned out. The first man must fix his eye on figure 1, and, at the same time, the second man on figure 4, and each of them is to place a plant against his own figure; and then the first gardener puts down another at figure 2, and another at figure 3, and while he is doing this, the second gardener supplies figures 5 and 6, in the very same manner; and when they are supplying figures 3 and 6, the gager is to stoop down to be instantly ready to take up the gage, in the manner before directed, and the gardeners must take care to keep time with each other, that there be no delay in moving after the plough, in its progressive motion.

"The gager is instantly to remove his instrument, placing the left end close to the last plant, and the other end as before; and the gardeners are to take care of the three figures belonging to their office, the first man managing the three first numbers, and the second the three last. They may go on very fast in this manner, if they please, and, if they are three honest active men, no plough can out-travel them in making one bout: and in this operation it is expected of the ploughman, that he will make his horses step on briskly, which they may very well do with such light work; for, by the swifter motion of the plough, there is not only less expence attending this culture, but the trench is better cleared of the mould, and left square;

and the furrow is thrown so far to the right as to be in less danger of falling back again, which it may otherwise do from a creeping sluggish motion of the plough.

"Though two active gardeners, or husbandmen, when the latter are used to the nature of plants, and placing them in the ground, may get forwards as fast as the plough; yet in order to have the plants properly put against the figures, it may be better to have them take their time, and to proportion their work in such a manner, that they may finish by the time the team is at their heels, in ending the second bout. The gager and the two gardeners, need not be afraid of too much stooping; for the gager, when he stoops to put down his gage, has walked five feet, from the last place where he took it up, and, in fact, is only diversion and exercise for him; and the first gardener, when he stoops to put down his three plants, stepping along at the same time, in that posture, has six feet of ground to walk upright upon, which he may dispatch very nimbly, if occasion requires it; and the second gardener, in like manner; and as a person attends them at their backs with a basket of plants, they may without loss of time, be supplied, while they are walking, and take less or more into their aprons, or hands, as they see convenient, and consistent with dispatch.

"When the gager gets up to the far end of the ground, he must remember to keep on the furrow side of the plough, that is, on that side towards which the mould is turned; and the ploughman is now to receive farther directions how to proceed, when he has gone the two bouts, mentioned before. He was desired to draw out a very straight furrow when he first went up the ground, by taking sight of a tree, bush, or any other mark, exactly in the middle of the ground, and directly opposite to the place where he is to set off from, and which he judges to be in the middle; or he may use any method agreeable to himself, provided a straight line be only drawn out by the plough, for on this depends the regularity of all the rest of his bouts, and the operations of horse-hoeing and ploughing during the growth of the cabbages. The first furrow being thus drawn out, the next business is, to turn the horses to the right, and then to measure three feet and a half, from the edge of the land-side of the first furrow, or that edge cut with the coulter; and, making a mark at the end of three feet and a half, he must put the share point in there and come straight back again, keeping exactly three feet and a half from the far edge of the other furrow; and then, as was said before, he must go a second bout, to turn the mould into the open furrow where the plants are placed, which he may very well do without doing them any harm: if he proportions the depth of the furrows, where the plants are put, to their size, as they will be greater or less, just as the season has been for their growth on the beds whereon they grew.

"When all this is performed, and the ploughman is ready to set off again, in order to make another bout, he is to turn to the right, to draw out another furrow, which is to receive the plants which must stand four feet and a quarter from the row of plants now on his right-hand; to do which he is to consider, that the near edge of the open furrow next to him is the breadth of two furrows, or eighteen inches from that row of plants; and taking eighteen inches from four feet and a quarter, the remainder is thirty-three inches; and because the plants must stand on the furrow side, therefore we must add the breadth of the plough, which is nine inches, to the above thirty-three, which then will make three feet and a half from the edge of the open furrow next to him; and now measuring three feet and a half from that furrow, he must make a mark, and go his bout turning, to the right, and making the same mark from the outer-most furrow as before, and so proceeding straight back again.

"He is now to go another bout, to earth his plants, and when he has done this, he must still turn to the right and make a halt on the head-land, to consider what is next to be done: he knows the edge of the open furrow now on his right-hand, and next to him is eighteen inches from the nearest row of plants, and that the furrow he is going to open is for the plants to stand just two feet from the last row; and therefore taking eighteen from twenty-four, the remainder is six: and because the breadth of the plough is nine, therefore he must measure fifteen inches from the edge of that open furrow next to him, and making a mark there, that is the place where he is to set off: and when he gets to the far end of the ground, he must turn to the right,

right, and measure off fifteen inches from the edge of that open furrow next to him, as he comes down again: he is to go another bout to earth his plants, and then all things will be easy to him, as it will be only repeating what he did before; for as he is now going another bout, he is to measure three feet and a half, from the near edge of the open furrow next to him on the right-hand, and go straight up, and turning still to the right-hand, he must measure the same distance, as he comes down again from that open furrow, and when he has made another bout to earth those plants, he measures fifteen inches from the edge of that furrow; and when the plants are put into that he is now making and earthed, he then proceeds to measure off three feet and a half, which form the interval, and so on earthing, and then measuring fifteen inches alternately with the other, for the partitions, till all is finished.

“By which operations the whole ground will be planted with two rows, at two feet the partitions, and four feet and a quarter the intervals. Thus, then, upon the whole of these directions, when he first sets off, and gets to the far end, and turning to the right, he measures three feet and a half; when he has earthed plants, he measures three and a half for the next bout to receive the plants; and, earthing these, he measures fifteen inches for another row of plants; and, earthing these, he measures three feet and a half; and earthing these, he measures fifteen inches; and so on, alternately, three feet and a half, and earthing; then fifteen inches, and earthing; then three feet and a half again.”

The farmer will, doubtless, be glad to know what crop he is to expect from his land after all his labour: he has already been informed, that the number of cabbages on an acre, if they have all stood to maturity, will be six thousand, nine hundred and seventy: these may be allowed to weigh, one with another upon a medium, three quarters of a stone each; and if an ox be allowed to eat nine stone a day, that is, twelve cabbages, then six oxen will live three months on one acre of them; so that supposing one acre of turnips, raised in the common method of husbandry, to be sufficient during the same space of time for two oxen, we may still expect, in proportion, three times more benefit from the cabbages than from the turnips.

Mr. Randall assures us, that the oxen will grow very fat upon such food; that he has given it to many cows for a long time together, without perceiving the least disagreeable taste, either in the milk or butter: on the contrary, the milk was rather richer and sweeter: and that both oxen and cows are exceedingly fond of this food. The same may be said of sheep, which improve in their flesh very fast, and grow surprizingly fat on cabbages: yet has the mutton no disagreeable taste; so that there is perhaps no vegetable which will raise lean sheep of the largest breed sooner than cabbages. *Randall's Semi-Virgilian Husbandry, p. 315.*

It has been fully proved by experience, that cabbages are not only very agreeable food for black cattle and sheep, but also that they are very nourishing to them. They are completely fattened upon cabbages, and their flesh is as well tasted, as when fed upon rich pastures. Cows fed upon cabbages give a great deal of milk, and the butter made from it is excellent.

It was indeed for some time otherwise in the north of England, where cabbages were first cultivated at large in the fields, for feeding cattle, particularly the large Scotch cabbage; but it was discovered, that the bad taste of butter, when the cows fed upon cabbages, was wholly owing to giving them the decayed leaves: for when these decayed leaves are all taken off, and only the sound cabbages given to the cows, the milk and butter is perfectly sweet, and of a rich taste. In taking off these decayed leaves, there is no loss to the owner: for the dry cattle eat them greedily, and are much nourished by them.

It is a great recommendation of the large Scotch cabbages, that they produce very large crops, from thirty to sixty tons upon an acre, when cultivated upon good land, well manured, and horse-hoed; which is most conveniently done when they are transplanted upon ridges, between four and five feet broad, a single row upon each ridge, and the plants set about two feet asunder in the rows. The rows being thus far asunder, there is good room to horse-hoe them, which should be done deep, and repeated till the hoe-plough is shut out by the spreading of the plants: the ground between the plants is likewise to be well and frequently hand-hoed, and no weed suffered to grow large.

The expence of this culture is fully recompenced by the greatness, and nourishing quality of the crop; by the hardiness of these cabbages, resisting frost; and by their coming into use in winter and early in the spring: add to these advantages the improvement of the land, which is remarkable, the succeeding crops of whatever kind being extraordinary great. For an account of the feeding quality of cabbages, see LUCERNE.

In Mr. Baker's reports to the Dublin Society for the years 1769, 1770, and 1771, he has related a number of experiments that he made in these years, upon various sorts of cabbages. These he distinguishes into summer and winter cabbages. The summer cabbages were those raised from seed sown in March, were called spring or summer plants: and those from seed sown in August, were called autumn or winter plants.

In cultivating cabbages, the objects principally in view are, the quantity of food they produce, and their duration.

The quantity of food for cattle that they produce is very great; from twenty or thirty to fifty ton and upwards per acre. Black cattle and sheep are remarkably fond of all sorts of cabbages, and they are also very serviceable for feeding horses and hogs; and afford good nourishment to all.

The duration of these plants is of great importance: for some of them continue sound through the winter; and during the months of March, April, and May. This renders them peculiarly valuable: for in these months the winter provision for cattle is mostly spent, and the grass is not then advanced so far as to supply them, often not till the middle of May; for which reason farmers are distressed for food for their cattle, during the whole month of April, and part of March and May.

The first set of experiments on cabbages of different kinds, being winter plants, sown in August, and transplanted the sixth of March from the seed-bed.

- N^o 1. The green borecole.
2. The long-sided cabbage.
3. The flat Dutch cabbage.
4. The great Scotch cabbage.
5. The Anjou colewort.
6. The Battersea cabbage.
7. The York cabbage.
8. The sugar-loaf cabbage.
9. The green Savoy cabbage.

The ground upon which these were planted out, had the preceding year produced turnips, and the year before that potatoes; and was twice ploughed for the cabbages, without any other preparation. These plants were horse-hoed the 25th of May; again in June, and the last time in August.

The horse-hoeings were performed with a small plough, drawn by two horses, one before the other. First turning a furrow from the row of cabbages of one ridge, and another furrow from the next contiguous ridge, both these furrows being turned into, and meeting in the interval between these ridges: the next hoeing turned the earth also from the plants, the plough going in the same tract as at the first hoeing, only deeper, and nearer to the rows: because at the first hoeing, the plough does not go deep enough, and near enough to the rows; which it should do as close to the rows as can be done, without tearing out the plants. The third hoeing turns all the earth out of the interval up to the plants, which compleats the ridges as they were at first. This is the manner in which he hoed one side of each of the two contiguous ridges. The other sides of the ridges were next hoed in the same manner.

This is called alternate hoeing; and is necessary in hoeing ridges, upon which there is, as here, only a single row of plants upon each ridge: for if they had a whole hoeing at once, viz. both sides of the ridges ploughed away at once from the plants, the plants standing upon a narrow slip of earth would be thrown down, in turning the second furrow, if that was done before the earth of the first furrow was returned to support the row. In hoeing close to the plants, some few leaves will be broken off by the plough, but in no proportion to so many as might be imagined.

“The expence, says he, of these several operations, depends upon the nature and condition of the land; from three to six shillings an acre. This stood me in five shillings and six-pence;” [which is nearly 3s. and 5d. per English acre.]

As some earth will remain in the intervals after the third hoeing, (called the heinting) that should also be thrown up

to the ridges on each side, and will require one bout, if done with the hoe-plough: but with a double board-plough, the henting may be thrown to the ridge at half a bout, or one furrow; which will throw it all up, and leave a clear open trench between every two ridges.

The produce of the nine kinds of cabbages from each ridge 630 feet long, and 5 feet wide, with their average, and extraordinary weight, all being winter plants, was as follows:

		distance in the rows.	weight per ridge.			average weight.	extra weight.	produce per plantat. acre.				produce per Eng. acre.				Duration.	
		inches.	C.	qr.	lb.	lb.	oz.	lb.	ton.	c.	qr.	lb.	ton.	c.	qr.	lb.	N ^o
N ^o 1.	Green borecole,	18	00	0	00	0	0	0	0	0	0	0	ran to feed.				2
2.	Long-sided,	24	33	3	27	12	1 $\frac{1}{4}$	16	38	1	0	18 $\frac{1}{4}$	23	15	1	0	6
3.	Flat Dutch,	24	34	1	22	12	1 $\frac{1}{4}$	20	38	11	2	3 $\frac{5}{8}$	24	1	2	0	7
4.	Scotch,	24	34	0	11	12	2	19 $\frac{1}{2}$	38	4	0	13 $\frac{1}{2}$	23	17	3	0	8
5.	Anjou colewort,	48	23	2	20	17	0	24	26	10	1	19 $\frac{1}{8}$	16	7	0	0	3
	Ditto, 3 feet distant,	36	30	3	21	16 $\frac{1}{2}$	0		34	13	0	11 $\frac{3}{4}$	20	8	0	0	4
6.	Battersea,	18	13	0	14	3 $\frac{1}{2}$	0	5	14	14	0	2 $\frac{1}{2}$	9	3	3	0	
7.	York,	18	11	2	27	3	2	4	13	2	3	14 $\frac{3}{4}$	8	5	1	0	5
8.	Sugar-loaf,	18	11	1	0	3	0	4	12	11	3	20 $\frac{1}{4}$	7	17	2	0	9
9.	Green favoy,	18	16	3	14	4 $\frac{1}{2}$	0	6	18	17	3	18 $\frac{3}{4}$	11	17	0	0	
																	To October and November.
																	December and January.
																	Middle of May.
																	February.

1. The first column of the above table shews the distance at which the cabbages were planted upon the ridges.

2. The weight of the cabbages upon a ridge of 630 feet long, and 5 feet broad.

3. The average weight of the cabbages upon each ridge.

4. The weight of the largest cabbages of each sort.

5. The weight of the Anjou coleworts, planted 4 feet distant in the rows, the average of 17 lb.

Ditto, 3 feet distant in the rows, average 16 $\frac{1}{2}$ lb.

6. Produce per plantation Irish acre.

Ditto, per English acre nearly.

7. Duration, or the time when each sort began to decay.

The duration of cabbages, or how long they continue sound, and without bursting or running to seed, is an important circumstance; and it appears, by comparing Mr. Baker's experiments with those related by Mr. Young, in his North Tour, that cabbages of the same kinds decay earlier in the season in Ireland than they do in England. The great Scotch cabbage in particular, which with Mr. Baker continued sound no longer than January, is of much longer duration in England, as appears in the following tables from Mr. Young, shewing the duration of this species of cabbage, as he was informed by the gentlemen who cultivated it at large in the fields, viz.

Spring sowing.

	Duration.
Mr. Middlemore,	April.
Mr. Lyfter,	Christmas.
Mr. Tucker,	end of March.
Mr. Ellerker,	end of April,
Mr. Smelt,	end of March.
Mr. Scroop,	beginning of May.

Summer sowing.

	Duration.
Mr. Tucker,	want cutting before Christmas.
Mr. Crowe,	May-day.

"Mr. Young," says Mr. Baker, "gives amazing accounts of the progress of cabbage-husbandry in England; and it seems to be universally agreed, that the cabbage answers all the purposes of maintaining and fattening horned cattle and sheep. The kind which seems to be in most general use is the Scotch; though the turnep-cabbage and borecole are not neglected.

"It appears that this Scotch cabbage is generally found with them to stand the winter. Some gentlemen informed Mr. Young, that they stand until April, and even May." I have just had the favour of a letter from Mr. Young, upon husbandry matters, dated the 12th of April, 1770, in answer to one I wrote him upon this subject, and he says—"As to the Scotch cabbage all my accounts ran that it lasts quite through April; and I have now letters by me, just received from Mr. Scroope and Mr. Dodsworth, that their present crop is in fine order, with but few black-caps among them. They are, as you observe, hard, but do not burst until long after their loose leaves are all dropped off, and their outward skin turned black."

"The long duration in England of the Scotch cabbage, would be to me surprising, did I not consider two

probable causes of accounting for it. In England the frosts begin in October and November, whereas in Ireland, those months and December generally afford mild weather, attended with rain, and scarce any frost until January, February, and March; and even then, in general insignificant, when compared with those of England, and particularly the northern parts, where the cabbage culture seems to be most adopted. Indeed I observe the like even in the wheat of Ireland: for in November and December it looks florid and healthy, even in poor grounds; but in January, February, even March, and sometimes in April, as this year, 1770, it falls off wonderfully, and looks sickly, except where the lands are rich and dry.

"However, there is yet another probable reason why the cabbage which I have for Scotch, may decay sooner than in England: mine, it is very likely, is not the true kind: and in truth I have thought them no other than the flat Dutch, because they appear to be the same. If we look at the table taken from Mr. Young, we see some of the gentlemen find theirs to decay as soon as mine; so that it is mighty likely these several gentlemen have not all the same species; because there the difference of climate cannot operate."

Mr. Baker had planted his cabbages upon five feet ridges, and the large sorts at two feet apart in the rows; but upon further experience found that these distances were greater than necessary, and that larger crops were to be obtained by planting them on four-foot ridges, and eighteen inches distance in the rows; and the smaller kinds at only one foot distance in the rows.

He likewise tried what crops could be obtained by sowing the seed for winter plants earlier than August; but found the inconveniency of early sowing: for in the year 1770, he sowed the seed of ten different sorts of cabbages for his winter crop, the 24th of July, which was attended with the two following ill consequences, viz.

1. The plants grew away so fast, that towards autumn they became much too large; and when he came to draw them up out of the seed-bed in the spring, 1771, to plant them in the full ground, he found that many of them had rotted in the shanks during the winter, and all of them were too long shanked. 2. Instead of spreading their leaves for cabbaging, as they should have done, towards June they shot up, and broke out in blossom, at least nine out of ten; and the few that did cabbage, were but small, none weighing above ten pounds; and they began to go off early in October: hence he draws the following conclusion:

"That cabbage-seeds for winter plants are not to be sown until August; and I shall add, as my opinion, not until between the 20th and 30th of that month."

"In the culture of the Anjou colewort, this year, 1771, I have been much more fortunate than in the sorts above-mentioned, and that from a lucky circumstance, viz. that in the summer 1770, I was attempting to raise the seed of this plant, for which I used to pay 40s. a pound. Had I bought the seed for autumn sowing in 1770, I should have been in the same situation with this, as I was with the preceding ones. Having saved about nine pounds of this seed, on the 29th of August I sowed about a pound of it: the spring was so dry that my transplanting was late, not until the 24th day of April. The land was thrown into four feet ridges, and in 1767 had produced potatoes, in 1768 turneps,

turneps, in 1769 turneps and cabbages, in 1770 under cabbages, and the part planted this year with Anjou, was the two preceding years under the same plants. This field contains a little above 6 $\frac{3}{4}$ acres; near one acre was planted with the Anjou, one with other cabbages, four acres of grafs, and the head-lands with potatoes and carrots. The Anjou was horse-hoed twice, in the usual manner.

"Eight horses were turned into this field, to feed upon the grafs: they began immediately to feed upon the Anjou colewort with surprising avidity. This was an unexpected application of the crop, and lost me the opportunity of weighing one of the rows, as I intended. Upon the most moderate and equal calculation we could make, we apprehended the horses were plentifully maintained three weeks upon this crop, which, at five pence per horse, amounts to 3l. 10s. I do not offer this calculation as being perfectly exact, though I believe it be within, rather than over the truth.

"In a fortnight after the horses were brought home, I turned in forty-five sheep, three young calves, and a fine young bull, which I have: these remained here in the following order:

December 18th, turned in,		
January 9th, sold 13	990 sheep a day.	
16th, sold 16	224 ditto.	
23d, sold 16	112 ditto.	
45	1326	

"These 45 sheep were not only maintained, but really much mended in flesh and tallow upon this pasture; equal in point of time to keeping 1326 for a day. If we value this at an half-penny per head, the pasturage amounts to 2l. 16s. 3d.

"Besides this crop of Anjou colewort, there was about an acre of summer cabbages, which from late planting, were nothing: I leave them to counterbalance for the food of the bull and three calves. By calculating from the improvement in the value of the sheep, the profit made upon them appears to be 3l. 3s. from their feeding upon this crop; which shews that I have not over-valued the pasture of the sheep, at an halfpenny a day.

"The accounts being united, will stand thus:

Maintaining 8 horses three weeks,	3	10	0
Maintaining the sheep as before mentioned,	2	15	3
	£	6	5 3

"Thus I think it comes out pretty clearly, that the Anjou colewort is worth at least six pounds an acre: a produce by no means contemptible, when we consider the cheapness of the culture; which, after the ground has been properly manured for potatoes, cannot amount to forty shillings, including rent, &c. But let no man imagine he can cultivate this or any other of the cabbage tribe, without liberal manuring; the most profitable method of doing which is certainly by making potatoes the crop in preparation.

"Although the experiment before us, has not been attended with all that accuracy which I am fond of adhering to in my pursuits; yet it affords some important facts which may be depended upon. I shall collect them in one view.

1. That horses will eat this plant, that they are fond of, and thrive upon it.
2. That sheep thrive very fast upon it, and are fond of it to excess.
3. That it affords them fine shelter, and food perfectly free from any kind of dirt.
4. That as fine plants may be raised from seed carefully saved in Ireland as from imported seed, I used to pay 40 shillings a pound for it: in 1774, I hope to supply the public at 4 or 5 shillings a pound; probably less.
5. That this plant may be planted upon the same ground for three years in succession, without intermission, even after producing turneps; being previously prepared by potatoes.
6. That ridges four feet wide seem to be a sufficient distance; as this, the third crop, upon the same ground, was a very noble one.
7. That Anjou coleworts will, in the winter, pay more than three-pence halfpenny a week per head for pasturing sheep.

"It was truly a pleasing sight to see the sheep dispersed through these lofty greens; the white and green made a variation every man must admire: half an hour's feeding the animals had found sufficient; then they marched, as it were by mutual consent, to the clean grafs, and all lay down in a cluster for an hour or two at a time; then rose again, stretched themselves, and all marched away to their food; and thus they went on, day after day, until at last, I am satisfied, they lay down half the day: a strong indication of their fattening fast.

"This plant grew, with Mr. Baker, six and eight feet high: sheep reach the leaves to about the height of four feet, and the horses eat the upper part of them. He observes, that Mr. Young, in his fourth volume, p. 202. says, "Anjou is good for nothing with Mr. Turner and Mr. Scroop. Savoy, I presume the green Savoy cabbage, this in the same trial, in rows four feet asunder, by one foot in the rows, came to five pounds at an average, or twenty-four tons per acre, which is a considerable produce. Cattle like them very well; but they would not stand the winter."

"Here we find," says Mr. Baker, the account which these two gentlemen gave Mr. Young of these plants, appears to be diametrically opposite to my success in the culture of them. With them "the Anjou was good for nothing;" and the Savoy "would not stand the winter." The latter I cannot account for: the former I think fully in my power, by experiments this year. I can be almost certain, that the Anjou in their trials was sown in the spring, and set in June. In that culture, I can now inform the public, the Anjou are not so luxuriant as I expected they would have been. The weight of the Anjou has been already stated: its duration for plentiful pasture continues until the middle of May; and the Savoy until February expired. I used all I had by that time, though I believe they would have stood longer.

"A table of the duration of winter plants, sown in August:

The class first in decay.

Duration.

The long-sided,	} October and November.
The Battersea,	
The York,	
The sugar-loaf,	

The second class.

The flat Dutch,	} December and January.
The Scotch,	

The third class.

The Anjou colewort, middle of May.

The green Savoy, end of February, or later. See above.

"Hogs eat raw cabbages greedily, and thrive upon them."

The seed of the Anjou was sent by the marquis of Turbilly to the London Society of Arts, who distributed it to many of the members; by which means this plant was raised in several parts of England: but it does not appear with what success it was cultivated in England; except what Mr. Young mentions as above. Mr. Baker appears to have been the first who cultivated it with accuracy and success. The marquis calls it the Anjou cabbage; Mr. Baker, the Anjou colewort, because it grows with open leaves, and does not cabbage. It appears to be a very valuable plant, with respect to the great quantity of food it produces for sheep and horses; and especially for its long duration, even to the middle of May, if the seed is sown in August, and transplanted from the seed-bed into the full ground in June: add to this the excellent shelter these tall plants afford to sheep.

Mr. Baker found, that from 16 to 20 pounds of seed was the proper quantity to sow in the seed-bed, to furnish plants of the larger kinds of cabbages, sufficient for an Irish plantation acre; which is from 10 to about 12 $\frac{1}{2}$ pounds to furnish plants for an English acre. The seed of borecole being smaller than most of the others, from 8 to 10 pounds of that will be enough for an English acre. The seed of all the cabbages should be sown pretty thin in the seed-bed; allowing between two and three perches of ground well prepared, to every pound of seed. The best way

way is to sow the seed in drills : Mr. Baker says, that where handy active men are employed, three men will easily transplant an Irish acre a day, which is about an acre and a half English.

“ The second set of experiments made in 1769 upon the cabbage husbandry, being the spring or summer culture.

The kinds were as follow :

	Distance.		Average.		Extra.		Produce of an Irish acre.					Produce per English acre.			
	inches.	feet.	lb.	oz.	lb.	oz.	Tons.	C.	qr.	lb.	oz.	Tons.	C.	qr.	lb.
N ^o 1. The green borecole,	21 $\frac{1}{4}$	by 5	5	6 $\frac{1}{2}$	8	0	19	4	0	17	1	12	0	0	0
2. Great Scotch cabbage,	23 $\frac{1}{2}$	by 5	6	13	9	0	21	16	3	11	6	13	12	2	0
3. Anjou colewort,	2 feet	by 5	5	9	0	0	17	15	2	17	14	11	2	0	0
4. Chos du Milan,	2 feet	by 5	4	8	0	0	14	8	2	7	0	9	0	0	0
5. Turnep-cabbage,	18 in.	by 5	5	0	0	0	21	00	0	0	0	13	2	2	0
6. Jerufalem colewort,	2 feet	by 3	7	0	14	8	36	15	0	0	0	22	10	0	0
	2 feet	by 5	7	0			22	1	0	0	0	13	6	0	0
7. White brocoli, 2d sowing,	2 feet	by 5	4	1	0	0	13	1	2	0	3	8	2	2	0
8. Purple brocoli, ditto,	2 feet	by 5	3	15	0	0	12	12	3	11	13	7	17	2	0
9. Green brocoli, ditto,	2 feet	by 5	3	8	0	0	11	3	3	4	8	6	17	2	0
10. Red pickling cabbage,	23 $\frac{1}{2}$ in.	by 5	6	0	9	0	19	7	0	0	0	12	1	3	0

“ The seed of these was sown the 10th of March, except N^o. 6, sown the 24th of March : likewise a second sowing of No. 7, 8, and 9.

“ Five plantation acres were prepared for these plants : the land was ploughed in November, again in April, and harrowed down ; and the latter end of May it was thrown into five. feet ridges, at three bouts of the plough. The 17th of June the land was manured, by laying the manure upon every second ridge alternately, and throwing it equally into the two contiguous furrows ; and immediately ploughed in, by turning the ridges into the furrows, by which means the new ridges stood over the dung, as in a hot-bed.”

“ The 21st and 14th of June there was fine rain, and three plantation acres were planted from the seed beds, with the plants, N^o 1, 2, 3, 4, 5 and 10. Mr. Baker finding the common dibbers made slow work, made dibbers of iron eighteen inches long, and seven pounds weight ; which made quick work, preferable to making out furrows in the ground with the plough, and much more exact. “ I can, says he, put out an acre of plants, for at least half, if not a fourth of the expence of transplanting the plants in furrows made by the plough ; and straighter, the top of the ridge being a guide to transplant them in a regular line, which is necessary where plants are to be horse-hoed : another advantage is, that the ridges, when planted in furrows made by the plough, cannot be raised for the reception of the plants, and have not that depth of well prepared mould for the roots to extend it, as when the ridges are raised hand-somely : suppose the staple that our plough works in to be nine inches, by throwing it up into these ridges, I make it eighteen : if the staple is but six inches deep by raising the ridges, they may still be made near eighteen, by widening the mould-board of the plough. The benefit of this to the plants must be obvious to every man.”

But here it is to be noted, that Mr. Baker said this in the year 1769, when he made his ridges for cabbages five feet broad, which would admit of being raised high : but if the ridges were made considerably narrower, and the staple was but six inches deep, by raising narrow ridges upon such staple to the height of near eighteen inches, so much of the mould would be raised into the crown of the ridges, that there would not be enough of it left on the sides to be horse-hoed ; which is a necessary consideration in culture of plants by the horse-hoe.

“ I have already informed the reader, that the Scotch is the kind of cabbage in most general cultivation in England, for the purpose of the farmer and grazier. According to the information which Mr. Young obtained, some gentlemen have had above 50 tons upon an English acre, (and some few as low as 15 tons) as appears by the following table from Mr. Young :

On clays and strong loams.	Soil.	Average weight. lb.	Distance.	Rooms to each plant.
Mr. Turner 39	clay	15	2 ft. by 4	8 sq. feet.
Mr. Crowe 35				
Mr. Scroop 37				
Earl of Darlington 40				
Mr. Dixon 48				
Average 39 Tons.				
On rich deep light loam.	rich loam	20	2 & 2 $\frac{1}{2}$ by 4	8 & 10 feet.
Mr. Tucker 44				
On inferior soils.	red sand	14	18 in. by 4	6 sq. feet.
Mr. Midlbmore 54				
Mr. Lyller 27				
Mr. Smeit 18				
Mr. Scroop, Dalton 21	sandy gravel	7 $\frac{1}{2}$	2 by 4	8 do.
Average 39 tons.				

Duration of the different sorts of the summer culture.

	First in decay	Second do.	Third do.	Fourth do.	Fifth do.	Sixth do.	Seventh do.	Decay.
	N ^o 7 white brocoli	8 purple do.	9 Green do.	2 Scotch cabbage	7 8 9	10 the red cabbage.	3 Anjou colewort.	March sowing worth nothing for the farmer's purpose.
								July sowing.
								in January. February
								March.
								April.
								May.
								May.
								April.
								and May.
								if taken up as directed, in Feb. will keep sound till June, or later, if desired.

Considerations upon Borecole and some other Plants, dropping off in the Winter the Leaves of the Summer Growth.

Under this head I shall only consider such of our plants as stand the winter throughout ; and of those only such as we have seen are most profitable in the course of our experiments, and therefore in this place I have only to take notice of the borecole, the Anjou colewort, the turnep cabbage, and the red cabbage ; these I think are the only plants which stand until spring, and cast their leaves of the summer growth.

The borecole I have already said stands the winter admirably ; and as it casts the summer leaves in December and January, proceeds in vegetation, and produces another succession of leaves, not so large, but infinitely more in number. With me all the summer leaves dropped off, and consequently were lost ; but that need not be the case with other cultivators. I thought it necessary for the information and conviction of the public, to let this whole plantation stand, without any diminution but the natural ; I still think, as I did in the year 1764, that the most advantageous way of using this plant, would be by turning their sheep into the field, as described in my report for that year. By that means the summer leaves will be turned to profit, which cannot answer any other way : for the pulling and bringing them home would be too expensive, because it must be all hand work, and men's carriage, to the head lands ; as no carriage can be admitted amongst the plants, the intervals being too narrow.

The Anjou colewort casts its summer leaves in November and December, but will be handsomely furnished again by the winter growth against the spring. The same objections hold good, with respect to making use of the summer leaves, by carrying them off, as I have just offered to the borecole ; and this plant should also be pastured with sheep, to prevent the loss of the summer growth. The extraordinary height of this plant (viz. the winter plants) might be some impediment to its being pastured by sheep ; as I suppose they cannot reach above four feet high, and my plants are now seven or eight feet : but I observed that the bulk of the summer leaves which fell off in the winter, were chiefly those about four feet up the stem : those above that height seem in general to stand the winter, and are food for horses above where the sheep can reach. Next to plentiful pasture, I heard the graziers always talk of good shelter. In plantations of borecole, Anjou colewort, and Jerufalem colewort, we have a profusion of pasture, and shelter beyond conception, for sheep and lambs, and we have

have them both at a season when they are most wanting, and when they can scarcely be had spontaneously upon any grounds, and more particularly on pasture.

"To direct the choice of species and seasons for the advantageous progress of the cabbage husbandry, I have added the following

Table of Successions.

Species.	Sown.	Planted.	In use.	Duration.
The long sided cabbage	In August	In March	In August	till November
—flat Dutch do.	August	March	December and January	January
—Scotch do.	August	March	December and January	January
—Anjou colewort	August	March	December and May	May
—green borecole	March	June	December and May	May
—turnep cabbage	March	June	February and June	June
—Jerusalem colewort	March	June	December and May	May

By this disposition of our cabbage crops, in sufficient quantities, we should have them, from the time of our grass and clover being diminished, until we can have those two resources again in plenty. Surely no consideration can so much recommend this husbandry.

The swine have had nothing all the winter but cabbages of different kinds, and they have done very well with that food, except such as were not bred to it; those do not keep themselves in so good order with it as the others. I am aware that it will be a matter of some admiration to many, that I keep such a quantity of swine, as I have frequently had occasion to mention in this report: (83 head, viz. four or five very large ones, some middling, and some small: upon the whole, if they had been all fat, I apprehend they would all have weighed upon an average three quarters of an hundred a piece.) My reasons are principally, that of making great quantities of dung, to which this animal wonderfully contributes, and the obtaining large quantities of meat at a cheap rate, for a very large family, as mine is.

The turnep cabbage, and red cabbage, also cast their external leaves the beginning of winter, and should be taken off for the cattle before they decay; but should not be fed off by sheep, because they will fall upon and wound the body of the cabbage, and do more damage than the value of the loose leaves.

The turnep-rooted cabbage is a spring plant, very hardy, and continues found through the winter and spring. The merit of this plant is in the root, the tops being very small. The objection to it is the labour in getting up the roots, which cannot be done without a mattock or a very strong three pronged fork. They are juicy, but not watry, have an agreeable flavour, and the black cattle are fond of them; but are so hard they cannot eat them but with difficulty; and Mr. Baker found they made the cattle's mouths bleed, and therefore when given to them, the roots should be first washed and chopped in pieces; and then they may be eaten by black cattle or sheep; they produce a great quantity of roots.

Mr. Baker apprehending that the distances he at first allowed to his cabbage plants, (of 5 feet ridges, and 2 feet or more in the rows) were greater than necessary, and that greater crops might be obtained by planting them closer, viz. the ridges to be only four feet broad, and the plants according to their respective sizes and luxuriancy, to be set in the rows, from one foot to two feet or more, gives the following table, of the most proper distances of the several sorts, to produce the greatest crops, from his observations and experience of the growth of each sort, as follows:

The Table of Distances for the Cabbage-Husbandry.

	Season.	Distance I have used.	Distance I venture to recommend.
The long sided cabbage	winter plants	2 feet by 5 feet	2 feet by 4 feet, or 18 inches by 4 feet
The flat Dutch cabbage	ditto.	2 5	2 feet by 4 feet, or 18 inches by 4 feet
Ditto	spring plants	2 5	18 inches by 4 feet
The Scotch cabbage	winter plants	2 5	2 feet by 4 feet, or 18 inches by 4 feet
Ditto	spring plants	3½ 5	18 inches by 4 feet
The Anjou colewort	winter plants	4 5	} 2 feet by 5 feet
Ditto	ditto.	3 5	
Ditto	spring plants	2 5	
The green borecole	ditto.	21¼ in. by 5	1 foot by 4 feet
The turnep cabbage	ditto.	18 5	1 foot by 4 feet
The Jerusalem colewort	ditto.	2 3	18 inches by 4 feet

At these distances, more plants will be required, and the expence of transplanting them will be something greater; but these are trifling in comparison with the increased products per acre.

Mr. Baker observing that a horse employed to draw the cabbages home, eat them very freely, ordered several other horses, one after another, to draw home the cabbages, "and they all eat the borecole most eagerly. But what is more remarkable, the horse which has been chiefly employed in this business, is in better order than any other draught horse I have; and I find (from the nature of his employment, often requiring him in the cabbage field, when the horses get their corn) he has been deprived of his share of corn.

"These events have determined me to try an horse next winter with the borecole and hay, and another with the borecole and corn. It may be imagined that the borecole will gripe the horses; I cannot tell; but the plant, as I before said, is very dry and warm. Should it be found to answer the purpose of maintaining the farmer's horses with a small allowance of hay or corn, or even both, it will be inestimable indeed.

"With pleasure I discover that the cabbage husbandry is making great progress through the kingdom; but I receive so many letters, complaining of the seeds, not only being mixed, but so often, that not a grain of the kind they had been purchased for was among them; which, added to

the prices they were sold at, is a great discouragement to the progress of this husbandry: I have therefore determined to raise the seeds myself, or all such kinds as I have, or shall find most advantageous to the farmer's purposes. But as all the cabbage tribe are apt to engender, and produce bastard kinds, I cannot raise many sorts in a season, to have them perfect, and therefore I cannot immediately furnish every kind. However, I have made some beginning, and now have the following sorts ready to supply such as may call.

Green borecole, a single pound 4 shillings; seven pounds at two shillings and 8 pence, per pound. } I used to pay 10 shil. a pound.
 Reynolds's turnep-rooted cabbage, a single pound 4 shillings; seven pounds at 2 shillings and 8 pence per pound. } Ditto 16 shil.
 Jerusalem colewort, a single pound 4 shillings; seven pound at 2 shillings and 8 pence per pound. } Ditto 16 shil.
 Anjou colewort, a single pound 8 shillings; seven pounds at 5 shillings 4 pence per pound. } Ditto 40 shil.

"By this reduction of prices, I hope the public will see manifestly that I have not any profit in view by this object; all I aim at is, to indemnify my expence, and to promote the cabbage-husbandry. If the demand shall be such as to

defray the expences, I do not despair of reducing the prices still lower, since it is not the price I look at to indemnify me, but the quantity sold. Mr. Marshall, in his *Minutes of Agriculture*, says, that he found cabbages of very great use to the yard-hogs, particularly the suckling sows."

CADDOW, a name given to the jack-daw, in some of the northern counties of England.

CADMA, the least of the pigs which a sow has at one farrowing; for they have generally one which is remarkably less than the rest.

CALF, the young of a cow.

There are two ways of breeding those calves you design to rear; the one is to let them run with the dam all the year, which is the common way used in the cheap breeding countries, which they reckon makes the best cattle; and the other way is, to take them from the dams after they have sucked about a fortnight: then they teach them to drink flet or skimmed milk, which they make just warm for them, it being very dangerous to give it them too hot. The best time for weaning of calves is from January to May. Let your calves have milk for about twelve weeks; only a fortnight before you wean them from milk, let water be mixed with the milk; and after your calf hath drank milk about a month, take some of the freshest, sweetest hay you have, and put little wisps of it into some cleft-sticks, which place so as the calf may easily come at them to learn to eat; and after Lady-day, when the weather is fair, turn your calves to grafs, taking them in a few nights at first, giving them milk and water, and sometimes giving the same to them in a pail in the field, till you find they are able to feed themselves, so as not to desire it: but by no means let your grafs be too rank, but short and sweet, that they may get it with some labour. All wean their calves at grafs; for if you wean them in the house with hay and water, it is apt to make them big-bellied, and to rot; and when you have resolved which of the males to keep for bulls, let the others be gelt for oxen, which the sooner you do the better: when they are between ten or twenty days old, is the best time and least dangerous.

In Hertfordshire, Essex, and most places near London, they commonly fat all their calves for the butcher, because they have there a good market for them, and the lands are not so profitable to breed on as in cheaper counties; a good calf there often selling for as much as a good heifer, especially if they are very fat and white, which they take a great deal of care to make them. Their way of doing this, is by keeping them clean, giving them fresh litter every day, which they lay upon their old litter; for they clear out their coops but two or three times in a year, and most commonly at a time when they have no calves in them: they constantly also let them have a large chalk-stone or two to lick, which they bore a hole through, and hang up by a string in a corner of the coop, which prevents their fouling it with dung and urine. They also observe to fet their coops where they may have as little sun come to them as they can, that they be not made close and stifling, and that they stand a yard above the ground, that the urine may run from them: and to make them white, they often let them blood when they are about a month old, and a little before they kill them; and because they are often loose, they do not let them suck their fill; but instead of it they sometimes give them chalk scraped into milk, which they pour down with a horn; also salt and water; and sometimes they cold bathe them, and give them bole-ammoniac and chalk, which they moisten with milk, and make it into balls, and give it them. If a cow will not let a strange calf suck her, rub both hers and the calf's nose with a little brandy. *Mortimer's Husbandry*, vol. I. p. 228.

A young calf is left with its dam the first five or six days, that it may be kept always warm, and suck whenever it pleases: but if in those five or six days it grows and gathers strength, there is a necessity for making a separation, as he would exhaust the cow if left always with her. Sucking two or three times a day will now be sufficient. If you intend to fatten him speedily, and at the same time, render his flesh fine and delicate, let him have every day raw eggs, boiled milk, and the crumbs of bread: by this means the flesh, at the end of four or five weeks will be excellent. Calves, therefore, intended for the butcher should not suck above thirty or forty days; but those designed for the dam for two months at least; as the more they suck, the stronger and larger they will prove. The best for bringing up are those calved in the months of April, May, and June. It is seldom that those which come later acquire sufficient vigour

to support them during the inclemency of the following winter; the cold causing them to droop, and many of them to die. Thus calves designed for keeping should be weaned at two, three, or four months; but before taking them totally from the milk, a little good grafs, or chopped hay, should be given them, that they may become accustomed to such aliment; for when they are to be entirely separated from their dam, they must never be suffered to come near her either in the stall or pasture, whither they should be sent every day, and remain there, during the summer, from morning to evening; but at the setting in of the cold weather in autumn, they must not be let out till late in the morning, and brought back early in the evening. And as the pinching cold of winter will be extremely detrimental to them, they should be kept very warm in a cow-house, and well supplied with water; fainfoin, lucern, &c. should be mixed with their common hay. They must be let out only in warm weather. A great deal of care is necessary to bring them through the first winter, which is the most dangerous period of their lives; for they will acquire so much strength during the following summer, that they will have nothing to fear from the cold of a second winter. *Buffon's Histoire Naturelle*, tom. IV.

Mr. Marshall says that he is clearly of opinion, that to suckle calves, in general, after they are ten weeks old, is bad management; for his account in this respect is uniform; those of nine or ten having paid as much a week as those of twelve or thirteen; and although a calf of six weeks old, may suck nearly as much milk as a calf of twelve weeks old; yet the first month or five weeks, the quantity is considerably less, and this advantage of their infancy is doubly as valuable to nine, as it is to twelve weeks.

The same gentleman in his *Rural Economy of Yorkshire* says "There is a practice pretty common in this neighbourhood, though not general, which merits notice from its singularity rather than from its excellency. It is the calf never sucks the dam! which from the time of her calving, is milked into a pail, and the warm milk given immediately to the calf; which never having had the teat, soon learns to drink. The chief reason given for this practice, is that the cow does not pine after her calf, so much at least, as when it is permitted to suck her. For rearing calves, no material objection is to be made to this method, except that of additional labour, and that calves do not fat so kindly with the pail as with the cow: nor is it probably so good for the udder of the cow.

Mr. Marshall in the same work says "The time of rearing a calf is Candlemas to Old Lady Day. A raw nose, that is a white muzzle, with nostrils red on the inside, is considered as a bad mark, portending a tender beast; and on the contrary a black or brown muzzle, with dark-coloured nostrils, is esteemed a sign of hardiness. A calf entirely white is generally rejected, under a notion that white cattle are of a tender nature; that they are peculiarly subject to lousiness; and that they are disliked by their associates! The finest ox I ever knew of the Holdernefs breed was white. The finest ox I ever saw of the Tees-water breed was white. One of the finest cows now in the vale is white. Nevertheless, valuable calves are annually sent to the butcher, merely because they are all white. The smallest speck of colouring, even the tip of an ear, red or black, saves them from proscription: under a notion, no doubt, that it hardens their nature; defends them from lice; and renders them acceptable to their companions: a vulgar error, which is not confined to this district; but which ought, in my opinion, to be universally exploded. Oxen in this country (as probably in others) are peculiarly subject to a stoppage in the intestines; owing, it is believed, to the "blood strings" of the testicles being left in the body at the time of gelding. The fact seems to be, that the disorder is generally caused by a link of the intestines being thrown, (in playing it is supposed) across a ligature situated near the anus; and the cure is radically effected by breaking this ligature: an operation which is not unfrequently performed. If the ligature be really a string of the testicle, indexterously left in the calf, much caution is requisite in the operation of gelding. An experienced cutter performed it thus: having extricated the testicle, and cut the seminal cord, he forced his finger and thumb upward, as it were into the body of the calf, (which stood on its legs during the operation) drawing the "blood string" twelve or fourteen inches long: the point of it appearing not abrupt, as if broken off, but fine as a thread, as if wholly extracted. Their treatment as before-mentioned differs in the practice of

of different individuals. In an instance which, perhaps, may be considered as a fair specimen, the treatment is this:—The calf never sucks its dam; but has her milk warm from the teat given to it twice a day in a pail; from the time of calving until it be a fortnight or three weeks old. At that age the calves begin to have half new milk and half skim-milk, boiled (which is thought to be more “nourishing” than raw milk) for about three weeks longer: they are then put to all skim-milk, or to milk and water, with perhaps a little oat-meal or wheat flour strewed over it; and with hay, in the early part of the season; or grass, as soon as spring and the warm weather sets in. Sometimes a small quantity of linseed jelly is mixt with thin milk and water, and is found of great service; making their skins remarkably sleek and silky. If too much be used, it is liable to make them scour. In the latter end of May or the beginning of June, according to the time of their being dropped; they are turned away to grass and water only, for the summer.

The same gentleman in his Rural Economy of Norfolk says “That he paid more than common attention to the rearing calves in this district, not only as being a primary object in the East-Norfolk system, but because the practice here is, in many respects, peculiar to this country. Some farmers bring up all the year round; rearing every calf he has dropt. Others rear in winter only; fattening his summer calves for the ped-markets; or at a distance from them, for the butcher. Norfolk farmers, in general, begin early in winter to rear their calves; some so early as Michaelmas; in general, if their cows come in before Christmas: not only as being fully aware of the advantage of rearing early, but in order that they may rear as many of their own calves as possible; drove calves being always hazardous and sometimes scarce. No distinction is made as to sex: males and females are equally objects of rearing, and are both occasionally subject to castration, it being a prevailing custom to spay all heifers intended to be fatted at three-year old; but such as are intended to be finished at two-year-old are, I believe, pretty generally left “open:” as are, of course, such as are intended for the dairy.

There are two reasons for this practice: they are prevented from taking the bull too early, and thereby frustrating the main intention; and by this precaution may lie more quietly—are kept from roving—at the time of fattening. This may be one reason why spayed heifers are thought to fat more kindly at three-year-old, and to be better fleshed, than open heifers.

The method of treatment depends in some measure on the time of rearing: the winter calves require more milk than the later-dropt ones do.

The general treatment of a calf dropt at Christmas may be said to be this: sucks twice a day, the first fortnight: has the pail twice a day, for the next month or six weeks. and once a day, for a month or six weeks longer:—with hay in a rack, and turneps in a manger; and, sometimes, with oats and bran among the turneps; which last, after a calf has taken freely to them, serves as both meat and drink.

In this consists the chief peculiarity of the Norfolk method of rearing calves; which may be said to be with milk and turneps: the last a species of food, which, in every other part of the kingdom, is, I believe, entirely neglected, or unthought of.

As soon as the weather gets warm enough, the calves are turned out, in the day, among the fattening bullocks, or on to a patch of turneps, or upon a piece of wheat, or a sward grass-piece, and housed again at night: until, the days growing long, and the nights warm, and the clover and dandelion have risen to a full bite, they are turned out altogether; and continue to have the first bite of every thing, which is good and palatable to them, throughout the summer.

This may be called the general treatment of calves dropt at Christmas; but the management of no two farmers are exactly the same.

The same intelligent gentleman in his Rural Economy of Gloucestershire, says, “The season of weaning lasts from Christmas to Lady Day: seldom longer: late-weaned calves interfere with the dairy.

The method of rearing is pretty uniform: at least in the outline. The calf is usually taken from the cow at two or three days old, and put to heated milk. The degree of heat, however, varies. In the practice of the first breeder in the vale, the milk was given to the calves scalding hot! as hot as the dairy-girl could bear her hand in it. The lips

of the calves were not unfrequently injured by it. His reasons for this practice were, that the heat of the milk prevented the calves from scouring; made them thrive; and enabled him to put his rearing calves to skim milk, immediately from their being taken from the cow; at two or three days old. They never tasted “best milk” after they were taken from their teat at that age.

This is an interesting instance of practice; and merits a few moment’s reflection. Nature has evidently prepared milk of a peculiar quantity for the infant calf; and this milk is useless in the dairy: it is therefore doubly good management to suffer the calf to remain at the teat, until the milk becomes useful in the dairy; which it usually does in two or three days. But although it becomes, to general appearance, similar to that of a cow which has been longer in milk, it is highly probable, that it is still singularly adapted to the yet infant state of the calf. In the suckling-houses, round the metropolis, it is well understood, that putting a young calf to a cow, which is old in milk, will throw it into a scouring. It, no doubt, requires a degree of correction to render it fully acceptable to the stomach of the calf, at so early an age: and, if we may venture to judge from this instance of practice, sufficiently authenticated, scalding the milk, very highly, gives it the due correction.

Besides the scalded milk, this judicious manager allowed his calves split beans, oats, and cut hay. When they took to eat these freely, water was, by degrees, added to the milk.

In the spring they were turned into a large well herbage ground; allowing them so good a pasture, that it was generally mown after them: and during the whole of the first summer, they had the first bite wherever they went.

“Calf-stages,” or calf-pens of this district is of an admirable construction: extremely simple; yet singularly well adapted to its intention. Young calves,—fattening calves more especially—require to be kept narrowly confined: quietness is, in a degree, essential to their thriving. A loose pen, or a long halter, gives freedom to their natural fears, and a loose to their playfulness. Cleanliness, and a due degree of warmth, are likewise requisite in the right management of calves.

A stage which holds seven, or occasionally eight calves, is of the following description.—The house or roomstead, in which it is placed, measures twelve feet by eight. Four feet of its width are occupied by the stage;—and one foot by a trough placed on its front; leaving three feet as a gangway; into the middle of which the door opens. The floor of the stage is formed of laths, about two inches square, lying lengthway of the stage, and one inch asunder. The front fence is of staves, an inch and a half diameter, nine inches from middle to middle, and three feet high: entered at the bottom into the front bearer of the floor; (from which cross joists pass into the back wall) and steadied at the top by a rail; which, as well as the bottom piece, is entered at each end into the end wall. The holes in the upper rail are wide enough to permit the staves to be lifted up and taken out; to give admission to the calves: one of which is fastened to every second staff; by means of two rings of iron joined by a swivel; one ring playing upon the staff, the other receiving a broad leathern collar, buckled round the neck of the calf. The trough is for barley-meal, chalk, &c. and to rest the pails on. Two calves drink out of one pail; putting their heads through between the staves. The height of the floor of the stage from the floor of the room is about one foot. It is thought to be wrong to hang it higher, lest, by the wind drawing under it, the calves should be too cold in severe weather: this, however, might be easily prevented by litter, or long strawy dung thrust beneath it.

It is observable, that these stages are fit only for calves, which are fed with the pail; not for calves which suck the cow.

Fattening calves are here kept on the stages until they are sold: rearing calves, until they be three weeks or a month old; or until they begin to pick a little hay; when they are removed to a rack, and are allowed greater freedom.

The fattening of calves is here a subordinate object of the dairy; the late-dropt calves are an encumbrance on cheese-making, the primary object, and are of course got rid of as soon as possible. One singularity of management, however requires to be noticed. Calves, whether for rearing or fattening, are seldom suffered to suck more than two or three days; sometimes they are put to the pail, as soon as they are dropt; the milk being, I believe, pretty universally

tally passed through the kettle; and given to the calves warmer than it comes from the cow. On the increased heat of the milk, the advantage of this unnatural mode of fattening is here thought principally to hinge.

In North Wiltshire, Mr. Marshall says, "The calves, which are not reared, are fatted by sucking, for the London market, mostly sent up dead. The common age of butchering six or seven weeks. Here, instead of calf-pens or stages, calf-stalls are in use. Each calf has its separate stall, about two feet wide and four feet long; just room enough to lie down; on a platform of boards or laths; with a range of troughs before their heads: with which, in this case, they stand towards the wall; tied up short, as aged cattle; a plan which might well be adopted by the sucking farmers about the metropolis. It has many advantages over the pens there in use."

The desire of profiting by the milk of the cow, is often the cause of the calf's being too early weaned. A month or two more, in short, the time required by nature, would strengthen it in its youth; it would grow more successfully, and, in time, fetch a profit with good interest. But this is hardly done any where. No sooner is it believed that it can subsist without the mother's milk, than the farmer thinks he gains a great deal by weaning it: ill fed, and infirm, it grows at best to be a sorry bull, or feeble bullock, from which little profit, and much less service, can be expected.

Ignorance and want of reflection form the principal source of this abuse! People do not know, or do not reflect, that the vital flame, inclosed in the heart of a newborn animal, must be cherished and augmented; that it attracts and is nourished by that contained in the milk; that this vital flame, weak at first, would scarce have power to separate the auxiliary fire from the milky particles with which it is incorporated, if milk was a less delicate substance than nature hath formed it for this first service; but in proportion as the vital fire acquires force, the milk grows thick, because its grosser particles are destined for forming and consolidating the body of the animal. When the vital flame is arrived at such a degree, as to be superior to the succours which the milk can afford, nature excites the animal to seek a more solid nourishment, and then, but not before, is the time for weaning it. For, by anticipating that time, you run the risque of leaving the animal imperfect in its interior parts: the aliment which is administered being above its strength, it cannot perform a perfect digestion, and the nourishment it receives is much the less; because, in all natural bodies, the strongest juices, and the most efficacious qualities are always mixed, and, as it were, blended with the hardest particles. Hence it happens, that a sickly animal does not derive from the same food so much nourishment as an animal in health. Indeed, the vital flame, too much employed in resisting the attacks of the corrupted humours, hath not force enough to extract from the aliment the necessary auxiliary fire it contains. Besides, the food being only in a part dissolved, passes away in the excrements, and forms only a thin inefficient manure.

As therefore we may be assured, that by weaning a calf too early, it will continue infirm and of a small value, so by leaving it with its mother, as long as its constitution requires, we may expect it will become strong and vigorous; and by following this method, we can hardly fail of raising a breed of cattle, that will redound both to the honour and profit of the farmer.

Young calves are apt to be attacked by insects, which disturb and torment them, and, at the same time, prevent their fattening. In order to preserve them from these insects, and even cure them when they are attacked, it will be proper to prepare an ointment of melted hogs-lard and quick-silver, well rubbed together in a marble or iron mortar. Spread this ointment upon a lincloth, which wrap up in three folds, and slitch it for a collar to the calves. It will not only cure them, but also disperse the insects.

There is no better nourishment for young calves, than vetches soaked in the water till they swell; but observe to steep no more than will serve them for once; because when they continue moist for any considerable time, they are apt to grow sour, and would then do them more harm than good. *Journal Oeconomique*.

Mr. Young, in vol. I. of his *Annals of Agriculture*, p. 297. recommends skim-milk with flax-jelly as proper nourishment for rearing calves, better than skim-milk alone.

In vol. III. p. 380. Mr. Young introduces a method practised in Cornwall, wherein shelled oats made an excellent gruel to mix with skim-milk, and his correspondent describes the method as follows: "In the first place, they are taken from the cow, from the fourth to the sixth day; then they are given raw milk from six to ten days or a fortnight; then skim-milk and gruel, from three quarts to four, in the morning, and the same again in the evening: a mixture of gruel is thought better than the milk alone: lately they have given their common family broth, which is thought as good, or better than the gruel, as the calves prove exceedingly well upon it, and the flavour of the salted provisions is thought to strengthen their bowels: the proportion of gruel or broth is about one-third of the quantity given: a little fine hay is set before them, which they soon begin to eat. As to continuing their meat when at grass, it depends on their age, the quantity of milk on hand, and the goodness and quantity of the grass: it is thought, after they are ten or fourteen weeks old, they will need no more milk, and for some time before, it is reduced to once a day. The disorder which most generally attends them, is what they call the *skat* or *scum* (a looseness) for which they mix a raw egg or two with their meat, stirring it well just as it is given, which is continued for several days; some grate acorns, and give them with their milk to stop the disorder; and where it has been obstinate, Bostock's cordial has been given with success. In Devonshire the method made use of for rearing calves, is by a mixture of scalded or skimmed milk and oatmeal, about two thirds of the former, and one of the latter, and found to answer extremely well; but they are not weaned till the 10th or 12th day. I believe either method will be found a very useful one, as thereby a saving will be made to the community, and the end and design of rearing fully answered.

Mr. Young, in his fourth vol. inserts a letter, page 327. from Sir Edw. Littleton, wherein tea made of a lock of the richest hay, infused in a portion of milk proved excellent to rear calves with, and he never saw calves look so well.

In the fifth vol. page 465. of the *Memoris of the Bath Society of Agriculture*, is the following article, on the subject of weaning calves:

In the year 1787, I weaned 17 calves; in 1788, 23; and in 1789, 15. I bought, in 1787, three sacks of linseed; I put one quart of the seed to six quarts of water, which by boiling ten minutes, became a good jelly; this jelly is mixed with a small quantity of tea of the best hay steeped in boiling water.

Having my calves drop at different times, I did not make an exact calculation of the expense of this hay tea, but out of my three sacks of seed I had better than two bushels left at last. I gave them the jelly and hay-tea three times a day: to the boy who looked after them 6d. per day; the price of the linseed was 4s. 6d. per bushel; the whole three years seed 2l. 5s.

My calves are kept in a good growing state, and are much better at this time than my neighbours, that are reared by milk; and they do not fall off so much when they come to grass.

CALKINS, a name given in some parts to a sort of horses shoes, made for frosty weather.

These shoes, by forcing the horse to tread wholly on the toes of his hind feet, are apt to occasion bleyms, and ruin the back sinews. The farrier, therefore, should be ordered to pare the horn a little low at the heel, and turn down the sponge upon the corner of the anvil, so as to make the calkin resemble the point of a hare's ear, which will remove the consequences often attending the common square calkin.

CALTHA, the marsh marygold, the name of a perennial plant, growing naturally in the low meadows in many parts of England.

M. Duhamel recommends this plant to the notice of farmers, as very useful to be cultivated as a winter pasture for cattle; and experience has justified his recommendation. Perhaps it might prove as useful in this country as in France, especially as cattle are known to be extremely fond of it, and the plant might be easily cultivated.

CAMMOCK, the name of a troublesome plant infesting arable lands; but more generally known by the name of rest-harrow. See the article *REST-HARROW*.

CANARY-Seed, the name of a small seed produced by a gramineous plant, cultivated in some parts of England.

A correspondent of the *Museum Rusticum*, has given us the method practised by the farmers of the island

of Thanet, in the culture of canary-seed. He observes, that they generally chuse to sow it in fresh land; that is, such as has only borne grass. After ploughing up the lay, and bringing the land into tolerable rough tilth, they sow it with peas; these are kept clean hoed as usual, and yield a good crop. The next year the land is well ploughed, and planted with horse-beans, which thrive well in that island. These two crops effectually kill the green sward, or grass; take off the rankness of the soil; and the frequent hoeings, which are necessary to keep the weeds under, bring the land into fine tilth. After the beans are off, a thorough ploughing is given to the land, and in that condition it remains till the spring: about the beginning of March, if the weather be fine, and the season dry, the land is ploughed for the last time; immediately after which the canary-seed is sown.

The farmers in that island used formerly to sow canary-seed with a broad cast, spreading it all over the land; but when this was the practice, they found it very difficult to hoe and keep the plants clean from weeds: at present they sow it in furrows, made across the land, constantly taking care to make the ridges between the furrows as sharp as possible: by this means the seed, which is sown by hand, slips from the sides and tops of the ridges in the furrows, and the plants come up in regular rows. The plants must be kept very clear of weeds by means of the hoe, weeding-hook, &c. and if it be a wet summer, the intervals must be hoed several times; but of this the intelligent farmer is the best judge.

Three pecks of seed are, in general, enough to sow an acre, sometimes more, and often less. The canary seed seldom comes on till the wheat-harvest is entirely over, and the corn housed: but it must be observed, that the wheat harvest is generally very early in that island. It is reaped with a hook, and as fast as it is cut, the reapers lay it on the land in wads, as they call them, or parcels about the quantity of half a sheaf of wheat unbound: in this manner, if the weather be favourable, it is left near a fortnight, at the end of which time, the wads must be turned, that the other side may be dried. If the weather be very wet, they must be turned oftener, to prevent the seed from sprouting.

The price of reaping canary in that island is from six to eleven shillings per acre; and the price of threshing and dressing it is five or six shillings a quarter. According to the goodness of the land, and the tillage that has been bestowed upon it, the farmers there expect their return to be from twenty-five to fifty bushels per acre; but the common crop is from thirty to thirty-four. It must, however, be observed that the farmers never pay so much as ten or eleven shillings per acre for reaping this crop, unless the canary be very much lodged and tangled, which it often is, owing to the land in which it grows being fresh, rich, and rank, and to the high winds to which that island is subject.

They sow successive crops on the same land for eight or ten years; and sowing canary would be a very great improvement to lands which lie convenient for water carriage to London markets, was it not a crop the farmer ought by no means to depend upon, not only because the return, or quantity it yields, varies greatly, but also on account of the fluctuation in the price of this seed in the London markets, where the greatest and indeed almost the whole demand is. *Museum Rusticum, vol. I. p. 22.*

CANKER, a small speck made by a sharp humour, with gnaws the flesh almost like a caustic.

This distemper often attacks the foot of a horse, and generally proceeds from thrushes, when they prove rotten and putrid, though many other causes may produce this disorder. The method used by farriers for the cure is generally with hot oils, such as vitriol, aqua-fortis, and butter of antimony, which are very proper to keep down the rising flesh, and should be used daily till the fungus is suppressed, when once in two days will be sufficient, strewing red precipitate powder over the new grown flesh, till the sole begins to grow.

There is one great error committed often in this cure, which is, in not having sufficient regard to the hoof; for it should not only be cut off, wherever it presses upon the tender parts, but should be kept soft with linseed oil; and as often as it is dressed, bathe the hoof, all round the coronet, with chamber-lye. Purging is very proper to complete the cure. *Bartley's Farriery, p. 314.*

CANKER, in trees, implies a wound or blemish in the trunk, which does not heal naturally, but will increase and damage, if not endanger the whole tree.

The canker in fruit trees is most commonly occasioned by wet, which gets in at the cleft where the tree was grafted, or at some other wound which has been neglected: but it also proceeds sometimes from the soil's not agreeing with the nature of the tree.

If this distemper be only superficial, arising from a bruise, for example, which the bark may have received, it may be cured by cutting the injured part out with a sharp knife, and then binding over it a mixture of cow-dung and earth, tied on with a wisp of hay, likewise daubed with cow-dung. This must be done before the sap begins to rise; for otherwise the bark will peel, loosen and wither much further than the bruise, to the great hazard of the whole tree, especially if the stem be the part affected: for as to a bruised branch, the best way is to lop it off at once, if there be the least suspicion of danger. But when the canker has been bred in the tree, or when it has extended from the trunk to the branches, or from the branches to the trunk, so that after cutting away to the very quick, there still remains an eye, or speck, like that which is sometimes seen to run through a whole plant of distempered corn, the shortest way is, to commit the tree to the fire, and to plant another in its stead. Mr. Nourse is indeed inclined to think that, if the canker has not penetrated too far into the tree or stock, supposing it to be of the apple kind, it may possibly be saved, by re-grafting it with a winter quinnin, a boderan crab, a boon apple, or a golden pippin; neither of which he had observed ever to canker: but how accurate his observations may have been in that respect, we shall not pretend to determine. Certainly it may be worth while to try a change of fruit in all such cases, if they are not absolutely desperate. He asserts, upon his own experience, that the apple which we call a woodcock, is no way apt to canker, or to be blasted.

This, if it be fact, renders it by so much the more worthy of cultivation, as it is a great and constant bearer, and yields an excellent juice. The misfortune is here, as well as in the attempts which have been made to suit the soil and the fruit, that each of these is distinguished, either by such general appellations and descriptions as serve only to puzzle the husbandman when he comes to real practice, or by names which are not known out of the places where they are used. Mr. Marshall will render an essential service to mankind if he should happily succeed in that important point, which, if we are rightly informed, is the object of his present studies; viz. to ascertain by an exact analysis, which no one can be better qualified to do with the utmost precision, what are the component particles of each different species of soil, and what proportion they bear to each other. This, divested of that parade of science, and of scientific terms, which the learned are too apt to display, and which serves only to embarrass common understandings, will, should such a work appear, as it is hoped that it will soon, answer a very essential purpose in agriculture, as well as lay a fine foundation for useful entertainment to gentlemen whose leisure permits them to prosecute such studies. But the task, considered in all its various branches, is arduous indeed! worthy of that able gardener (we use the word here in its most extensive and most proper meaning) and skilful botanist, whose love for the welfare of mankind has prompted him to undertake it.

Mr. Worlidge assures us, that he himself cured a tree desperately diseased with the canker, by cutting off as many as he could of the cankered boughs, laying its roots bare during all the winter, and applying to them in the spring a great quantity of swines dung, not too new, mixed with the earth, which was then returned into its former hole. If this does not do, he condemns the tree to be grubbed up, as being past recovery. *Nourse's Discourse on the Benefits and Improvement of Husbandry, p. 138. Worlidge's Systema Agriculturae, cap. viii. sect. ii.*

CAPELLETS, in horses, are particular swellings which those animals are subject to, of a wenny nature, which grow on the heel of the hock, and on the point of the elbow; they rise from bruises and other accidents, and when this is the case, should be treated with vinegar and other repellers; but when they grow gradually on both heels or elbows, we may then suspect the blood and juices to be in fault; that some of the vessels are broke, and the juices extravasated. In this case the suppuration should be promoted, by rubbing the part with marshmallow ointment; and when matter is formed the skin should be opened with a lancet, in some dependent part towards one side, to avoid a scar: the dressings may be turpentine, honey, and tincture of myrrh. The relaxed skin may be bathed with equal

parts of spirit of wine and vinegar; to which an eighth part of oil of vitriol may be added. The contents of these tumours are various, sometimes watery, at others suety, or like thick paste; which if care be not taken to digest out properly with the bag, will frequently collect again: was it not for the disfigurement, the shortest method would be to extirpate them with a knife, which, if artfully executed, and the skin properly preserved, would leave very little deformity.

When those tumours proceed from an indisposition of the blood, they are best let alone, especially those of the watery kind, which will often wear off insensibly, without any applications: but when they are like to prove tedious, you should endeavour to disperse them by bathing the parts with repellers, and have recourse to rowels, purges, and diuretic medicines, to carry off the superfluous juices and correct the blood. *Bartlett's Farriery, p. 277.*

CAPO, a word used in Cheshire, to signify a working house.

CAPON, a cock-chicken gelded as soon as left by the hen, or at least as soon as he begins to crow.

Capons are very useful to lead chickens, ducklings, young turkeys, pheasants, and partridges, which they will do better than the hen, and at the same time make a stouter defence against kites and buzzards. The largeness of their body is also of great advantage, as they will cover between thirty and forty of them.

CARBERRY, a name given in some parts of England to the gooseberry.

CARCASE, a name generally given to the body of a horse.

The carcase of a horse ought not to be too small and slender; for a small carcased horse is generally weak. On the other hand, a very large carcased horse proves often heavy and inactive, and when he happens to be under-limbed, it is reckoned a great fault, though this remark often fails, and horses, that have been reckoned very much under-limbed, have proved as strong, and fully as serviceable as any other.

A low back is another fault that almost every body complains of, and indicates weakness, though a moderate sinking below the withers is not at all amiss, if the back be otherwise straight. When this sinking is not great, the forehead generally rises well. But when a horse has a low back, and is higher behind than before, it is not only ugly, but such horses are generally weak, are apt to be pinched in their shoulders, and have an awkward way of going, owing to the heaviness of their hind parts, which hinders them from getting on.

Some are fond of horses which are home ribbed, which is indeed a property that denotes both beauty and strength, as those that are open ribbed are looked upon to be weak and loose; but in some horses the short ribs approach so near the haunches, that they have scarce liberty to breathe, and such horses are the most out of wind of any other when put upon hard exercise, and easily get broken-winded. But a horse that is open and loose in his flanks, like a grey-hound, is liable to many disadvantages, which it would be tedious here to relate; such are always narrow over the chine, have little or no belly but what is forced by art and feeding; and though we find some of this kind more vigorous than others, and even exceed all expectation, yet the generality of such horses are seldom fit to carry a great weight, or to hold out in hard riding. Some are great admirers of short backed horses, which is a right way of judging, so far as this stands in opposition to a very long back. But some horses are so very short, notwithstanding they are otherwise of a good size, that they seem to be lost under common furniture. But when a tall horse happens to have a short carcase, and very long legs, like a spider, such horse is seldom good for much. If a horse's back be short, his whole body and limbs ought to be short, and then it denotes strength and firmness; but most of these make but a slow progress on a journey, though they will endure and hold out as long as any other, unless they are urged on with horses of greater speed.

It always denotes strength in a horse, when his carcase is of a moderate size, his ribs large, his flanks not hollow but snoot hand full, with a straight back, or but a very little sinking, his hinder parts, or uppermost haunches not rising higher than his shoulders. *Gibson on Horses, vol. I. p. 31.*

CARDOON, a kind of wild artichoke, propagated only by its seed, which is of an oval form, about as big as a grain of wheat, of a very dark green, or blackish colour, and marked with black streaks from one end to the other.

There are two seasons for sowing it: the first is from the middle to the end of April: and the other about a month later. The soil should be rich, deep, and fine. In a bed of such mould, four or five feet wide, two trenches should be opened, a foot wide, six inches deep, and at least three feet a sunder: or, to answer the same intention, the rows of holes of the same depth should be dug straight by a line stretched along the bed. These holes should be three feet asunder, and in quincunx order; or, if a trench is used, the quincunx form should be observed in sowing the seed, which is performed in the following manner. Five or six of the seeds are dropped nearly together, at the distances before mentioned, and then covered over: not with a design to let so many plants grow close together in a thick cluster; but, as the growth of these seeds is somewhat precarious, to be the more certain of having two or three plants at each stated distance: for if all of them come up, they are immediately thinned to that number; and if they miscarry entirely in any one spot, the chasm is filled up with plants taken from another place, generally a hot-bed, on which some of these seeds are most commonly sown when its heat is expiring, for a recruit in a case of need. The first sowing will generally come up in three weeks, and the latter in about fifteen days. Great care must be taken to keep those plants clear from weeds, and to water them frequently, in order to make them increase in bulk, and not run to seed. But this intention will doubtless be much better answered in every respect by a judicious application of the principles of the New Husbandry; we mean, by deep and frequent stirring of the ground on each side of the bed, letting the share or spade approach to within a very few inches of the plants.

Towards the latter end of October, the cardoons thus cultivated will be fit for tying up, in order to be blanched. In order to this, a dry day should be chosen, when all the leaves of each cluster being collected close together, wisps of straw, or long litter, should be twisted round them so as to prevent the access of the air to any part of them, except their very top, which should be left open. In a fortnight or three weeks the plants thus covered will become white and fit to eat.

This tying up, and blanching of cardoons, may be continued till the winter approaches, and then those who are fond of them as to think it worth their while to be at the trouble, may take them up, with some earth about their roots, and remove them into a green-house, if they have one, or into a cellar, and by that means keep them for use all the winter. Some of these may be replanted in the spring, in an open border, as before, to seed in June or July; or they may be cut down to the ground, when thus planted anew, and their second year's shoots may be tied up and whitened as before.

Besides the use which the Italians, French, and Spaniards, make of this cardoon, in eating it raw with pepper, salt, oil, and vinegar, many think it preferable to celery, when stewed, because it is mellow, and much more tender.

CARLICK, the same with charlock. *See the article CHARLOCK.*

CARPET-WAY, a green-way, or path left in an arable field, without being ploughed.

CANE, a hollow place where water stands. It also implies a wood of alder, or other aquatic trees in a moist boggy place.

CARRIAGE, a general name for carts, waggons, and other vehicles, employed in carrying timber, corn, persons, &c. from one place to another.

CARRIAGE, also signifies a furrow, or trench, for conveying of water to overflow and improve meadow-land. It is distinguished into two sorts; the main carriage, which should be made with a convenient descent; and the lesser carriage, which should be shallow, and as many in number as possible.

CARROT, the name of a root too well known to need any description here.

The Society for the Encouragement of Arts, &c. being persuaded that the cultivation of carrots for the food of cattle could not fail of being advantageous to the farmer, published a premium of twenty pounds to the person who should sow the greatest number of acres with carrots, for the feeding of cattle only; adding, that it was expected the person who received the premium should give an account of the soil, culture, time of taking up, and their effects on the cattle fed with them.

This premium was accordingly given in the year 1766 to

to Mr. Robert Billing, a very intelligent farmer at Weasenham in Norfolk, he having sowed thirty acres and two roods of land with carrots, for feeding cattle only. At the same time he sent an account of the methods he used in the culture of his carrots, which was so well approved of by the society, that it was published at their request: an abstract therefore of this pamphlet must, we presume, be very acceptable to the reader.

Mr. Billing observes, that the use of carrots for the winter-feed of cattle has been long known and practised in the eastern parts of Suffolk, where it is common to make carrots serve the same purpose turnips have many years done in most parts of the county of Norfolk; besides, that many are sent from thence to the London market: but carrots never have been sown in the latter county, for the maintenance of cattle, till he tried a small parcel in the year 1761, and another in the year 1762.

He thought it prudent, he says, to make these trials before he came a candidate for the premium offered by the Society; the hopes of deserving which encouraged him to venture a pretty large and unusual expence, as well as the loss of a great part of his winter crop, and which has thus become the means of making known, in his part of the country, a species of husbandry with which they had before no acquaintance but by hearsay, being above fifty miles from the country where it had before prevailed.

In the year 1763, he sowed thirty acres and a half by mensuration.

This quantity of land lying in three parcels, one, of thirteen acres, bore wheat in the year 1762; one, of half an acre only, had borne clover; and the last, of seventeen acres, turnips that year. The piece of thirteen acres is a cold loamy soil, shallow, and upon a sort of loamy gravel. The half acre is a soil much mixed, upon a moist clay, the seventeen acres may be divided into two parts, the one of fourteen acres, and the other of three. Both are a light and dry soil, newly improved with a marle; the former, an exceeding good tempered soil, upon a marle; the other, a shallow black sand, upon a kind of imperfect grit-stone, called, in Norfolk, a carr-stone.

Previous to giving an account of the success of his crop of carrots, and of the use he made of them in feeding cattle, he describes the manner in which he cultivated these several pieces of land, founded as well on the best information he was able to procure, as upon the observation afforded him by his own experience of the former year.

The wheat and clover stubble he split down with the plough early in the preceding November, and is satisfied, from all the observations he has made since he first begun the cultivation, that whether the wheat stubble be, as it is called in Norfolk, flat work, or in ridges, or the carrots are to be sown after clover or rye-grass, the land cannot be ploughed too early; so that the frost and snow may have their full effect in mellowing the ground for the reception of so small a seed; and this is the more necessary to be attended to, the stiffer and tougher the soil shall chance to be.

The land that had been turnips he let alone till the end of January, or beginning of February, thinking this time enough, because the earth was thoroughly cleaned by the cultivation and summer hoeing necessary for the crop of turnips.

Of the thirteen acres of wheat stubble, six were dunged for wheat, but not for carrots; four and a half not dunged at all; and two and a half for the carrot crop only. The clover land was dunged for the carrots: and of the seventeen acres that had been turnips in 1762, part had been tatted for the turnips, that is, where sheep had been folded; and the whole crop of turnips was fed off by sheep and neat cattle.

Four pounds of seed on an acre is sufficient: but as the seed is very small, light, and hard to separate and disperse equally on the ground, he was at first a good deal puzzled how to overcome this difficulty; and though he was advised to make use of a mixture of sand, he did not find it answer, because the weight of the sand carried it all to the bottom of the seed cot: he sows it therefore now unmixed, as they do turnips, after having forced it through a fine chaff-sieve by rubbing.

It will be three weeks, after sowing, and sometimes longer, before the carrots appear: this is the principal advantage, besides the difference of expence, the turnips have over them, for the latter are not sown till about Midsummer, and coming quicker to the hoe, get the better of the weeds

more easily; for weeds do not grow near so fast about Midsummer, as in the spring.

The carrots lying a longer time before they come up, and continuing afterwards a long time very weak, they are seven or eight weeks before they are fit for the hoe, and in the mean time afford the weeds an opportunity to get strength, in a season too, when unluckily they grow the fastest: Mr. Billing is therefore of opinion, that though it is necessary to sow carrots before turnips, it is better to sow them as late as you can with safety to the crop; for of his, those sown in April on the clover stubble came much the soonest to the hoe, though later sown.

The wheat and clover stubble were ploughed three times; the piece after turnips but twice; the first time shallow, the second as deep as the staple of the ground would permit; and on this ploughing the carrots were sown.

As it would remove some of the objections to a carrot crop, and lighten much the expence of weeding, could they be sown later, and as this might be done could the seed be made to come up sooner, this sensible farmer imagines the seed might be steeped in somewhat that would forward its vegetation, and afterwards sown, when dry enough to separate.

Yet however expensive the strength of the weeds in a crop of carrots makes the hoeing of them, the crop itself is not apt to suffer, for though the young carrots are quite covered in a thicket of weeds before hoeing, and should be buried in earth after the hoeing; yet they seem no way hurt if they get clear again, as they generally do in a fortnight after, if not cut off, or buried too deep, for want of skill in the labourer.

The Norfolk hoe is six inches wide. If the carrots chance to be tolerably clean, they may be hoed the first time for eight shillings per acre; but if the ground be full of weeds, occasioned either by much rain, the foulness of the ground before sowing, or the length of the time between the sowing and hoeing, the first hoeing will amount to ten or twelve shillings per acre.

About ten days or a fortnight after hoeing, they should be harrowed: this will displace the weeds, and prevent their growing again, which many of them will otherwise probably do, especially if it be showery weather: the harrowing does not hurt the carrot plants, but, on the contrary, does them much service, by bringing fresh earth to them, as well as killing the weeds.

About three weeks after harrowing, in case it has not perfectly cleared the ground of weeds, or in case new weeds come up, Mr. Billing hoes the carrots a second time, which costs about four or five shillings per acre, as the ground is more or less foul: and after this, if there still remain any weeds, which will be the case if much rain falls during the time of the second hoeing, a second harrowing is bestowed.

Where the weather has been favourable, and those employed in hoeing have done their duty, the carrots once hoed and harrowed have been as clean as those on which two hoeings, and as many harrowings have been bestowed.

Mr. Billing next proceeds to inform us of the success he had in the year 1763, on the several parcels of ground already described. His carrots proved best on the piece of two acres and a half that had been wheat, not dunged for the crop of wheat, but dunged for the crop of carrots, and on the half acre clover stubble dunged for the carrots.

Many of the carrots out of both pieces measured two feet in length, those on the former from twelve to fourteen inches in circumference at the upper end, and those of the latter from twelve to sixteen; a difference of bulk owing, perhaps, both to the different soils, and the effect of former crops.

On the two acres and a half Mr. Billing computes he had from twenty-two to twenty-four loads per acre, and about fifty-five, or fifty-six cart-loads on the whole: the half acre on clover stubble produced about twelve loads; the six acres and a half dunged for wheat, but not for carrots, produced from eighteen to twenty cart-loads per acre, and in the whole about one hundred and four loads; the four acres not dunged for either wheat or carrots, produced from twelve or fourteen loads per acre, and in the whole fifty-two loads.

He had but an indifferent crop of turnips the succeeding year, on the seventeen acre piece, but had from sixteen to eighteen cart-loads per acre of carrots on fourteen acres of it, but a very poor crop on the three remaining acres; so that

that he computes he might have on the seventeen acres after turnips not quite two hundred and seventy loads, which make, with the former, about five hundred and ten loads of carrots, equal in use and effect to near one thousand loads of turnips, or three hundred loads of hay, as experience has convinced him from the various methods in which he had tried them.

Mr. Billing thinks it is not improbable that he might besides lose five or six loads, which the poor people took, instead of a single load they might have stole, had the land been cropped with turnips; but this loss will be evidently much lightened, should the growth of carrots become general in the country.

The best method of drawing the carrots is with a four tined fork, with which a man breaks the ground six or eight inches deep, very carefully without injuring the carrots; and is followed by a little boy, who gathers the carrots, and throws them in heaps.

Our farmer began to draw his carrots for use about three weeks after Michaelmas; but as the cattle he intended to feed on them had never been used to so hard food, he thought it best to give them, at the same time, both cabbages and carrots, lest they should suffer by a distaste at the beginning.

He had about forty load of cabbages growing on one half acre, equal in use, as appeared on trial, to about seventeen or eighteen loads of carrots. He observed, that cattle of every sort naturally eat the cabbages as readily as they would have done turnips; and soon after having gradually learnt to eat carrots, began to prefer them. Both the cabbages and carrots, and afterwards the latter with turnips, were brought from a place where they grew, to a pasture close; and, without any other preparation than shaking off the dirt, they were dispersed on the ground for the cattle to feed on promiscuously.

From the experience Mr. Billing has had in fattening cattle on turnips in houses or stalls, he is persuaded that by this means the carrots might have been made to go a great deal further; but besides the great trouble attending this method, especially if the number of beasts be great, and the hazard of beasts foundering in the way to London, an accident that often happens to stall-fed cattle, and that the benefit of their stale is lost to the ground, he is convinced the beef is not so good, though perhaps more slightly.

The first flock he began to feed in this manner consisted of twelve neat beasts, and forty-nine shearing weathers, or those not quite two years old: ten of the former were Norfolk bred steers, and began to feed on the first carrots he drew: at the same time he put on a cow, and a heifer three years old. At old Martinmas, Mr. Billing bought seventeen Scotch bullocks, which, with a cow from his dairy, made up the number thirty; and soon after he increased this number to thirty-three, by adding three more from his dairy.

It is, however, to be observed, that when the cabbages were spent, he allowed a load of turnips each day for some time for this flock of cattle, which, with three loads of carrots, was a sufficient provision for them. This enabled him to determine, that one load of carrots is nearly equal to two of turnips; for if the cattle had been fed on turnips only, it would have cost him little less than seven loads, computing on the experience of many years fattening cattle with turnips; yet he declares he never knew cattle thrive faster.

Nine of the steers were sold fat in Smithfield on the seventeenth of February, and weighed about forty Norfolk stone, that is, seventy London stone, each. Another steer and cow were killed in the country, the latter at Weasantham town, and which died very fat, about the same time: the Scotch were sold at St. Ives about the beginning of May: the steers sold in Smithfield for about seven pounds fifteen shillings each.

Our farmer being told the market was then low there, sold all the Scotch, except one, at St. Ives, where they fetched him about seven guineas each.

The former cost about four pounds ten shillings each; the latter three pounds fifteen. The other Scotch he sent to London, where, though it weighed but a little above sixty stone, it sold for eight pounds, and was said to be some of the fattest beef killed in London that winter, as Mr. Billing was informed by Mr. Brownworth the salesman: the others were not inferior.

The forty-eight weathers were sold at St. Ives in the month of May, at about fifteen shillings each.

These thirty-three beasts, and forty-eight sheep, brought Mr. Billing, according to his computation, about one hundred and twenty pounds profit; out of which deducting one tenth for the share the cabbages and turnips had in fattening them, which is rather too much, especially as the cattle soon began to leave the turnips, there remains one hundred and eight pounds to be carried to the account of the carrots.

The large quantity of carrots our industrious farmer had growing gave him also an opportunity of trying their use in feeding dairy cows, sheep, horses, and hogs.

In the month of April he found he should have nine or ten acres to spare, beyond what is necessary to complete the fattening his bullocks. This happened too at a time when his turnips, as well as those of his neighbours, began to decay, and enabled him to supply that defect, to which the Norfolk farmers are very subject in the spring of the year, and which no method of managing their turnips ever exempted them from, when the weather is wet and frosty by turns; and from this decay the carrots seem protected by their hardness. From this time he fed his whole dairy of thirty-five cows, and his flock of twenty-one score of sheep, on carrots.

At the same time he thought of a method of getting the carrots out of the ground with more ease and expedition than he had done before, which was of great use when he had other occasions for his servants; besides which it also prepared the land better for the ensuing crop.

They were ploughed up with a narrow-sharred wheel plough; going slow, the share opened the earth, and cut very few of the carrots; those few being only such as chanced to meet the very point of the share.

The plat or earth-board, turned most of the carrots out of the ground, and, by harrowing afterwards, were most of them quite cleared from the earth. Though the roots extended a good way in the ground, and below the pan, he did not think it necessary to plough so deep, and consequently the land suffered no damage which otherwise it might have done, as some few of the carrots instead of being turned out, were buried: it is also necessary to plough the land and harrow it a second time; but though this should be at an interval of a month, the buried roots will take no harm.

Mr. Billing turned his dairy cows and flock of sheep on this land after the ploughing, without any further trouble or preparation, and had all the reason in the world to be pleased with the event; both took readily to eating the carrots, though he thinks the cows more so than the sheep.

The former not only gave more milk than is usual at that time of the year, but many continued to give milk, which would with such turnips as he had then to give them, have been nearly dry. The butter made was likewise much better than that of turnips; and both sheep and lambs did much better than he ever remembers them to have done at this season of the year: besides this, the land was evidently very much improved from the stale of the cattle, of which he plainly perceived the benefit in the ensuing crop.

It is proper to observe, that in this method, some few of the carrots continued buried, even after a second ploughing; but these were turned out upon a third ploughing, when barley was sown, and were clean eaten up by a flock of sheep, without any injury to the new sown barley.

In this manner the cows and sheep were fed for three weeks, which Mr. Billing values at about twenty pounds; and, considering how he might have suffered, had he wanted turnips, and not been able to supply that want with carrots, he thinks, he might value his feed at a great deal more.

In November 1763, he began to feed sixteen horses, which did all his farming work, with carrots: they had neither hay nor corn, except his team that carried his corn to Brancaster, a sea-port, at fifteen miles distance: to this team he allowed a bushel of oats a day: the rest had nothing besides carrots, except pease-straw and chaff, until the sowing barley. In April he increased their work so much, that he thought it necessary to give them a few oats; but they continued to subsist chiefly on carrots, until they were turned to grass, the latter end of May.

Mr. Billing declares he never knew his horses in better order or do their work better; and they were so fond of carrots, that he frequently found, that when the team mentioned before was so fatigued, that they refused to eat their

their corn, they would eat it when mixed with the carrots chopped.

It may be proper to observe, that he always chopped off the heads and tails of the carrots he gave his horses, and sometimes gave them another cut. Though he could not find it was necessary, he mashed them also for his horses, none of which trouble he found at all requisite, or even useful for other beasts: the gathering and removing the carrots, and dispersing them about the pasture-land where he feeds cattle, were sufficient.

Mr. Billing gave the sixteen horses two loads of carrots every week; and these two loads, he computes, saved him more than a load of hay; which, at twenty-five shillings a load, amounted to thirty-five pounds.

To this might be added, the benefit received by the swine, to which he threw all the tops and tails of the carrots used for the horses; and they thrive exceedingly, and were so fond of them that he never could find that any dirt which might stick to them, prevented their eating them: but as the principal part of the food of the swine was milk at first, and afterwards pease, our farmer has not set any value on this part of his profit: the total of what he has estimated is on the other articles, amounting to one hundred and sixty-three pounds.

Of the thirty acres and a half, four were sown in the year 1764, with oats, all the rest with barley: the four acres were part of the land where he ploughed up the carrots; the rest of this piece was sown with barley; both produced a prodigious crop, not less than three loads of corn in the straw, per acre: on the rest of the land his crop was less bulky, and shorter, yet very good, perhaps not less in the quantity of grain than the other. And here it may not be improper to mention, that when in a former year, he had sown the two ends of a large close with carrots, without dung, and the middle with turnips, for which the land was well dunged, yet, when the whole enclosure was, the next year, sown with barley, that after the carrots was the best.

Another recommendation of carrots is, that our intelligent farmer finds them a more certain crop, both for growth and duration, than turnips: the latter are exceedingly apt to fail, as well as rot, towards the spring, when most wanted. Perhaps the former is, in some measure, owing to the lands in Norfolk being, as the farmers express it, surfeited with turnips, to which they have been so long accustomed. But however this be, there are many reasons for chusing both, that if one fail, we may rely, for so necessary a winter provision, on the other.

This candid farmer thinks he ought not, however, to conceal, that at the first beginning of a new sort of husbandry, many difficulties stand in the way: the expence is very heavy, much beyond the expence of turnips, and is, perhaps, increased by the awkwardness of labouring men and servants, who are both ignorant and perverse about most new employments: besides this, the cleaning of carrots from weeds is much more necessary than of turnips, and yet goes on much slower, so as sometimes hardly to be completed: and, moreover, if a long continued frost should happen, it will be very difficult to get carrots out of the ground (indeed the turnips in this case are apt to spoil;) but this inconvenience may, in some measure, be prevented, by drawing the carrots before the frost; though this will be attended with difficulty when the quantity amounts to fifty or a hundred loads.

Such is the account given by Mr. Billing, with regard to the culture and use of carrots, for the feeding of cattle. And as these experiments were made so much at large, the farmer may, without hesitation, adopt this method; and if his soil is adapted to the growth of carrots, he need not doubt of greatly increasing his annual profit. That they are wholesome feed for cattle has been long known: but that such advantages resulted from their use as Mr. Billing relates, few farmers could have imagined.

The advantage resulting from carrots is pretty fully set forth in this experiment, but would have been still more obvious had Mr. Billing ascertained the weight of his loads of carrots, and other vegetables made use of.

Carrots are also very useful for feeding hogs, as appears from Mr. Young's experiments on that subject, one of which may be proper to insert here.

"In January 1766, says he, I drew from the herd ten hogs, as equal in size as possible, and weighed them alive in five lots.

	stone.	buishels.	stone.	lb 6
N ^o 1. weighed	13	4 eat of pease	16	weighed 27
2.	12	6 pollard	80	27 9
3.	13	0 buckwheat	27	29 13
4.	12	11 potatoes	28	25 7
5.	13	1 carrots	49	31 0

- N^o 1. was fatted with white-pease, that weighed 66 pounds per bushel, the price 1l. 10s. a quarter.
 2. with pollard, weighed 22 pounds per bushel, the price nine-pence per bushel.
 3. with buck-wheat, weighed 47 pounds per bushel, price 2s. 3d. per bushel.
 4. with boiled potatoes, weighed 54 pounds per bushel, price 2s. per bushel.
 5. with boiled carrots, weighed 55 pounds per bushel, raw, price 1s. 1d. per bushel.

"I thought it best to fix on a given sum, as proper to fat each hog. The people I consulted with were of opinion, that eight bushels of white pease were necessary to fat one such hog well. This I accordingly fixed on as my criterion. The account of the expence therefore stands thus:

	l.	s.	d.
N ^o 1. Pease 16 bushels value:	3	0	0
2. Pollard 80 bushels.	3	0	0
3. Buck-wheat 27 bushels	3	0	9
4. Potatoes 28 bushels, 2l. 16.	3	0	0
Labour and coals 4s.			
5. Carrots 49 bushels, 2l. 13s. 2d.	3	0	0
Labour and coals, 6s. 10d.			

Each lot was weighed as soon as the food was done. The result was as appears above in the third column.

"It is evident, says Mr. Young, from this experiment, that carrots boiled are superior to any other food. I did not expect that potatoes would be so much inferior: but I have found from divers other trials since, that it is requisite to mix the meal of some kind of corn with them. Pollard in this trial, as in the last, is superior to pease."

The superiority of carrots over potatoes in this experiment, does not consist in their being more feeding than potatoes: for 28 bushels of potatoes advanced the weight of the hogs, lot No. 4, 12 stone and five pounds; whereas 49 pounds of potatoes, the weight of the carrots made use of by lot No. 5, would have advanced them 21 stone 5 pounds, and the carrots advanced them but 18 stone. The reason of the carrots appearing superior in the experiments, is on account of the price, the carrots being rated at only half the value of the potatoes per bushel; a disparity that seems too great to hold generally: for potatoes may be cultivated more extensively than carrots can be, as they require a more particular soil than potatoes; and the expence of cultivating them is greater than that of potatoes, particularly in the articles of hoeing, and taking up according to Mr. Billing's experiment.

It appears likewise from other experiments, that as weighty a crop of potatoes, or nearly so, may be raised upon an acre of land, as of carrots; and in that light the potatoes will go farthest in feeding hogs, which, will be a principal consideration with farmers, who have the option of raising either of these crops. Upon the whole, both these roots are highly valuable to farmers for the purpose of feeding hogs, as they are for feeding various kinds of cattle; in which respect, indeed carrots appear to be the most universal.

Wild CARROT, Bird's-nest, or Bee's-nest, the name of a biennial weed common in pasture grounds. It greatly resembles the cultivated carrot, of which indeed it is only a species. The wild sort however differs from the cultivated in its roots, which are small and sticky. In both sorts, after they have done flowering, the umbels contract themselves into the shape of a bird's nest.

Carrots are very hearty and nourishing food for all sorts of cattle, and very proper to feed or fatten them. They cannot, however, be brought into so general use, as some other roots, such as potatoes, turnips, or as cabbages; unless they could be cultivated in strong land, which hitherto has been supposed improper for them; because their lateral roots are so very slender and weak, that they cannot spread or penetrate into strong land. The sandy soils are some of them rich, and such are found to be very proper for

carrots. Yet strong land is generally richer than sands, and not only consists of more minute parts than sandy land, but is capable of a higher degree of fertilization, with the assistance of good tillage and manure. The only difficulty here is, by what means strong lands can be kept open, and in fine tilth, while the carrots are growing in it; for in regard to the preparation of the land, before the carrot seed is sown upon it, that it may be done by deep ploughing, and bringing the land into fine tilth for the reception of the seed. Gardeners do, indeed, raise carrots upon different sorts of land, strong as well as light; but they do not desire their carrots to grow large, and for that reason they sow the seed thick, and allow their carrots to stand close upon the ground, not usually more than eight or ten inches distant from each other. They likewise cultivate their ground well, and deep; manure it highly, and give it several hand hoeings, which destroys the weeds, and loosen and improve the surface of the land. These operations are expensive, but are notwithstanding necessary; and as we shall shew, will, with some variation, be very profitable to farmers, even in large concerns. A valuable instance of this we have in Mr. Baker's report to the Dublin Society, for the year 1771.

In 1769, and 1770, he laid a large quantity of manure upon the head lands of one of his fields, ploughed them well and mixed the manure with the land, and then carried off all the staple thus mixed, and spread it on a field for a dressing, the under stratum of this ground was a strong poor earth, upon which he had a mind to sow carrot seeds for an experiment.

"I intended, says he, to sow the carrot seed in March, but the extreme drought and husky winds, which we had all the spring of this year 1771, prevented my getting the ground into that fine order, which I conceive to be necessary for the reception of carrot seed. At best, no one will conceive this ground to be well adapted to carrots, after having taken away the natural staple. But I was inclined to try them upon my land, with an hope that if I succeeded here, I might have expectations upon some other field of the farm; and accordingly have determined upon a field of four acres for this purpose, which I shall prepare as fast as I can.

"As I could not sow the seed, for the experiment now before us, when I intended, I rubbed a pound of it in about half a bushel of fine riddled mould, and kept it there three weeks, with an hope that the seed would be somewhat forwarded, thereby to make it vegetate the sooner, and to break its natural cohesion, which renders it very difficult to sow: accordingly when I came to sow it, I found it a good deal swelled, and the adhesion very much abated."

[The hairs on the borders of this seed occasion it to adhere so closely, that it is impracticable to sow it even till these hairs are rubbed off; which if not done before the seed is mixed with mould, by which it is swelled and softened, it cannot be well rubbed afterwards to get off the hairs without damaging the seed; for which reason, the best way is to get off the hairs at first, by rubbing the seed once or twice through a fine wire sieve. A seedsmen, who can sow turnip-seed well can sow carrot-seed even and alone, when thus prepared, much easier than can be done when mixed with earth, sand &c. because such mixtures being of a different specific gravity from the carrot-seed, they fall upon the ground unequally; by which the seed is unavoidably sown in patches too thick, in some parts, and in other too thin as happened in this case; though the quantity of seed one pound to eighteen perches, (the quantity of land of this experiment) was more than sufficient to have sown it all very thick.]

"On the 20th of April we had gentle rain; the 21st and 22d light showers: I caused the ground to be three times ploughed and harrowed without intermission. On the 22d of April I had the seed sown, and bush-harrowed the ground: after the second ploughing I drew out twenty-one horse-cart-loads of dung, spread it over the ground, and ploughed it in.

"I frequently looked to see if there was any appearance of the carrots, but to no purpose for a long time: at length I imagined they were coming up very thick; but behold what I took for carrots proved to be what the labourers call dog-fennel; a weed which excoriates and inflames their skins in harvest where it touches. It appears to be a sort of fingle, or wild chamomile; however, at last some carrots were distinguishable enough; but the long continuance of dry weather prevented their going on with any vigour; and therefore, not distinguishable enough to venture the hoe among them; and that more particularly, as I have not an experienced and expert hoer.

"However, on the 28th of June I began to hoe them; for the weeds were so immensely thick that the few carrots which were distinguishable, were almost lost.

"The hoe we began with was a very light four inch hoe: in a moment I saw from the dryness and hardness of the ground, and multiplicity of the weeds, many with strong roots, that this instrument would never do; and the clods were so hard as to kick them about in spite of the man's greatest care, and by which mischief was unavoidable. I instantly ordered an hoe to be made with a bevel edge under, and flat above; a little like an adze, two pounds and a half weight, well steeled and tempered like an axe, with an hammer over the eye to break the clods. It was pleasing to see with what facility he cut up the weeds with safety to the carrots; the weight and sharpness of the instrument, added to its particular set and bevel edge, gave it a power which no arm could have given to the other.

"The continuation of dry weather soon parched up the weeds, and the carrots looked very pert in a few days; but vastly too thick on one side of the ground, and abundantly too thin on the other, wholly from unequal sowing.

"The rain we had on the 9th of July, and again some days after towards the 19th gave new vigour to the carrots; and where they were not very thick, they were of a fine black green, but a new creation of weeds also appeared. On the 23d of July the carrots were hoed again, thinned, and set out as near as could be a foot asunder: some of them were pulled up, most of them 9 and 10 inches long, quite strait, but a little indented in their sides, and about as thick as my thumb: their being indented I attribute to the extreme hardness of the ground from the dry weather. The 25th, 26th, and 27th, rain stopped the hoeing: on the 29th the hoer proceeded again; the rain stopped him again, and he did not finish this second hoeing until the second of August: he was four days at it, which came to three shillings and four pence.

"August 20th he began to hoe them again the third and last time; when I had the mortification to see great damage had been done by stealing them: this hoeing took the man two days and a half at 10d. per day, amounts to 2s. 1d. They grew away at a great rate indeed; and although my crop, from having chosen improper ground, unequal sowing, and plunder, was not large; yet I shall be encouraged by the attempt to proceed farther upon this farm in their culture.

"On the 8th of November I had the crop dug with three pronged forks, the common forks I found too weak for this use: when the carrots were brought home, I had them topped and pointed, and all the particles of dirt rubbed off, and then weighed; they weighed one ton thirteen hundred and a half; the tops and points weighed ten hundred and a half.

"It was a great pleasure to me in the sequel of this experiment, to find that I had many carrots after being trimmed, that weighed two pounds and three quarters: I weighed several, and I am confident there were hundreds of the same size. This fact is a great encouragement, since carrots of two pounds each, at a foot asunder, will afford 63 tons an acres; a produce that it is reasonable to imagine will bear almost any expence in culture.

"I shall now state our whole expence, in order to ascertain what these carrots cost per hundred weight.

DR. CARROTS, CULTURE, &c.

		per experiment.			per acre.		
		l.	s.	d.	l.	s.	d.
April 22.	To ploughing three times as deep as possible, - - -	0	1	2½	1	6	0
	To sowing and bush-harrowing three times, - - -	0	1	0	0	5	0
	To drawing out 20 loads of dung, (say 320 loads per acre)	0	1	10	1	6	8
	To seed at 10d. - - - - -	0	0	10	0	7	6
June 28.	To hand-hoeing the first time, - - - - -	0	3	1½	1	8	1
July 23.	To second hoeing, - - - - -	0	3	4	1	10	0
August 20.	To third hoeing, - - - - -	0	2	1	0	18	9
September 29.	To one year's rent of 18 perches, at 18s. per acre, - -	0	2	0½	0	18	0
November 9.	To digging and bringing home, - - - - -	0	7	6½	3	7	10
Total for culture, - - - - -		1	3	3	11	17	10
November 11.	To trimming, weighing, and putting up, - - - - -	0	8	3½	3	14	7½
		£ 1	11	6½	£ 15	17	17

By 10½ C. of tops and points, at half the value of straw, i. e. 4½d. per C. which I believe they were worth for the cattle and swine, - - - - - 0 0 11½
£ 1 7 7

" Thus we see that these carrots cost me 11. 6s. 6½d. which, according to our produce of 33½ C. is per C. 9½d. If in the judgment of the reader the tops and points should not be valued at any thing, which I own in my estimation would not be just in such an enquiry as this, in that case, the carrots cost 11 ¼d. per hundred weight.

" Mr. Young in his general estimates of the value of carrots, values them from 12 to 14 pence per bushel; and I collect from his writings that a bushel is about half an hundred. Now, if this valuation shall hold good in the general application of them for horses, horned cattle, and swine, even at the price they cost me per hundred in this my first attempt upon this farm, they surely must be a crop of very noble profit: however, as I believe we are not yet arrived to that excess of price for meat which I hear prevails in England, since I left that kingdom; in our culture of carrots we cannot expect to make so much of them as Mr. Young's experience has afforded in England: but suppose with us they should be found worth twenty shillings a ton, the experiment now laid before the reader, even in that case, shews a profit which is very inviting.

" The produce in this experiment I consider not half a crop, owing to late sowing, long drought, improper ground, imperfect hoeing, irregular sowing, (for one side of the ground had only here and there one) and the hand of violence; and yet the produce cost, including all charges, only 16s. 3d. a ton. This fact I have pleasure in laying before the public, because it is an important one.

" As to the application of the present crop, my quantity was insufficient to do any thing with accuracy: I shall only observe, that they have been consumed by the swine in the house; where they are greatly preferred to any garden carrots, on account of their extraordinary sweetness.

" We see, that including every article of the charge, that in the commencement of the carrot husbandry upon a farm, an Irish acre of carrots, according to the charges incurred upon the experiment before us, will cost about sixteen pounds, (nearly ten pounds per English acre) I own a formidable sum; but if the crop shall be worth from twenty to sixty pounds, the expence is surely well laid out.

	Ton.	C.	qr.
Our acreable produce of clean trimmed carrots was - - - - -	15	5	2
Of tops and points - - - - -	4	14	2

It appears from this experiment, that carrots will thrive well in strong land, if properly prepared for them; a circumstance of great importance to farmers, as they may obtain good crops of this valuable root on most sorts of land, whether strong or light, provided the land is dry, or free from springs.

The culture of these carrots was very expensive, particularly the hand-hoeing, which cost 3l. 16s. 10d. though only about half the land was planted; and is at the rate of near 2s. 8d. per acre for hand hoeing; whereas had these carrots been drilled in rows a foot asunder, the hoe-

ing would not have cost above one third of that sum - and less than half the seed sown here would be sufficient to drill.

But as a good depth of mould is a material consideration in the culture of carrots, it is much better to drill the seed upon the ridges than upon level ground: I have found upon trial that excellent carrots may be raised upon a strong loam, ploughed into three feet ridges, one row upon each ridge horse-hoed; but ridges about four feet broad are better; for they may be trench-hoed, or to the depth of two furrows; by which it was obvious the carrots will grow to a great size, much larger than they can be advanced to by hand-hoeing, and upon level ground, and, which are material considerations, at a less expence, and the land more improved than by any other method of culture. Many of Mr. Baker's carrots were two pounds and three quarters each; and if upon four feet ridges, and six inches distant in the rows, this is two carrots upon every four square feet of ground, which weighing three pounds each, is above twenty-nine tons per English acre.

That this estimate is a very moderate one, may appear from what Mr. Young relates, " that from light sandy loam, or rather absolute sand, so loose that a shovel with very little force would penetrate into it a yard deep, carrots were raised upon this soil, which when taken up in October, some of them were as large as the body of a quart bottle; very long and straight; and they had often upon this land from twenty to twenty-four loads on an acre, each forty bushels." See the Farmer's Letters, p. 216. A bushel of carrots weighs about half a hundred weight, or 56 pounds; so that these crops were from 20 to 24 tons of carrots upon an acre, a very valuable crop obtained by hand-hoeing. It is a circumstance of great encouragement to farmers to cultivate carrots, considering that they may obtain as large crops of them upon poor strong land, as from such rich sand as Mr. Young mentions here; and that even greater crops may be had from ordinary land, and at a less expence by the horse-hoeing culture.

The whole expence of this culture, viz. horse and hand-hoeing, will not amount to half the cost of hand-hoeing in Mr. Baker's method; with this further advantage, that by deep ploughing the earth from one side of the rows, the carrots may be drawn up easily with a fork, or even by hand, at a very small expence; and one pound of seed is more than sufficient to drill an acre; for by some trials I found that a pound of carrot seed rough, (or before the hairs were rubbed off) evenly sown broad-cast will furnish full sixty seeds to every square yard of land. If therefore this seed is drilled upon four feet ridges, a single row upon each ridge, every two feet and three inches length of the ridge contains a yard square of ground, upon which 60 seeds being drilled, they will not lie quite half an inch in the row; and every six inches length of row will have 13 seeds in it, and only one carrot is necessary in 6 inches to produce the above crop.

Carrots are of singular use to farmers, being very nourishing food for all sorts of cattle, which are all fond of them. In Mr. Billing's experiment upon carrots, he takes notice

notice that in feeding his cattle with them, he found that two loads of carrots went nearly as far in feeding them as three loads of turneps; and they are not only a surer crop, and liable to fewer accidents, but also more proper to be stored for feeding cattle in winter and spring than turneps; but the turnips do not occupy the land so long.

Mr. Marshall recommends 6 or 8 lb of carrot-feed to be scattered on an acre, in flutes, a foot apart, and two or three inches deep; covering the seed in such a manner as to leave obvious traces of the rows. This will give an opportunity of keeping down the interval weeds with the double hand-hoe, before the carrots come up. As soon as the plants are distinguishable, hand-weed the rows, and continue to hoe the intervals.

CAR-SICK, a term used in some of the northern counties to signify the cart-rut, or gutter, made by the wheel of a cart or waggon.

CART, a vehicle mounted upon two wheels, and drawn one or more horses.

The chief difficulty in the construction of wheel-carriages, consists in properly adapting the wheels and axle, which ought to be done in such a manner, that the carriage may move with the least force possible. *See the article WAGGON.*

The carts of Norfolk, Mr. Marshall says, have a singularity pertaining to them. The shafts instead of being fixed hinge-wise to the axle, or to the bottom of the cart, are a continuation of the side-pieces of the bottom itself: of course, the Norfolk carts do not tilt in the manner in which carts in general do. In setting on manure, a long-belly-band is made use of; so that the shafts rise with the fore part of the cart; the shaft-horse being the only stay to its tilting up entirely, nor is this an uncommon circumstance; the shaft-horse, in this case remaining upon his hind-legs, until he be drawn down again by the fore-horses. This, to common observation, is an awkward and a barbarous custom: yet it is not often that the shaft-horse receives any injury from this practice. A broad soft belly-band, of leather or hempen, ought however to be used on this occasion. The iron chains, which are frequently used are painful to the eye at least.

Marling, it is probable, brought it into use: as the wear and tear of carts in this rugged operation is endless; the simplest, strongest, and least expensive cart, has of course been for ages, most used; and it is probable that a more simple, a stronger, or a less expensive cart, cannot be devised, than that above described. Carts of a common structure, of which there are few now used, here, for particular purposes, are called tumbrels.

CARTER. *See SERVANTS.*

CART-HORSES, agreeable to Mr. Marshall in his Minutes of Agriculture, are not equal to oxen, either in their support, labour, or profit. Indeed, he says that cast-off coach-horses or saddle-horses, if strong, though slightly tamed, do very well. If the work be light, they step quicker; and if not too gay, are preferable to heavy cart-horses for whip-reins. Horses are subject to fret and bathe themselves with sweat, while oxen seem unconcerned with the same labour, and chew their cud. The expence of their keep is considerably above that of oxen; viz. a team of horses for four months cost in keep between 25 and 30 pounds, while a team of oxen for the same space of time only cost about eight pounds. He has made a general remark, that whatever horses do, oxen can do temporally; but whether they can work every day in the year, he could not determine. But he says that horses kept only on hay with oxen, cannot support the fatigue of work so long as the oxen. He recommends discoloured barley in preference to oats, and three-fourths of the same quantity will be sufficient to have the horses improve upon it, and as the discoloured barley will fetch but the same price of oats there will be a saving of 25 per cent. Old cart-horses are not worth their keep in winter, while they are at dry meat. For experience shews, that when once a cart-horse begins to fail, whenever he is unable to give due mastication to his dry food, it is better management to knock him on the head, than to waste on him corn and hay. Mr. Marshall then observes, that 80 or 100 guineas are required to purchase four horses, which in six or seven years will be worn out and useless; whereas forty guineas will purchase the same number of oxen, which, after they have worked five or six years, and have been kept at two-thirds the expence of horses, will fetch as much or more than their first cost. Indeed it is a management so obviously eligible, and so glaringly preferable to that of

the use of cart-horses, that few will hesitate a moment which to pursue. In a political light, this management is still more eligible. Oxen, after they have fed the hungry, will themselves become the first of human food. Horses, after they have ate the food of the fatherless, become a nuisance to the animal world; or, buried in a corner, lie a total loss to agriculture and to the community.

CART-LODGE, a small out-house for sheltering carts, waggons, &c. from the weather.

Farmers should be very careful to place their waggons, carts, &c. under proper shelter, when out of use, as they will last twice as long by this means, as they would if exposed in the yard to all weathers; for as they are thus sometimes wet, and sometimes dry, they soon rot, and become unfit for use.

CART-LADDER, a kind of rack, placed occasionally at the trail of a cart or waggon, to make it hold the larger quantity of hay, straw, &c.

CART-RAKE, the cart-track, or furrow made by the wheels of a cart or waggon.

CART-RUT, the same with cart-rake. *See the preceding article.*

CARTWRIGHT, a person whose business it is to make carts, waggons, &c. generally called a wheelwright.

CARUE, or **KERUE**, four. Thus to carue, signifies to grow four, and is generally applied to cream.

CARUNCLE of the eye, the fleshy substance in the inner corner of a horse's eye, next the nose.

CASINGS, or **COW-BLAKES**, dried cows dung, used in several parts for fuel.

CAST, a flight of birds, insects, &c. Thus a cast of bees signifies a swarm or flight of bees.

CATCH-LAND, a name, given to such land as is not certainly known to which parish it belongs; and therefore the minister, who first gets the tithes of it, enjoys it for that year.

CATERPILLAR, a general name for all insects of the butterfly kind, while they continue in their reptile or worm state. They are by some called cankers.

It is well known, that all winged insects pass through a reptile state, before they arrive at perfection. This great change from a worm to a fly, or butterfly, was formerly esteemed a real metamorphosis, or change of one animal into another; but later discoveries have put it beyond all doubt, that the embryo butterfly, when all the lineaments of his parent, is contained within the external cases, or coverings of the caterpillar. When the included animal has acquired a sufficient degree of strength, these coverings are thrown off, and it appears in its genuine form of a fly, or butterfly. It must, however, be observed, that before the creature can free itself from these coverings, it must pass through a state of rest, called by naturalists nymph, or chrysalis state.

Mr. Hitt observes, that there are two sorts of caterpillars, at least those of two colours, which feed upon fruit trees, the one black, and the other green. The black generally make their appearance in March, if the season be dry, upon the pear, apple, and several other trees.

Sometimes great numbers of them are contained in a sort of kel, or web, and, if they are to be come at, should be taken off; for otherwise they will disperse themselves to all parts of the tree, and there feed upon the blossoms, leaves, or their buds, before they are unfolded. After they have lived some time in this active state, they generally conceal themselves in a bunch of leaves, or in a cavity of the rind of a tree, where many of their eggs are hatched the same summer, and become very destructive. There is also reason to think, that some of their eggs are preserved in those places during the winter, as many of them, and some kindled or animated, have been found in old nail holes, and under pieces of dead bark, during the month of February.

The walls should therefore be well washed, and the dwarfs and standard trees well dressed and cleaned at that season.

The green caterpillars, which may, perhaps, be the same with the former at their first appearance, till their colour is gradually changed by living wholly on green food, are never seen so early in the spring as the former; but are very prejudicial to both the young branches and fruit of the apricot, cherry, plum, apple, pear, currant, gooseberry, &c.

They

They are never seen in great numbers together inclosed in a kel or web; but are generally found single, wrapt up in the extremity of a new made branch of the above-mentioned trees, or in a bunch of blossoms of an apple, pear, or cherry tree, and sometimes on an apricot, with a leaf to cover them. Part of their bad effects may be prevented on wall-trees, or dwarfs, whose branches are within reach. If they are at the extremity of a branch, it will appear in a round knob, and they generally eat off the part they had wrapt together, which spoils the branch the next year. When they have inclosed themselves in a bunch of blossoms, or young fruit, then they prove very destructive, by generally eating into all they had joined together, which causes much fruit to drop off soon after, and others when they are more grown.

Some of those which are but slightly eat, will continue upon the tree till the time of gathering; but they never make good fruit, being generally ill tasted, and many times have a white grub within them.

When the caterpillars are first perceived upon the wall or dwarf trees, whether before or after they are wrapt up, a brine should be prepared, and the trees swept all over with a brush or besom dipt in it. This will destroy many of the insects, by beating some off, and killing others. This work should be often repeated, if there be a necessity for it, as there generally is in dry seasons. Perhaps a small engine would be the properest and most effectual instrument for this work.

But gentlemen, who have leisure sufficient, may easily preserve their fruit-trees from the ravages of caterpillars, by carefully inspecting them every-day in the spring; for it will easily be seen when a bunch of blossom-leaves, or young fruit, are joined together by a caterpillar; and, on the first discovery, the leaves are to be separated by the hand, and the caterpillars killed; this will save a young branch or bunch of fruit, which would otherwise have been certainly destroyed. Whoever perseveres in this work will never have much of their fruit destroyed by such insects, which experience has sufficiently demonstrated to be more destructive to the fruit than any other causes that happen in the spring, though many will attribute the scarcity of fruit to blasts or lightnings, or to the branches being sun-burnt, which are the common constructions put upon the effects of these insects.

When standard trees are properly ordered with cutting and dressing, they will not be much subject to be infected with caterpillars; for by taking off the old rind, and cleaning the cankered parts of those trees, many of the insects are destroyed, together with their eggs concealed in those places; and by keeping the branches thin and open, they are more easily shaken off by the winds. *Hitt on Fruit Trees*, p. 265.

Caterpillars not only destroy the leaves and blossoms of fruit-trees, but they also destroy cabbages, and other productions of the garden; and are generally the effect of great drought.

To prevent their numerous increase on trees, gather them off in winter, taking away the prickets, which cleave to the branches, and burn them; but if they get on cauliflowers or cabbages, take some salt water, or strong brine, and water the plants with it, and it will kill the insects: the same effect may be produced by taking some of the caterpillars themselves, bruising them with garlic, and infusing the mixture in water; or you may smoke them with whips of dry straw in March, just as the bud begins to open.

In the summer while they are yet young, when, either through the coldness of the night, or some humidity, they are assembled together on heaps, you may take and destroy them; or you may wash your trees with water, in which worm-wood, tobacco-stalks, and colocintida have been dissolved; or take lime-dust, and when the wind is high, and the trees wet, sprinkle the dust, so that the wind may blow it on the trees. *Mortimer's Husbandry*, vol. I. p. 325.

CATKINS, a name given to such flowers as have an aggregate of summits hanging down, in the shape of a rope, or cat's tail.

CATS'S-FOOT, a name given in some countries to ground-ivy.

CAT'S-TAIL, a round substance growing upon nut-trees.

CATTLE, a general name for beasts of pasture, that

are neither wild nor domestic, but generally confined to those of the ox kind.

Cattle are known to be very advantageous to the breeders of them; and therefore those in middling fortune would do well to apply some part of their time and farms to this useful work: but people in these circumstances, finding it impracticable to make large profits, too often reject, with disdain, the small advantages continually in their power. In vain the wise man informs them that whoever neglects small profits will daily decay; in vain reason dictates, that from a small stock they must be contented with small gain; but that a great number of small profits, which it is easy to multiply by labour, becomes in a short time an object of consideration.

It must not however be imagined, that in order to derive a considerable advantage from cattle, it will be sufficient to have a great number, and to give them the necessary fodder: there are many other circumstances to be attended to, without which it would be in vain to flatter ourselves with the expectation of riches. They are often kept in too narrow a cow-house, from whence many inconveniencies arise. Sometimes they fight, and wound one another. The most voracious starve their neighbours, from whom they carry off all the fodder within their reach; and the injured cows decay insensibly, become languid, or give little milk. In summer the heat incommodes them, a circumstance which makes them grow lean, and diminishes the quantity of their milk. Care must therefore be taken that they have sufficient room in their stalls; that they be cool in summer, and warm in winter. At all seasons let them be dry, for that is a material point. Even in summer, humidity is disagreeable to them, and in winter it chills them. To prevent this double inconvenience, it will be proper to pave the cow-houses on a gentle descent, and to dig a pit to collect all water and stale. By this means the cattle will lie always dry, and the stale be collected for good purposes. Horned cattle sometime contract a habit of licking one another; and that injures so much, that a butcher who perceives it, will give less money for them than for others. They are cured of this habit, by rubbing the places they have licked with cow-dung, the bitterness of which prevents them from pursuing it.

We shall insist on the advantages attending the breeding of young cattle, whatever trouble it may cost, because there is no prudent countryman who is not fully persuaded they are real. To buy what he may have of his own growth is to a farmer no acquisition, but a dissipation: because the land produces no money, which is only to be obtained by the sale of commodities, and very often the purchase of some goods destroys all the profit resulting from the sale of others. It ought, therefore, to be an inviolable maxim, especially with those in narrow circumstances, to spare no pains in improving their stock, not making small estimation of what has cost them no money, but frugal as if they had bought it. By this means, if we except unforeseen accidents, which can never be prevented, they will find wealth flow in upon them annually, though slowly and lay the foundation of a solid fortune. *Journal Oeconomique*.

Fattening and feeding CATTLE. Cattle are bought in to fat at spring, and about Michaelmas. Those you buy in at spring will be fat in July, August, or September, according as they are forward, and you have keeping for them; and those which you buy in August, September, or October, must be either to sell in winter or in spring, and must be forward in flesh to be improved the beginning of winter, and only kept up in flesh during the hard time of winter, either with burnet, hay, turnips, carrots, &c. to be fit for a good market whenever it offers; or they must be young lean cattle, that may by their growth pay for their wintering, and to be fit to fat the next summer. Some upon ordinary land buy in young Welch heifers, which, if they prove with calf, they sell in spring, with a calf by their side for the dairy; and those that are not with calf they fatten: all which ways turn to good account, according as prices fall out; but most commonly all meat, either at Christmas or in the spring, is one third part dearer than in summer: because all have not the convenience either of hay, turnips, &c. to fatten cattle with in winter; and it is but in a few places, especially near London, which is the chief market for fat cattle, that hay can be afforded to fatten them with; for

G g they

they reckon an ox that cost about six pounds, will require about two loads of hay to keep him up all the winter.

For the wintering of cattle, you must about September turn out those you design to keep up for a winter or a spring market, and your cows, that give milk into your rowens, till either snow or a hard frost comes on, as by that means they will need no fodder: but when either snow or frost comes, you must give hay to such cows as are near calving, or those that have lately calved, or that give a great deal of milk, and also to your fattening cattle. This must be done every morning and evening, in proportion to the quantity of rowen you have upon the ground; for the more rowen you have, the less quantity of hay will do, and even the four grass which your cattle would not eat before, will, when the frost hath taken it, become good sweet food for them, and what they will eat with pleasure, if it be not covered so deep with snow, that they cannot come at it. But for your lean cattle, and those that give but little milk, straw will do well enough to fodder them with; only you must observe to give barley-straw first, and the oat straw last, except you value your milk: if you do, give such cows your oat-straw, provided, the quantity of milk they give doth not deserve hay, or hay be scarce with you; for barley-straw will quite dry up the little milk they have, though it is good food for dry cattle. But if your hay and carrots fail you, pour scalding hot-water upon your malt-dust, and, when near cold, give it the cows you design to continue the milk of, and it will cause them to give a great deal, though they eat straw with it. A bushel which costs about three-pence, will be sufficient for a cow in a week. But about London, where they have grains in plenty they give them to their cows in winter, which makes them give a great deal of milk; but is apt to rot them, if given in too great quantities, and for too long a time.

When your rowen is quite eaten up, which will commonly be about February, you must house your milch-cows, which you give hay to all night in your cow-house, and your other cattle in your yard; for which use you should have two yards; one for your cattle which eat straw with racks and other conveniences to fodder them in: observing to feed them often, and not to give them too much at a time; because when they have blown upon it, they will not eat it; both your yards ought to be well sheltered, and made as dry as possible, and a good deal of straw given them to lie dry and warm in, which is a very great advantage to them, and will greatly increase the quantity of your dung.

As to the buying of fat cattle, milch-cows, or lean cattle, experience, and the advice of such persons as understand them, are the best instructors.

For the feeding of land, you may do it with beasts and horses together, or with beasts first, and horses afterwards; and after both put in sheep. But let not your grass be too rank before you feed it; for if you do it will be sour, and your cattle will eat the tops only, so that the other part will lie untouched, and rot upon the ground, as hardly any beast will eat four grass, till the frost hath taken it, except Welch heifers. Observe also where you have inclosures, to be often changing of your cattle from one pasture to another; for by that means you will give your land an opportunity of getting a fresh head, fresh grass being a great help to the feeding of cattle. *Mortimer's Husbandry*, vol. I. p. 231.

Cattle are frequently well fed in winter with rye-straw, mixed with a little hay; with the straw or halm of buck-wheat; with the leaves of white beet; with turnips, the turnip-cabbage, carrots, cabbages, burnet, and the bruised tops of surze; as may be seen under each article. They are also well fed and fatted with the cakes of linseed and rape-seed, or cole-seed. See the articles COLE-SEED and LIN-SEED.

It is really surprising that though plants have been constantly obvious to the eyes of every man, nothing has been delivered down to us in any book, concerning the kinds of plants proper for the different kinds of cattle; the consequence of which inattention frequently is, that the farmer, by not distinguishing and selecting the seeds or proper grasses, fills his pastures with weeds, or which is here equivalent to them, with bad grasses, unfit for the nourishment of the animal he intends to rear.

The illustrious Linnæus in his journey through Dale-

caria in the year 1734, made the first attempt to lay down rules for the farmer's direction in this interesting subject. In his journey he observed, that the horses easily distinguished wholesome from noxious food; for being very hungry, they devoured all sorts of plants, except the meadow-sweet, valerian, lilly of the valley, angelica, loose-strife, marsh-cinquefoil, crane's-bill, hellebore, monkshood, and several shrubs. This gave him a hint to recommend to the curious to apply themselves to examine what plants such animals as live on vegetables will not touch.

The ingenious author of the Swedish Pan, in order to encourage inquiries of this kind, very properly observes, that we admire the wisdom of the Creator, which has made some vegetables absolutely disagreeable to some animals, while they are agreeable to others; and plants, which are poisonous to some, are wholesome to others. This did not happen by chance; it was ordained for wise purposes: for if the author of nature had made all plants equally grateful to all kinds of quadrupeds, it must necessarily have happened, that one species of them having remarkably increased, another species must have perished by hunger, because it would have got into better pasture. In like manner we find it contrived in relation to the plants themselves, which do not all grow in the same country and climate; but every plant has its place, in which it grows more abundantly than elsewhere. From hence we may observe that those animals which live chiefly upon particular plants, abound most in certain places. Thus one animal leaves that which is poisonous to itself, for another animal, which feeds upon it deliciously. Long-leaved water-hemlock will kill a cow, whereas the goat browses on it greedily. Monkshood kills a goat, but will not hurt a horse. Parsley is deadly to small birds, while sheep, hares, rabbits, and swine eat it safely; and pepper is mortal to swine, and wholesome to poultry. Hunger will often drive animals to feed upon plants which nature never intended for them, but after this has happened once, they become more cautious for the future.

Perhaps many of the terrible diseases to which cattle are subject and which has swept away innumerable multitudes, may, in part at least, be owing to the mixture of noxious plants among their food. The great Linnæus was of this opinion: and the following passage in the writings of that admired naturalist is too interesting to be omitted in a work of this kind.

"When I arrived, says he, at Tornea, the inhabitants complained of a terrible disease then raging among the horned cattle, which died by hundreds, soon after their being let into the pastures in the spring. They desired I would consider this affair, and give them my advice what was to be done in order to put a stop to this evil. After a proper examination, I thought the following circumstance worth observing:

"1. That the cattle died as soon as they left off winter fodder, and returned to grazing.

"2. That the disease diminished as the summer came on; at which time, as well as in the autumn, few died.

"3. That this distemper was propagated irregularly, and not by contagion.

"4. That in the spring, the cows were driven into a meadow near the city, and that they chiefly died there.

"5. That the symptoms varied much, yet agreed in this: That the cattle, in grazing indiscriminately on all sorts of herbs, had their bellies swelled, were seized with convulsions, and in a few days expired with dreadful bellowings.

"6. That no man dared to flay the recent carcasses; as they found by experience, that not only the hands of such as attempted it, but their faces too had been inflamed and mortified, and that death had ensued.

"7. The people enquired of me, whether there were any kind of poisonous spiders in that meadow; or whether the water, which had a yellowish tint, was not noxious.

"8. That it was not a murrain was clear because the distemper was not contagious, and because that distemper is not peculiar to the spring. I saw no spiders but what are common all over Sweden; and as to the water, the sediment at the bottom, which caused the yellowness, was nothing but what came from iron.

"9. I was hardly got out of the boat which carried me over the river into the meadow, before I guessed the real cause

cause of the disease; for I there beheld the long-leaved water-hemlock. My reasons for guessing this were the following:

"10. Because in that meadow where the cattle first fell ill, this poisonous plant grows in great plenty chiefly near the banks of the river. In other places it was scarce.

"11. The least attention will convince us, that brutes shun whatever is hurtful to them, and distinguish poisonous plants from those which are salutary by natural instinct; so that this plant is not eaten by them in the summer and autumn, which is the reason that few cattle died in these seasons; those only which eat of it by accident, or were driven to it by extreme hunger.

"12. But when they are let into the pastures in the spring, partly from their greediness after the herbs, and partly from the hunger they had undergone during the winter, they devour every green thing that comes in their way. It also happens that herbs, at this season, are small, and scarcely supply food in sufficient quantity. They are besides more juicy, and covered with water, and smell less strong; so that what is noxious is not easily discerned from what is wholesome. I observed likewise, that the radical leaves were always bitter, and the others not, which confirms what I have just said.

"13. I saw this plant in an adjoining meadow mowed along with grass for winter fodder; and therefore it is no wonder, that some cattle, though but a few, should die of it in the winter.

"14. After I left Tornea, I saw no more of this plant, till I came to the vast meadows near Limingen, where it appeared along the sides of the road; and when I got into the town I heard of the same complaints as at Tornea, of the annual loss of cattle, with the same circumstances.

"15. It would therefore be worth while to eradicate carefully these plants, which might easily be done, as they grow on marshy grounds, and generally by the sides of pools and rivers. But if this cannot be performed, the cattle should not be suffered to go into such places, at least during the spring: for I am persuaded that later in the year they can distinguish this by the smell alone." *Lin. Flora Lapponica.*

Were experiments carefully and judiciously made on the above beneficial plan, we should soon know with certainty what species of animals any pasture affords the best nourishment for. We see, for example, heifers fall away in enclosures, where the meadow-sweet grows in abundance, and covers the ground so that they can hardly make their way through it: while the country people, imagining that the pasture is too rich for them, are quite amazed, and never dream that the meadow-sweet affords them no nourishment: whereas the goat, which stands bleating on the other side of the hedge, is not suffered to go in, though he longs to be browsing upon this plant, which is to him a most delicate and nourishing food. Long experience has taught us, that sheep take up poison in marshy grounds, though no one till lately knew what the particular poison was: yet the spider-wort, the mouse-ear scorpion-grass, the mercury, the sun-dew, the hairy-wood-grass, the lesser spear-wort, and the butterwort, have evidently suspicious marks.

Hence we see, that what makes low grounds so noxious to sheep is not wholly the moisture, but the plants which grow there; for it is remarked by shepherds, that the great danger to sheep is immediately after a fresh spring of grass, when it is natural to think they lick up the young and tender shoots of poisonous plants along with their proper food, not being then able to distinguish the one from the other.

From the observations of this kind the husbandman may form a right judgment of his meadows, and turn into each the animals best adapted to the nature of the pasture.

"The industrious farmer, says the author of the Swedish Pan, may judge from hence, when he sows his meadows with hay-seeds for pasture, that it is not indifferent what kind of seeds he chooses, as the vulgar inadvertently think: for some are fit for horses, others for cows, &c. Horses are nicer in choosing than any other cattle. Plants, whose seeds grow in pods, are particularly relished by them. Goats feed upon a greater variety of plants than any other cattle: but then they chiefly hunt after the extremities and flowers. Sheep, on the contrary, pass by the flowers, and eat the leaves. And again, different animals have different dispositions as to grazing more or less near the ground. The husbandman, who understands these things, and who, in consequence thereof, knows how to lay out his lands, so

as to assign to each sort of cattle its proper food, will necessarily have his flocks and herds healthier and fatter, than he who is unacquainted with these principles. The good manager will also observe the same precautions in the making of his hay: for although many herbs are eaten when dry, which would be refused while green, it does not from thence follow, that they yield good nourishment. Much might be added concerning the propensity of cattle to this or that plant: for example, that sheep delight above all things in the fescue grass, and grow fatter upon it, than on any other kind of grass; that goats prefer certain plants, but, being led by an instinct peculiar to themselves, they search more after variety, and do not willingly stick long to any one kind of food: that geese are particularly fond of the seeds of fescue grass; that swine hunt greedily after the roots of bullrush, while they are fresh, but will not touch them while they are dry." *N. Hasselgren. Amant. Academ. Suec. tom. II.*

If a farmer, says the intelligent Mr. Lisle, intends to graze cattle in a hill country farm, these three things are especially to be regarded; first, to raise a good quantity of French grass for hay and aftermaths. Secondly, to turn a good quantity of hill country meadow into rich pasture, by feeding it, dunging it, and laying on it other manure, to make it fit for raising the bullock or heifer in the spring, when he comes first from hay into grass-lease, and to receive him with a vigorous aftermath, when other grasses, as clovers, and French grass aftermath goes off. Thirdly, to have hovels in your bartons, inclosed with close court-walls, to shelter your cattle in the winter from wind and rain. All these three things are necessary and uniform, corresponding with one another; without them, grazing must be carried on very defectively, and to little profit, by the hill country farmer.

By the methods here prescribed, in order to the fattening of cattle, plenty of French grass hay will enable the grazier to purchase barren beasts before the spring grass comes, when it is most likely they will be cheap, and may be bought to the best advantage, allowing the value of the hay they may eat in consideration with the purchase; and if by winter-hayning some meadow-ground (after it has been kept high in heart by feeding and soiling it) you can early in the spring, by April, or sooner, have a bite to take off such grazing beasts from hay to grass, it will be very advantageous before clovers can be ready, which are seldom so, in the hill-country, till a week or a fortnight in May; and by hayning up such meads for an aftermath, which towards the end of summer are in very good heart, you will support your bullock, and carry him on when the spirit of other grasses fail. Then such cattle as are unfinished being brought to French grass hay, and tied up under hovels or coverings, and within court-walls, will proceed in thriving by being secured from the wind and rain, and the tedious hill-country-rimes, that often continue whole winter days, all which makes cattle brought from grass to pitch, and mashes them out. Besides, if you have not plenty of French grass hay, you cannot make the best of a milch-cow that warps, or of a cow that towards the latter end of winter you may perceive proves barren, or of a fat cow that casts her calf before you kill her. The necessity of French grass hay only, and not of clover hay, is mentioned here, because it is supposed that the hill country farmer, who provides store of French grass hay, will be wise enough not to mow his clover to feed them, in order to improve his lands; for the hill-country farmers have generally so much land for their money, that all they can do is little enough to keep their arable land in such heart as it ought to be in for their profit.

If the foregoing cautions are not observed, the ill consequences that will follow must be such as these: if the first of the three foregoing cautions be disregarded, your cattle cannot at any time of the year be made fat, as they ought to be, and then you must be under the necessity of selling them half fat, of which necessity the buyer never fails to take the advantage; and sell them you must, notwithstanding there be ever so fair a prospect of prices rising in a month or two; and you will commonly find, that you have nothing for the meat they have eat whilst they have been fattening. In the second place, we will suppose that very few will be so unwise as to begin to fat a beast in October with hay, and so to keep him upon hay during the winter: but we may reasonably suppose, that warping beasts, barren heifers, &c. may, and commonly are, begun to be fatted with hay from Christmas, in which case, though hay be

be plenty, yet if an early spring grafs be wanting, such cattle must be kept on it at least to the middle of May; for till then, in the hill-country, it will not give a beast a bite, and then commonly, where the master is at a loss and disappointed, the cattle evidently suffer before he can make the most of them, and, in this case, he will find a beast plainly pitch before he can find a purchaser for him. Again, if early spring-grafs be wanting, you cannot begin summer fattening of cattle, nor buy a barren heifer till towards the middle of May, and then they are commonly very dear: and in the hill-country, from so late a beginning, the summer grafs will hardly fat a beast, the ground falling early off its strength, being generally poor. And then, if you have not a quick growing aftermath treasured up, by keeping such ground as was formerly meadow in good heart for that purpose, it is plain you must again run into the first evil; and, if you have such an aftermath, you may again often want hay in November and December, to finish summer fattened beasts; so that plenty of hay is always necessary, &c. And, lastly, though you have both hay and grafs, if you want winter shelter, the cattle must suffer.

All fattening cattle, whether lambs, sheep, barren cows, or oxen, require a proportionable progression from coarser to better food, as they grow more and more into good flesh; otherwise when half fat they will go back, and you will not without great difficulty raise them again, which will be a great loss; nor will such beef spend kindly.

A gentleman, who would make a good hill-country grazier, ought, against the time he buys in his heifers to take care to be provided with an overplus stock of middling good hay, or of winter vetches, or of barley straw, and autumn grafs, mixed together, layer and layer of each. Be it what it will, it ought to be at least better than barley-straw; for he is to suppose he has bought barren heifers, which have been kept all the winter upon straw: if they have been kept better, for instance, on straw and rowet, there is still the greater reason for him to mend their keeping; and he is, from the time of buying, to consider, that he ought to begin to raise them in flesh; for the better case they are in when turned to spring grafs, they will take to fattening the kinder, and bear their first scouring the better. If he could turn them into the field, for an hour or two in the day where there is a little rowet, it would do well, and to have change of the above dry meats would keep them the better to their stomachs.

Oxen are turned off to fattening at two seasons of the year, which, in several respects, are very convenient. The first is about May-day, when the labour of the ox is pretty well over for the spring season, the spring corn being then generally all sown. The second is the beginning of winter, namely, from the first of October, to the middle of November, when the wheat and winter vetches are generally all sown, and the ploughman's hurry relaxes.

Oxen turned out at May-day will hardly get fat before Christmas, and if not turned out till June, will not be fat till March, April, or May; which again falls out very fortunately, because from Christmas until the latter end of May cow beef is very scarce, and is generally supplied with ox beef; but then it is obvious, when an ox gets half, or three quarters fat by or before winter, he must be supported and carried on by a great quantity of hay, and that very good, for the beast will then grow nice.

Those that are turned from the plough in October and November, ordinary food will serve for some time; for should you lay the best hay before such an ox, then hungry and poor, he will devour more than the profit. The most you can propose by this method is to get him fat by July, instead of September or October; during all which interval of time, heifer-beef will be plenty, and sink the price of ox-beef; so chargeable a method therefore will not quit costs.

What the grazier ought to do in this case is to bring his ox easily and gently into good flesh by a rowet; for which purpose he ought to have hayned up his grounds, and of which rowet he should give him the worst first, except it be of so sour a kind as to want the correction of the winter frosts before he will eat it, of which kind stubble rowet commonly is, and in such case that food must be reserved till then, or rather for young beasts and milch-cows. He ought to give him variety of dry meat along with his rowet, in which he should consult his tooth, by flinging before him, alternately, every sort of good straw, giving now and then a lock of winter vetches, or coarse hay, but of every

thing good in its kind, *i. e.* sweet and well made; and thus the ox ought to be carried on throughout the winter. About the beginning of March he ought to have better hay; not only because the rowet may be supposed to be all gone, but also because the ox, mending in flesh, grows nicer, and will be weary of dry meat, through the tediousness of being foddered so much with it during the winter; therefore his hay must be mended, for not proceeding is going back. Against April, if possible, a short head of grafs should be got for him in your pasture grounds for cow-cattle, by hayning the pasture in February, that he may have grafs along with his hay, as was before observed in the fattening of barren heifers: and against May a head of hop-clover must be in readiness, in the hill country to receive him into his first full grazing; for it is not to be supposed that the meadows of the hill-country, which according to this scheme are to be converted into pasture, can be fit before the first of June to entertain a grazing ox; and it is also to be noted, that in the hill-country, in the month of May, hop-clover will not afford a good bite for an ox or cow, unless the autumnal bud be hayned, and preserved by being fed by sheep: in the month of May, if it should prove a dry spring, the fattening oxen and cows must also have good hay given them, with their hop-clover, if it be short.

Fattening in the hill-country, especially if you give your cattle hay in the winter, is more chargeable than in the vale; not only because hay is dearer there, but also because the winter season begins a month sooner, and continues a month later in the former than in the latter. The farmer in the hill-country must likewise, by forcing nature as it were, provide rowet and several sorts of grasses in their due order, exactly accommodated to the season of the year, besides winter meat, &c. Whereas all may be procured by the latter in the natural course, with very little care and trouble.

It will be necessary to observe, that every hill-country grazier goes to work without his tools who does not lay down from fifty to an hundred acres of land proper for it, with French grasses, not only on account of making up the deficiency of the meadows not laid down to pasture, being converted to other uses, but also to answer many other demands. *Lisle's Observations in Husbandry, vol. II. p. 18.*

A stalled ox in the winter, if he be kept to hay only, will eat at least a load every two months. *Ibid. p. 5.*

Fourteen pounds weight of hay is the constant allowance on the road to every fat beast that is drove to London; they that entertain cattle sling fourteen pounds of hay for each beast into the rack in the evening when they come into the inn, which is to serve also next morning for their breakfast; so that half a tod, or seven pounds of hay, is supposed sufficient for a fat ox's bait at night, and the same in the morning. *Ibid. p. 9.*

For the manner of feeding and fattening cattle with cabbages, carrots, turnips, turnip-cabbages, &c. See the articles CABBAGE, CARROT, &c. and plate III. for a cattle shed.

Mr. Marshall, who treats largely on the subject of cattle, in his Rural Economy of Norfolk, says, "In treating of this species of live stock, it will be proper to consider, separately,

1. The present breed of cattle, in this district, is not less peculiar to the country, than its breed of horses was formerly (*see* HORSES), and is strongly marked with the same leading characters.

The native cattle of Norfolk are a small, hardy, thriving race; fattening as freely, and finishing as highly, at three years old, as cattle in general do at four or five.

They are small-boned, short legged, round-barrelled, well-loined, thin-thighed, clean-chapped; the head in general fine, and the horns clean, middle-sized, and bent upward: the favourite colour a blood-red, with a white or mottled face.

The breed of Norfolk is the Herefordshire breed in miniature; except that the chine and the quarter of the Norfolk breed are more frequently deficient.

This, however, is not a general imperfection. I have seen Norfolk spayed heifers sent to Smithfield, as well laid up, and as full in their points, as Galloway or Highland "Scots" usually are; and if the London butchers be judges of beef, there is no better fleshed beasts sent to Smithfield-market.

These two qualifications, namely, the superior quality of their

their flesh, and their fattening freely at an early age, do away every solid objection to their size and form. Nevertheless, it might be advisable to endeavour to improve the latter, provided those two far superior qualifications were not by that means injured. But it might be wrong to attempt to increase the former, which seems to be perfectly well adapted to the Norfolk soil.

The medium weight of a well-fatted three-year old is forty stone (of fourteen pounds each).

Bulls of the Suffolk polled breed have, at different times, been brought into this district: and there are several instances of the Norfolk breed being crossed with these bulls. The consequence is, an increase of size, and an improvement of form: but it is much to be feared, that the native hardiness of the Norfolk breed, and their quality of fattening quickly, at an early age, are injured by this innovation; which was first introduced by gentlemen, who, it is probable, were unacquainted with the peculiar excellency of the true Norfolk stock; and the mongrel breed, which has arisen from the cross, yet remains in the hands of a few individuals.

A few years ago, a Highland Scotch bull was brought into this neighbourhood, by a man who stands high in the profession of grazing, and who has crossed his own stock, of the true Norfolk breed, with this bull. The produce of this cross proves, that if the genuine breed can be improved, by any admixture of blood whatever, it is by that of the "Highland Scot." The chine is, by this cross, obviously improved; and the hardiness, as well as the flesh, and proneness to fat at a certain age, cannot receive injury from this admixture. The only thing to be feared from it is, that the stock will not fat so early, as will that of the genuine breed; and, if the opinion of the oldest, gravest, and I had almost said, the best farmer in the district has any weight in this case, this evil effect is much to be apprehended: he is clear in that a "Scot" does not fat kindly even at three years old, much less at two; at which age many hundred head of cattle are annually fatted in this country.

The fact appears evidently to be, that the Norfolk husbandmen are in possession of a breed of cattle, admirably adapted to their soil, climate, and system of management: and let them cross with caution, lest by mixing they adulterate; and, in the end, lose, irretrievably, their present breed of cattle; as their forefathers, heretofore, lost a valuable breed of horses; the loss of which can, now, be only lamented.

If, through the laudable spirit of improvement, attempts be made with foreign breeds, they ought to be made with caution. But, from what I have seen and known of the Norfolk stock, and what I have since seen of the improvement of the breed of cattle, in other counties, it appears to me, evidently, that nothing more is wanted to improve the form of the present breed of cattle in Norfolk than a due attention to the breed itself.

While such cows, and such bulls, as I have sometimes seen, are suffered to propagate their deformities, no wonder some valuable points should be lowered. But if, in the reverse of this unpardonable neglect, men of judgment and enterprise would make a proper selection, and would pay the same attention to the Norfolk breed as is paid to the long-horned breed, in the midland counties, and to the short-horned in the north of Yorkshire; every point might beyond a doubt be filled up, and the present valuable qualities be at the same time retained.

But the great cause of neglect in the breeding of cattle in Norfolk is, that men of judgment and spirit rather choose to purchase of the Scotch drovers, or of their poor and industrious but less judicious neighbours, than to go themselves through the tedious round of rearing. However, if we consider the present universal scarcity of cattle (1786), and that the Scotchmen, through recent improvements of their plan of husbandry, are now enabled to fat a part of that stock, which formerly they drove wholly to the southward; it seems highly probable that the Norfolk grazers will, henceforward, find their advantage in increasing and improving their own breed; and they may rest assured, that he who first sets about its improvement will have it in his power to keep the lead; and reap, of course, the highest advantage.

The prime intention of keeping cows in this country is the rearing of young stock; the produce of the dairy, unless in the neighbourhood of large towns, being a secondary object.

But the number of cows kept, even by the rearing-farmers, is few: eight or ten may be considered as a middling dairy of cows upon a middle-sized farm; I mean on the east side of the county.

In West-Norfolk, especially on the marsh land side towards Cambridgeshire, large dairies of cows are kept, for the purpose of making butter, which is sent weekly to London under the denomination of Cambridge butter.

This is a fortunate circumstance to the East-Norfolk breeders, who draw an increase of rearing-calves from that quarter of the county: whose dairymen, in their turn, are benefited, in being by this means enabled to get rid of their calves, at an early age; jobbers making it a business to transfer them from one side of the county to the other.

By this means, and by buying up the calves of cottagers, farmers, and gentlemen of the neighbourhood, who do not rear their own, an East-Norfolk breeder is able to rear a greater number of calves than the number of his cows amount to.

Ten or twelve calves may, perhaps, be considered as the medial number reared at present, on a farm of one hundred and fifty pounds to two hundred pounds a year.

In the neighbourhood of Norwich and Yarmouth, cow-keeping is frequently applied to the fattening of calves for the ped-markets.

Also, in the neighbourhood of these and other towns, but-ter becomes an object of sale. Mr. Marshall further says,

Rearing cattle calls for a threefold division; viz.

Calves,

Yearlings,

Two-year-olds.

The rearing of cattle is become, in my opinion, a subject of the first importance to this country: an universal and growing scarcity of neat stock is experienced, more or less, throughout the kingdom. I have therefore paid more than common attention to the rearing of calves (the first and most difficult part of the business) in this district: not only as being a primary object in the East-Norfolk system, but because the practice here is, in many respects, peculiar to the country.

The number has already been mentioned in general terms: it varies, however, with the quantity of meadow or other natural grassland belonging to a given farm; and sometimes, but not always, with the time at which the cows happen to come-in.

Some farmers "bring up" all the year round;—rearing every calf he has dropt. Others rear in winter, only; fattening his summer calves for the ped-markets; or, at a distance from them, for the butcher. Norfolk farmers, in general, begin early in winter to rear their calves: some so early as Michaelmas; in general, if their cows come in, before Christmas: not only as being fully aware of the advantage of rearing early; but in order that they may rear as many of their own calves as possible; "drove calves" being always hazardous, and sometimes scarce.

No distinction is made as to sex: males and females are equally objects of rearing, and are both, occasionally, subjected to castration; it being a prevailing custom to spay all heifers intended to be fatted at three-year-old; but such as are intended to be finished at two-years-old are, I believe, pretty generally left "open:" as are, of course, such as are intended for the dairy.

There are two reasons for this practice: they are prevented from taking the bull too early, and thereby frustrating the main intention; and by this precaution they lie more quietly—are kept from roving—at the time of fattening. This may be one reason why spayed heifers are thought to fat more kindly at three-years-old, and to be better fleshed, than open heifers.

The method of treatment depends in some measure on the time of rearing: winter calves require more milk than the later-dropt ones do.

The general treatment of calves dropt at Christmas may be said to be this: sucks, twice a day, the first fortnight: has the pail, twice a day, for the next month or six weeks: and once a day, for a month or six weeks longer:—with hay in a rack, and turneps in a manger; and, sometimes, with oats and bran among the turneps: which last, after a calf has taken freely to them, serves as both meat and drink.

In this consists the chief peculiarity of the Norfolk method of rearing calves: which may be said to be with milk and turneps: the last a species of food, which, in every

other part of the kingdom, is, I believe, entirely neglected, or unthought of.

As soon as the weather gets warm enough, the calves are turned out, in the day, among the fattening bullocks, or on to a patch of turneps, or upon a piece of wheat, or a forward grass-piece, and housed again at night: until the days growing long, and the nights warm, and the clover and dandelion have risen to a full bite, they are turned out altogether; and continue to have the first bite of every thing, which is good and palatable to them, throughout the summer.

This, may be called the general treatment of calves dropt at Christmas; but the managements of no two farmers are exactly the same. The lattermath and stubbles being finished, the yearlings—provincially “buds,”—are put to turneps: either as followers to the bullocks, or have some fresh turneps thrown to them: in either case, they sleep in the par-yard, and generally have a separate par allotted them; though sometimes they are parred with the two-year-olds.

In the yard, the best of the “stover” is allowed them, and, perhaps, a little ordinary hay: it being a maxim, pretty generally adopted among good farmers, to keep their young stock as well as they can the first winter.

In spring, and summer, they follow the bullocks, and run in the meadows; or, if these be wanting, are sometimes sent out to summer grass in the marshes or grazing-grounds.

The two-year-olds, run in the stubbles and broken grass till Christmas, or until turneps can be spared them; when they generally follow the bullocks. In winter, they are always “parred” at night; sometimes with the cows; sometimes with the buds; sometimes alone. Good farmers generally keep them separate:—if parred with the buds, they rob them; if with the cows, they are liable to be “horned,” and are never at rest; except while the cows are eating up the best of the fodder.

Some farmers, when turneps run short, “put out” their two-year-olds in winter; and others when they are plentiful, “graze,” that is, fat their two-year-olds.

In general, however, they are “kept over-years,” on meadows or lays, or are sent to the marshes or grazing-grounds, as situations and circumstances point out; and, at Michaelmas, are put to turneps as fattening-cattle.

The agistment price for two-years-olds, from May-day to Michaelmas, varies with the keep.

Bullocks is the grand object to which every part of the Norfolk husbandry more or less tends, and which distinguished it, from the husbandry of all other countries.

The practice of fattening bullocks on turneps is, however, now beginning to creep into every part of the kingdom: but it may be said to be still in a state of infancy every where, except in Norfolk; and an accurate account of the practice of this parent-country cannot fail of being useful to every other turnep-land district.

Impressed with this idea, I spared no pains, nor let slip any opportunity, of making myself acquainted with the subject. The grand divisions of the subject are,

The species of bullocks fatted.

The method of obtaining them.

The method of fattening them.

The only species of cattle fatted in East-Norfolk may be said to be home-breds and Scots. Some Irish beasts have, at different times, but not regularly, been brought into the country, and have generally done very well. In West-Norfolk, great numbers of Lincolnshire and Yorkshire oxen were formerly, and some few, I believe, are now, fatted; but in this district they have always been considered as much inferior to the Scotch and home-bred stock.

Home-breds consist of steers, spayed heifers, open heifers, barren cows, running calves.

The last is a species of fattening cattle peculiar, perhaps, to this country. They are calves, which are suffered to run with their dams until they be a twelvemonth or more old: the cow being all the while at head-keep, of which the calf partakes, as well as of the milk of its dam: which, herself, in the mean time, generally gets fat enough to be sent to Smithfield, with her calf (perhaps, as heavy as herself) by her side.

The Scotch cattle fatted in Norfolk consist of Galloway Scots; other Lowland Scots; Highlanders; Isle of Skys.

The Galloway Scot is large, thick, short-legged, mostly hornless, and of a black or brindled colour: the flesh well grained; and the form altogether beautiful: chine

full; back broad and level; quarter long and full at the nache; round barrel; deep girth; and the bone, head, and chap, in general, fine.

This I apprehended is the genuine original Galloway Scot; and a principal part of the bullocks brought into Norfolk under that name are of this description: but the droves are generally adulterated with a mongrel sort; the produce of a cross with the long-horned breed.

This species of adultery is said to be committed and encouraged by the nobility and landed gentlemen of the countries they are bred in; but the fact appears to be, that they have already one of the finest breed of cattle in the world upon their estates; and it behoves them to hand it down to posterity as pure at least as they received it. In this age of improvement, it might be laudable to endeavour to improve it to the utmost: not, however, by foreign admixtures; but by giving the most beautiful females to the most beautiful males of their own breed. They appear to me to have much to lose, but nothing to gain, from crossing, not even with the present long-horned breed of the inland counties.

This species of Scotch cattle appears to be originally of the county of Galloway, which forms the southern extremity of Scotland; but they are now, it is said, propagated in other parts of the Lowlands, especially in the rich-land countries of Lothian, in the neighbourhood of Edinburgh. I have known them fatted to eighty stone; and have been informed, from authority which I have no reason to doubt, that they have been known to reach near one hundred stone (of fourteen pounds each).

Lowland Scots are the ordinary breed of black-cattle, in the Lowland counties, size below the Galloways, and appear to be a mixture between these and the Highland Scots. Sixty stone is a good weight for a Lowland Scot. His form and inclination to fat partake of the Galloway breed: the former, however, is seldom so near perfection as is that of a true Galloway Scot. Lowland Scots are some of them horned, some of them polled: their colour black, or brindled, or dun.

Highland Scots. This seems to be a distinct breed. The size is beneath that of the Lowland Scots: forty to fifty stone is the ordinary weight of a Highland Scot. In form, flesh, and fattening quality the Highlanders resemble much the Galloway Scots; except that their backs in general are coarser, their bone proportionably larger, and in that they have, in general, but not always, horns, of the middle size, and mostly bent upward, like those of the Welsh cattle but finer.

In general appearance there is a strong resemblance (their horns apart) between the Highland Scots and the black cattle of North-Wales; but with respect to flesh and fattening quality, the main objects, the comparison is greatly in favour of the Scotch breed which the gentlemen of North-Wales are said to fetch annually out of Scotland, or to buy them up at the English fairs, to be fatted for their own tables.

The Isle of Sky appears to be only a variety of the Highland breed; contracted by soil, or climature, or both. They are, in point of size, the lowest in the gradation. But with regard to flesh, fattening, and growth while fattening, they may be said to stand foremost. I have known an Isle of Sky Scot, brought at two years and a half old for less than forty shillings, reach, in about twenty months, to forty five stone.

At that age their growth in England is astonishing; owing, perhaps, not more to their nature than to a change of climature, and a change of food. Much, however, depends upon their age. If they be intended for immediate fattening, four years old is the properest age. An Isle of Sky or a Highland Scot at two or three years old will grow, but he will not fat; at five or six he will fat, but he will not grow, while fattening, equal to a four-year-old bullock. At this age the weight of Isle of Sky Scots, when fat, varies from twenty to forty stone.

These are the four species or varieties of cattle which are brought by the Scotch drovers to the Norfolk fairs, and which are bought up and fatted by the Norfolk farmers, under the foregoing names. There may be other breeds and admixtures of cattle propagated in Scotland; but, not being sent to this market, they are foreign to the present subject.

The method of obtaining bullocks for fattening, is either by rearing, or by purchase.

Some farmers rear all their own fattening-stock: others purchase

purchase the whole. But the more general practice is to rear part, and buy in part. Much depends upon situation; but more, perhaps, upon judgment: and still more, perhaps, upon an ample and regular supply of the means of purchase. It is allowed, that the affluent fortunes which were formerly made by some few Norfolk farmers, were chiefly acquired through a superior skill in the purchase of stock, seconded by a full supply of money; by which means they were always able to time their purchase to the best advantage. But in men of inferior judgment, and who have not money at their command to purchase when the price of stock is low, it is undoubtedly prudent to rear the whole, or a principal part, of their own stock; for, in doing this, they travel a beaten track, and tread on sure ground.

The purchase of home-breds is chiefly at the fairs; or at the breeder's houses; or on at the Castle-hill at Norwich, where there is a weekly market; sometimes pretty full of different sorts of live stock.

The purchase of Scots is, in this district, chiefly at the fair of St. Faith's, a village near Norwich; to which the Scotch drovers bring annually great numbers.

These Scotch dealers have a succession of fairs, which keep them some months in the country; during which time a continued stream of cattle is kept flowing from its various sources in Scotland to its general efflux: which is judiciously removed from place to place, that the diffusion may be more regular and easy.

East Norfolk, as observed above, is principally supplied at St. Faith's. The northern hundreds sometimes draw an additional supply from Hempton-Green; and the southern ones from Haleworth and Hoxone, which, with the other fairs in Norfolk, lie within the reach of the Norfolk farmers.

The Highlanders and Isle-of-Skys are chiefly or wholly oxen; but the Galloway, and other Lowland Scots have a mixture of spayed heifers; a species of fatting cattle which is coveted by judicious graziers.

The most common age is four years old; but many of the Scotch cattle brought to these fairs are probably much older: some of them have been worked: even some of the Highlanders are said to be worked at the collieries. There are also many three year olds, and some two years old or under. These are bought to be kept over year in the meadows, marshes, and grazing grounds.

For the same purpose, two year old home-breds are also purchased, the first day of these and at other fairs.

But, for immediate fatting, the desired ages are three years old for home-breds, and four years old for Scots.

In the method of fatting, the first thing to be considered is, the proportion of bullocks to a given quantity of turneps. This depends on the size of the bullock, and the quality of the turneps. The general calculation is a middle-sized bullock to an acre of good turneps. Taking turneps on a par, a fatting-bullock and a follower, come, perhaps, nearer the real proportion.

The time depends on the growth of the turneps and the possession of the bullocks: the home-breds are usually put to turneps about Michaelmas; the Scots, as soon as they are purchased. It is observable here, that notwithstanding a Scotch bullock, especially of the smaller kind, never saw, perhaps, a turnep, yet, when thrown to abroad, in company with two or three home-breds, he generally soon learns to break his turneps. Some particular bullocks, however, will receive a check before they take to them.

The place for fatting bullocks on turneps is either the field, the yard, sheds, or hovels.

The first requires least attendance and attention, and is highly beneficial to light land: the second makes a great quantity of manure, but a waste of stover: the last requires less litter; but incurs a greater portion of labour.

In a dry, open season, bullocks at turneps do best abroad; in wet, pinching weather, best under cover.

Out of these established facts arises an obviously eligible plan of management, where circumstances will admit of it. In autumn, so long as the weather continues moderate, let bullocks remain abroad; but, whenever it sets in very wet, or very severe, take them up under cover; and there let them remain until they be finished, or until the warmth of spring calls them abroad again.

But the most eligible method of fatting depends on a variety of circumstances: these Mr. Marshall says, are

The soil and situation;

The conveniencies in the yard;

The season; and

The species of stock to be fatted.

Cattle which have been accustomed to lie abroad in a severe climate, will stand the winter in the field better than those which have been used to a sheltered yard, in a warmer climate.

No general plan of management can, therefore, be laid down. All that can be done is, to point out the various modes of use, and leave every man to consider well his own particular circumstances, and make his election accordingly."

In Mr. Marshall's Rural Economy of the Midland Counties, he gives the following directions on the subject of cattle and livestock:

"In the midland district, the four principal species are found in peculiar plenty, and in a singular state of improvement. The other three I shall pass over. Rabbits cannot be deemed an object of the rural economy of this district; and with regard to poultry and bees, nothing sufficiently striking has occurred to me in it, to require particular notice: except that game fowls are here in the first estimation, as a species of poultry; as producing more eggs, and being themselves better fleshed and better flavoured than fowls in general.

"Therefore this division of the present work will be confined to horses, cattle, sheep, swine.

"A country that has deservedly obtained so much credit by its management of live-stock, especially the three species first mentioned, and which has carried on the improvement of the several species, more particularly those of cattle and sheep, with a spirit unknown before, and has raised them to a height unattained, perhaps, in any age or nation, is entitled to every attention. It would indeed be unpardonable, and altogether inconsistent with this undertaking, to pass over its practice in a superficial manner. The spirit of improvement is now in the zenith, and the improvement itself, taken in a general light, is now, probably, at its height. The breed of horses in this district is allowed to be on the decline. Its breed of cattle are probably at its height; and its sheep are at present so near perfection, that it is not probable they should hereafter receive much improvement. Beside, the grand luminary of the art has passed the meridian, and though at present in full splendor, is verging toward the horizon.

"It must not however be understood, by those who are not locally acquainted with this district, that Mr. Bakewell, though he has been long, and most deservedly, considered as the principal promoter of the art of breeding, and has for some length of time taken the lead, is the only man of distinguished merit in this department of rural affairs, in the district under survey. It abounds, and has, for many years, abounded with intelligent and spirited breeders. I could mention some fifteen or twenty men of repute, and most of them men of considerable property, who are in the same department, and several of them eminent for their breeds of stock.

"Nevertheless, it must be and is acknowledged, that Mr. Bakewell is at the head of the department; and whenever he may drop, it is much to be feared, and highly probable, that another leader, of equal spirit, and equal abilities, will not be found to succeed him.

"Having said this, however, it will be proper to apprise my readers still farther, that the following account must not be understood as a detail of the practice of Mr. Bakewell; but as a more enlarged register of the practice at present established in the midland counties. For, notwithstanding I have been repeatedly favoured with opportunities of making ample observation on Mr. Bakewell's practice, and have as repeatedly been favoured with his liberal communications on rural subjects, it is not my intention to deal out Mr. Bakewell's private opinions, or even to attempt a recital of his particular practice, any other than as it constitutes the valuable part of the district under survey.

"In registering this practice, it will be requisite, beside a separate account of the several breeds and their improvement, to describe the methods of breeding and rearing each species, and to detail the business of grazing, and the dairy management.

"To give full scope to the enquiry, it will be necessary to take a separate view of each species of live-stock, that are here the objects of attention, and previously to convey some general ideas respecting the principles of improvement

ment which have here been laid down, and the means by which they have been successfully and rapidly raised into practice. The subject is new, at least to this work, and will therefore require a degree of attention adequate to its importance.

The most general principle is beauty of form; a principle which has been applied in common to the four species. It is observable, however, that this principle was more closely attended to at the outset of improvement (under an idea, in some degree falsely grounded, that beauty of form and utility are inseparable) than at present, when men who have been long conversant in practice, make a distinction between a useful sort and a sort which is merely handsome.

"The next principle attended to is a proportion of parts, or what may be called utility of form, abstractedly considered from the beauty of form: thus, of the three edible species, the parts which are deemed offal, or which bear an inferior price at market, should be small, in proportion to the better parts. This principle, however, appears to have been differently attended to in different species; and will require to be examined, in taking the separate views of each species.

A third principle of improvement, which has engaged the attention of the midland breeders, is the texture of the muscular parts, or what is termed flesh; a quality of live-stock which, familiar as it may long have been to the butcher and the consumer, has not, perhaps, been attended to by breeders, whatever it may have been by graziers, until of late years in this district; where the flesh is now spoken of with the same familiarity as the hide or the fleece; and where it is clearly understood, that the grain of the meat depends wholly on the breed, not, as has been heretofore considered, on the size of the animal.

"It appears however, in the Practice of Yorkshire, of late years, that circumstances led the breeders of that country to pay some attention to the flesh of cattle; and, I have been informed, by a gentleman conversant in the Herefordshire breed of cattle, that similar circumstances took place, and probably about the same time, in that quarter of the island.

"But the principle which at present engrosses the greatest share of attention, and which, above all others, is entitled to the grazier's attention, is fat, or rather fattening quality: that is, a natural propensity to acquire a state of fatness at an early age, and, when at full keep, in a short space of time: another quality which is found to be hereditary, depending, in some considerable degree at least, on breed, or what is technically termed blood; namely, on the specific quality of the parents.

"Thus it appears, that the midland breeders rest every thing on breed; under a conviction, that the beauty and utility of form, the quality of flesh, and its propensity to fatness, are, in the offspring, the natural consequence of similar qualities in the parents: and, what is extremely interesting, it is evident from observation that these four qualities are compatible, being frequently found united, in a remarkable manner, in the same individuals.

Without admitting, or endeavouring to confute, in this place, that the four qualities here explained are the only ones necessary to the perfection of the several species of live-stock now under review, we pass on to the means whereby those principles have been applied, in attaining the degree of perfection at present observable in the district under survey.

"The means of improvement, in the established practice of the kingdom at large, are those of selecting females from the native stock of the country, and crossing with males of an alien breed; under an opinion, which has been universally received, that continuing to breed from the same line of parentage tends to weaken the breed.

"Rooted, however, as this opinion has been, and universally as that practice has prevailed, there is little doubt of the fact, that the superior breeds of stock of this district have been raised by a practice directly contrary; that of breeding, not from the same line only, but the same family: a practice which has now been so long established, as to have acquired a technical phrase to express it. Breeding *in-an-din* is as familiar in the conversation of midland breeders, as *crossing* is in that of other districts. The sire and the daughter, the son and the mother, the brother and the sister, are, in the ordinary practice of superior breeders, now permitted to improve their own kind; and through

the assistance of this practice, as will appear, the bold leader of these improvements produced his celebrated stock.

"The argument held out in its favour is, that there can be only one best breed; and if this be crossed, it must necessarily be with an inferior breed; the necessary consequence of which must be an adulteration, not an improvement.

"How far this novel practice may, in a general light, be considered as superiorly eligible, would be improper to be discussed in this place; in which I mean to convey only a general idea of the present practice of the district; in order to save repetition, and to enable the reader to follow me through the several parts of the enquiry with greater ease. To this intent, it must likewise be understood, that although much has probably been done by breeding in-and-in, much also has been done by crossing; not, however, by a mixture of alien breeds, but by uniting the superior branches of the same breed.

"The degree of excellency obtained, however, through these means, is not more remarkable than the rapidity with which the improvement of the several breeds has been carried on and extended, not over this district only, but to various parts of the island.

"But these circumstances likewise have arisen principally out of a mere point of practice, which, though not peculiar to this district, is no where, I believe, equally prevalent (except in Lincolnshire) and enters not, in any degree, into the practice of the island at large; in which breeders of every class rear or purchase their male stock.

"Here, on the contrary, breeders mostly hire them by the season, of a few leading men in the line of breeding males for the purpose, returning them at the end of the season to their respective owners, who, during the time of letting, have their shows or exhibitions, to which dairy-men, graziers, and stallion-men repair, to choose and hire males for the coming season.

"Beside these private exhibitions, there are, annually, public shows in different parts of the district, for the same purpose: thus Ashby has its stallion show, Leicester its show of rams, and Bosworth has its show of bulls; not however merely for letting, but likewise for sale.

"The practice of letting male stock, by the season, is a department of rural affairs not known to the kingdom at large, forming a new subject in the rural science.

"In practice, however, it generally happens that a breeder of male stock; provincially, for want of a better term, called a tupman, is likewise a dairyman, and frequently a grazier; Mr. Bakewell being the only man in this district who confines his practice solely to breeding and letting.

"It must not however be understood that dairymen and graziers universally, throughout the district, hire their males of these superior breeders. Many of them still go on in the old track of rearing, or of purchasing of each other, agreeably to the practice of other districts.

"The practice of letting out male stock by the season being a subject new to this undertaking, it will be proper in this place to examine it with due attention.

"Its origin does not clearly appear. It has probably arisen in the letting of stallions for the spring season. A domestic industrious man has a good horse; but is too attentive to the ordinary business of his farm, to follow him every week to three or four markets, and too diffident to set him off to advantage, and to enter into contests and unavoidable squabbles with stallion-men; while, to a man of more leisure and less modesty, a loose calling is most agreeable. Thus both parties are served: the latter, by receiving a certain sum and his horse again; the hirer by getting a greater number of mares than the owner could have got. This mode of disposal would of course give a loose to the breeding of stallions; for the breeder not only got rid of the disagreeable part of the business, but, if his own neighbourhood were overstocked, he could by this means send them to other districts. Similar circumstances might lead to the letting of bulls and rams.

"Be this as it may, the letting of rams has long been the practice of Lincolnshire; and the letting of horses has probably been practised, on a small scale, in many districts. But the letting of male stock, viewed in the general light we are now viewing it, was never applied, generally, to the three principal species, until of late years in this district. Mr. Bakewell, though he cannot be deemed the projector, has certainly been the principal promoter of this branch of rural business.

The effect of letting male stock has probably been greater than was foreseen. The great improvement which has been made in the stock of this district is striking, but may be accounted for in this practice. A superior male, the best for instance, instead of being kept confined within the pale of his proprietor, or of being beneficial to a few neighbours only, became through this practice a treasure to the whole district; this year in one part of it, the next in another. Hence, even one superior male may change considerably the breed of a country; but in a year or two his offspring are employed in forwarding the improvement. Such of his sons as prove of a superior quality are let out in a similar way; consequently the blood in a short time circulates through every part, and every man of spirit partakes of the advantage.

The breed of the midland counties, is the longhorned: a breed which appears to have occupied, a length of time, the central parts of the island.

In a general view, the old stock of the country, notwithstanding the singular efforts that have been made toward improvement, remains with little alteration. Each division of the district has still its own breed, distinguishable from that of the other divisions. There is a similar distinction between the breeds of Staffordshire and Derbyshire, for instance, as there is between those of Herefordshire and Gloucestershire. The breeds of other divisions of the district have characteristics sufficiently strong to show, that the longhorned breed of cattle have, during some length of time, been the prevailing stock of the country; and that, viewing the district at large, Leicestershire excepted, no radical change, nor any obvious improvement or alteration, has yet taken place. A striking instance, this, of the slow progress with which improvements in this department of rural economy are made, even when carried on with every advantage.

But notwithstanding the whole stock may still be said to be in possession of the country, every division of it wears, at present, strong marks of improvement. Warwickshire, Staffordshire, and Derbyshire, may contend for some share of this beneficial change; and in Leicestershire, the improved breed may be said to have gained, already, a degree of establishment.

The history of this extraordinary improvement would be interesting and useful; as it might furnish useful ideas to the improvers of other breeds. All I am able to give is a sketch.

Craven in Yorkshire has long been celebrated for a superior variety of the longhorned breed of cattle. From this source, it is well known, the Lancashire cows have been, and, I believe, still are drawn:—the flower of these celebrated cows originating in Craven-heifers.

Formerly, the Craven breed seems to have extended, in a similar way, into Westmoreland, also an adjoining county. From Westmoreland, bulls and heifers of this breed found their way into the midland counties. The present improved breed is traceable, by the indisputable evidence of many persons still living, to what was here called the “true old Westmoreland sort.”

It is generally understood, here, that through this breed, and some fortuitous circumstances, rather than from any fixed principles of improvement, Mr. Webster of Warwickshire (of Canley near Coventry) became, some forty or fifty years ago, possessed of a superior breed of cattle; and continued, during many years, the leading breeder of the midland counties. I have, indeed, heard it said, by a man who has himself been a breeder of some eminence, “that Mr. Webster had the best stock, especially of *beace*, that ever were, or (he believed) ever will be, bred in the kingdom.”

To this bold assertion, however, I am not ready to give full credit. I register it merely as an evidence of the high degree of excellency which Mr. Webster acquired. It is improbable that, after twenty or thirty years anxious attention, not of one man only, but of several, the breed, though excellent then, should not, since, have received some degree of improvement.

Be this as it may, Mr. Bakewell is well known to have got the lead, as a breeder of cattle, through the means of the Canley stock. His celebrated bull Twopenny, that may be said to have first given the lead to Mr. Bakewell, was out of a cow, purchased, when a heifer, of Mr. Webster, and was got by a bull from Westmoreland; a bull purchased in Westmoreland.

Mr. Fowler of Oxfordshire (of Rollright on the borders of Warwickshire), whose stock is at present in the first estimation, owes the superiority of his breed to the same source. His cows are of the Canley blood; and his bull Shakespear, the best stock-getter, I believe, the midland district ever knew, was got by a grandson of Twopenny, (out of a daughter of Twopenny) and a cow of the Canley blood.

Mr. Princep of Derbyshire (of Croxall in this district) acknowledges to have raised his present noble herd of cows, the first dairy of longhorned cows in the kingdom, I believe, for form and size taken jointly—from a cow by the name of Bright; purchased of the late Mr. Chadwick of Castle Bromwich: which cow was got by Mr. Webster's Bloxedge bull, that is spoken of here, as being the purest fountain of the Canley blood.

The present state of the improved breed of the Midland counties, which might well be distinguished by the Canley breed, is the following:

Mr. Bakewell is in possession of many valuable individuals, males and females. His bull D. generally known by the name of the “mad bull,” is a fine animal; and is a striking proof of the vulgar error, that breeding in and in, weakens the breed. He was got by a son of Twopenny, out of a daughter and sister of the same celebrated bull; she being the produce of his own dam. Nevertheless, D. is the sire of Shakespear, by another daughter of the same bull, and is probably the most robust individual of the longhorned breed; while D. himself, at the age of twelve or thirteen years, is more active, and higher mettled, than bulls in general are, at three or four years old.

This has long been esteemed Mr. Bakewell's best bull; and has been kept, principally, for his own use. He was never let, except part of a season to Mr. Fowler; but has had individual cows brought to him, at five guineas a cow.

Mr. Bakewell's cows are of the finest mould, and the highest quality: and his heifers beautiful as taste could well conceive them: clean and active as does. Mr. Bakewell's exhibition of cattle would gratify the most indifferent spectator, and could not fail of being highly satisfactory to every lover of the rural science.

Mr. Fowler's cattle are, at present, in the highest repute. His cows have long been considered as of the first quality:—of the best Canley blood. And his bull Shakespear, already mentioned, has raised them to a degree of perfection, which, in the opinion of the first judges, the breed of cattle under notice never before attained.

This bull is a striking specimen of what naturalists term accidental varieties. Though bred in the manner that has been mentioned, he scarcely inherits a single point of the longhorned breed; his horns excepted. When I saw him in 1784, then six years old, and somewhat below his usual condition, though by no means low in flesh, he was of this description.

His head, chap, and neck, remarkably fine and clean. His chest extraordinarily deep; his brisket down to his knees. His chine thin; and rising above the shoulder points; leaving a hollow on each side, behind them. His loin, of course, narrow at the chine; but remarkably wide at the hips; which protuberate in a singular manner. His quarters long, in reality; but, in appearance, short; occasioned by a singular formation of the rump. At first sight, it appears as if the tail, which stands forward, had been severed from the vertebrae, by the chop of a cleaver, one of the vertebrae extracted, and the tail forced up to make good the joint: an appearance, which, on examining, is occasioned by some remarkable wreaths of fat, formed round the setting on of the tail: a circumstance, which, in a picture, would be deemed a deformity; but, as a point, is in the highest estimation. The roundbones snug; but the thighs rather full, and remarkably let down. The legs short and their bone fine. The carcase, throughout (the chine excepted), large, roomy, deep, and well spread.

His horns apart, he had every point of a Holderness or a Teeswater bull. Could his horns have been changed, he would have passed, in Yorkshire, as an ordinary bull of either of these breeds. His two ends would have been thought tolerably good; but his middle very deficient. And I am of opinion, that had he been put to cows of these breeds, his stock would have been of a moderate quality. But being put to cows, deficient where he was full (the lower part of the thigh excepted), and full where he was deficient, he has raised the longhorned breed to a degree of

perfection which, without so extraordinary a prodigy, they never might have reached.

No wonder that a form so uncommon should strike the improvers of this breed of stock; or that a carcase they had been so long striving in vain to produce, should be rated at a high price. His owner, however, happened to be among the first of his admirers, and could never be induced to part from him, even for a season; except to Mr. Princep; who had him two seasons, at the extraordinary price of eighty guineas a season. A price at which no other bull has yet been let.

This extraordinary animal is now (1789) eleven years old, and firm in his constitution; but so lame, in his hind quarters, as to render him at present, and during the last season, entirely useless.

His owner, however, has less to regret, as he is in possession of many valuable females of his produce; and of one male, now three years old, by the name of Garrick.

This bull was out of a cow got by a bull of Mr. Bakewell, called the Hampshire bull.

Thus, though we find Mr. Fowler, at present, in possession of the lead, he has evidently obtained it through the assistance of Mr. Bakewell's stock. But whether he has gained the ascendancy by accident, merely, or whether he had the better basis to build upon, may be a moot point difficult to determine.

Mr. Fowler's cows (about five and twenty in number) are many of them an extraordinary mould; especially in the fineness of the foreend, and the width and fatness of the hind quarters. A daughter and sister of Shakespear, being got on his own dam, is among the first of his herd: another evidence of the good effect of breeding from the same family. Mr. Fowler conducts his business on the old principle of selling, not on the modern way of letting, his bulls. Such heifers, too, as his own dairy does not require, he sells, and at high prices. Mr. Coke of Norfolk has had all the cow calves he could spare, during the last three or four years, at, I understand, ten guineas each; taking them while young. Mr. Fowler has now (October 1789) ten bull calves (all, I believe, by Garrick), for which, it is said, he has refused five hundred guineas.

Mr. Princep's cows, of his own breed, have been mentioned as being of a very fine quality: nevertheless, his present herd wears evident marks of improvement. Every cow and heifer of the Shakespear blood is distinguishable at sight;—by the extreme fineness of the foreend,—the width of the hips,—and the formation of the rump; an impression which they have received with singular exactness.

Mr. Princep has two valuable bulls, by Shakespear: one of them out of the celebrated Bright.

Beside the three herds that are here particularised, there are many others, in the midland district, that are entitled to great attention; but which, for various reasons, I think may, with propriety, be omitted in this register. Therefore what remains to be added to the foregoing account of the present state of the breed, is a general description of its higher class of individuals.

The foreend long; but light, to a degree of elegance. The neck thin; the chap clean; the head fine, but long and tapering. A thick short head, with a snub nose, and a hollow face—provincially a Dutch head—is condemned, here, as a most hateful point.

The eye large, bright, and prominent.

The horns vary with the sex, &c. Those of bulls are comparatively short—from fifteen inches to two feet:—those of the few oxen that have been reared of this breed are extremely large:—two and a half to three and a half feet long:—those of the cows, nearly as long, but much finer; tapering to delicately fine points. Most of them hang downward, by the side of the cheeks, and, if well turned, as many of the cows are, shoot forward at the points. Too frequently, however, the double bend does not take place; the horns continuing to shoot downward, until they would reach the ground, or point inward until they would gag the mouth which supports them, were not the points from time to time removed: and, in some individuals, while one horn is pointing to the ground, or winding under the jaw so as to prevent its opening, the other is shooting away from the head, or taking some other awkward direction: thus tending to disfigure and destroy the animal which nature ordained them to ornament and defend.

The shoulders remarkably thin and fine, as to bone, but thickly covered with flesh; not the smallest protuberance of bone discernible.

The girt small, comparatively with the shorthorned and middlehorned breeds.

The chine remarkably full, when fat; but hollow, when low in condition. This is considered by accurate judges, as a criterion of good flesh; as the large, hard, ligatures, which in some individuals, when low in condition, we see tightly stretched along the chine, from the setting on of the neck to the fore part of the loins, is a mark of the flesh being of a bad quality.

The loin broad, and the hips remarkably wide, and protuberant. The protuberance of the bones of the hips, is a point at present in the first fashion; but is always, I observe, mentioned in the language of enthusiasm, not of reason. A wide loin, with the hips protuberating in fat, is indisputably a most desirable thing. But what use, or even ornament, two knobs of bone can produce, is not to me evident. In some individuals they have to me an artificial appearance; as if the loin were a lid, and the hips handles to remove it. I can admire a full hip, and conceive its utility; but I am clearly of opinion, that there are many points of a bullock better entitled to the breeder's attention, than a protuberant one; yet, it is more than probable, that, in the improvement both of this and the shorthorned breed, points of some consequence have been sacrificed to this idol.

The quarters long and level; the nache of a middle width; with the tail set on variously, even in individuals of the highest repute.

The roundbones small; but the thighs in general fleshy; tapering however, when in the best form, toward the gam-brels.

The legs small and clean, but comparatively long. The feet in general neat, and of the middle size.

The carcase as nearly a cylinder as the natural form of this animal will allow. The ribs standing out full from the spine; receiving the entrails within them. The belly of course appears small. The smallness of the belly is held out as a superior excellency. The viscera being lodged within the ribs is certainly such. But I cannot believe that a paucity of intestines is a valuable property of cattle: intestines are to them what roots are to trees. The ideas of offal, and largeness of bone, have, perhaps, in more points than one, led the improvers away from perfection. This, however, by the way.

The flesh, of the superior class I am describing, seldom fails of being of the first quality.

The hide of a middle thickness.

The colour is various: the brindle, the finchback, and the pye, are common: the lighter they are, the better they seem to be in esteem. This colour, however, appears to be merely a matter of fashion. Nevertheless, it strikes me that a light colour of cattle is advantageous to the grazier. It is a fact, in the nature of vision, that white objects appear to the eye larger, than black ones of the same size; and a light-coloured bullock, no doubt, appears larger in a market, than a darker-coloured one, of the same weight.

It may be remarked, in this place, that the six cows which formed the basis of Mr. Webster's breed, were red, and it is observable that some of Mr. Fowler's best cows are of that colour.

The fattening quality of this improved breed, in a state of maturity, is indisputably good.

As graziers' stock, they undoubtedly rank high.

As dairy stock, however, their merit is less evident: dairy-women here, and elsewhere, bear witness against them: nevertheless, the advocates for the breed assert their eligibility in this character: some, indeed, go so far as to say, that a cow which is profitable to the grazier is so to the dairyman: a position that might be contradicted by a thousand evidences.

Nevertheless, it appears to me probable, that a cow may be so constituted, as to convert her aliment into milk, while milk is continued to be drawn from her, and, when the draught is stopt, but not till then, to convert the same current of chyle into fat: a versatility of constitution, however, which I believe, does not belong to the breed under notice; whose propensity to fatness appears to be too great, to permit their lactescent powers to preserve the ascendancy long enough for the purposes of the dairyman.

As beasts of draft, the carcase of the longhorned breed, viewed generally, renders them unfit: nevertheless, the carcase of some of the best of the variety under notice, is sufficiently powerful for the purpose of draft; while their natural

natural activity, and cleanness of limbs, are very favourable to this purpose.

But the enormous size of the horns, of the oxen of this variety, would invalidate all their qualifications, were they greater than they really are. If they happen to take a convenient form, they may be dispensed with; but standing out awkwardly, as they frequently do, they become an insuperable objection.

A method of preventing their growth, or even of checking their exuberance, would be a most valuable discovery; to those, especially, who are in possession of the breed, and wish to make them useful as beasts of draft.

From this description of the improved breed of cattle of the Midland counties, it appears very evidently, that the principles of improvement, laid down afore-going, have, to this species of livestock, been judiciously applied. The utility of form has been strictly attended to: the bone and other offal small; and the forend light; while the chine, the loin, the rump, and the ribs are heavily loaded; and with flesh of the finest quality.

The males and females require to be treated of separately, in breeding.

Viewing the district at large, its economy with regard to bulls, is the same as that of other places. Dairymen in general, use their own bulls, generally of their own rearing; and smaller cowkeepers employ those of their neighbours. But dairymen who pay a closer attention to their stock, purchase their bulls, or hire them by the season, of bull-breeders; who rear, perhaps, five to ten bulls yearly; the superior breeders, for letting; the inferior, for sale.

The practice of letting this species of male stock, probably originated in this district; and in the practice of Mr. Bakewell; about twenty-five years ago.

In the spring, previously to the season of business, the breeders have their private shows; and beside these, as has been intimated afore-going, there are public shows; more, however, for the purpose of sale, than of letting.

The prices given for bulls, by purchase, run from five to a hundred pounds; by the season, from ten to fifty or sixty; by the cow, from half a crown to five guineas.

The let bulls are sent out in April or beginning of May; being generally led in halters; or driven singly; and are returned at the end of the season—generally in August, in the same manner.

With respect to the age at which bulls do business, as it is technically termed here—the practice of this district differs from that of most others; where from two to four years old, namely three seasons, is the ordinary period of employment. But, here, they are pretty commonly allowed to leap while yearlings; and, if good stock-getters, are kept on so long as they will do business; perhaps till they are ten or twelve years old. If they grow vicious, they are kept wholly in the house; if they throw gates or break pasture, they are humbled by a bull chain, fastened ingeniously to the nostrils.

It is observable, in this place, that the bulls of this improved breed are not unfrequently even while youthful, deficient in vigour:—the hired bulls being sometimes returned prematurely on this account.

This might be laid hold of as an argument against the practice of breeding in-and-in. It is, however, more probably owing to a different cause.

A handsome bull,—a bull nearly perfect in all his points, is most difficult to breed: yet the breeder's object is to render him, to the eye at least, as near perfection as may be. He is, therefore, made up for the show, by high keep; as well to evince his propensity to fatness, as to hide his defects; thereby showing him off to the best advantage: the consequence of which is, being taken from this high keep, and lowered, at once, to a common cow pasture, he flags.

Hence, it is become a practice of judicious breeders, when their bulls are let early enough, to lower them down, by degrees, to ordinary keep, previous to the season of employment.

There is only one instance, I believe, of cows being kept solely for the purpose of breeding: the dairy being here, as every where else, a joint attention.

Such as are not employed in the rearing of calves, ought certainly, in common good management, to be made to pay for their maintenance by milking or working: the last, a use to which Mr. Bakewell alone, perhaps, has put them.

One circumstance in the management of breeding cows, practised by leading breeders at least, is noticeable. In the

practice of less spirited and less judicious breeders, a cow or heifer, if she happen to miss the bull, is proscribed, let her form and blood be what they may; and, as soon as her milk is obtained, is condemned, even for the first offence.

This, when dairying alone is the object of cowkeeping, is undoubtedly judicious; but, when breeding is a principal or even a joint object, as it is in the practice of most dairymen, such a conduct may be highly blameable. For though it may be easier to breed handsome good cows, than bulls of that description; yet, when we consider how much of the success of breeding depends on the female, it is evidently a want of common policy, to cut off a valuable cow, for one miscarriage.

If she do not breed this season, let her maintain herself by working, until the next. Mares are kept, year after year, without breeding. And if mares are found nearly equal to geldings, in work; why should not cows be nearly equal to oxen, in the same intention?

The rearing of cattle is here confined to bulls and heifers, for breeding, and the dairy: there is not, in ordinary practice, a steer reared in the district; excepting some few of late years, for the purpose of draft.

The method of rearing, here, differs little from that of other districts; except in the rearing of bull calves, and sometimes high-bred heifers, by suffering them to remain at the teat, until they be six, nine, or perhaps twelve months old; letting them run, either with their dams; or, more frequently, especially where the dairy is an object, with less valuable cows or heifers, bought in for the purpose; and, when the intention is fulfilled, sold, or fatted: each cow being generally allowed one male calf, or two females.

The effect of this practice is a quick growth; and, perhaps, like rearing vegetables in a rich soil, the practice may assist in meliorating the constitution, and enlarging the frame. Be this as it may, the growth of calves, reared in this way, is strikingly rapid.

The best method of the dairymen is this:—The calves suck a week or a fortnight, according to their strength (a good rule): new milk in the pail, a few meals:—next, new milk and skim milk mixt, a few meals more: then, skim milk alone; or porridge, made with milk, water, ground oats, &c. and sometimes oilcake,—until cheese-making commence: after which, whey porridge, or sweet whey, in the field; being careful to house them, in the night, until warm weather be confirmed.

Turneps are not thought of as a food for calves: nor, in the ordinary practice of the district, is either corn, cake, or linseed in use; milk, whey, hay, and grass, being the sole food of rearing calves, until autumn, when turneps are usually given.

The time of rearing extends, in this district, through the winter months; but is confined, in a great degree, between the beginning of December and the latter end of March.

In the treatment of young stock, I find little in the practice of this district, that requires particular notice.

The bulls, in the common practice of dairymen, are suffered to ride while yearling; namely, at fifteen to eighteen months old; and the heifers to take them, while two years old; bringing them into the dairy at three years old: generally keeping them from the bull until late in the summer,—as the latter end of July, or the beginning of August;—it being a pretty general opinion, that heifers should come in at grass: beside, by this practice, one bull serves both the dairy cows and the heifers. I have known a dairy of twenty or thirty cows, and ten or twelve heifers, served by a calf;—a yearling bull.

In the practice of superior breeders, heifers are sometimes kept from the bull until they be three years old; bringing them in at four: especially in that of their enterprising leader; in whose superior practice, maiden heifers, as well as dry and barren cows, are occasionally enured to harness: a laudable example, that might be profitably followed by every other breeder of cattle.

In the choice of cows, dairy farmers are guided by criteria different from those which have been enumerated as the favourite points of graziers and modern breeders, for which, *see* DAIRY.

In Mr. Marshall's Rural Economy of Yorkshire, he speaks of cattle in that county, and says, "Within the memory of a person now living: namely about seventy years ago; the ancient breed of black cattle, which probably once prevailed

ailed throughout England, and whose name is still very improperly used in speaking of cattle in general, were the only breed of cattle in this district. By description, they appear to have resembled the present breed of the Lowlands of Scotland; mostly all black; but some with white faces: mostly horned; but some of them "humbled;" that is hornless.

To these succeeded a black and white breed; probably a variety of the original species. But still the red cow's milk was considered as medicinal; and many inveterate disorders were no doubt cured with it, that is to say by a perseverance in milk-diet.

The black mottles, probably a transient sort, were succeeded by the long-horned or "Craven breed;" the probable, and, I believe, undoubted origin of the present celebrated breed of the Midland counties.

But in a country where the business of aration was carried on principally by oxen, this breed was found extremely inconvenient. Horns a yard long were not only troublesome but dangerous in yoke; especially in the narrow roads and hollow ways with which the district formerly abounded. Accidents were frequently happening to them; by getting their horns entangled in the hedge or the back; sometimes breaking off their horns; but more frequently breaking their necks.

This was a sufficient inducement for adopting the short-horned or "Holdernefs breed;" probably of Dutch extraction. This change took place some forty or fifty years ago: and the short-horned breed still prevails; though it has undergone several alterations since its first introduction.

The first variety of this species of cattle which I can recollect, was a thick, large-boned, coarse clumsy animal: remarkably large behind, with thick gummy thighs. Always fleshy, but never fat; the flesh being of a bad quality. This, however, was not the worst: the monstrous size of the buttocks of the calf was frequently fatal to the cow. Numbers of cows were annually lost in calving. These monsters were stigmatized with the epithet Dutch-buttocked. This was probably the worst breed the Vale ever knew.

The unprofitableness of the Dutch breed being evident, men of discernment began to set out about improving it. In the course of the last twenty years the bone has been lowered, the hind-quarters reduced, and the flesh and fattening quality very much improved; not by foreign admixtures and unnatural crossings, but by choosing the cleanest and best-fleshed bulls and heifers from among their own or their neighbours stock.

It is very observable, however, that in effecting this improvement, the horn has been considerably lengthened; the present prevailing breed appearing as if it were a cross between the old short horizontal horn (provincially, buckle-horns) and the middle elevated horn of Herefordshire and Suffex: not, perhaps, from either of these breeds having been employed in the improvement, but merely from the circumstance of a fine horn, namely, a clean, small, sharp, horn - having been fashionable for the last twenty years.

This shews how much the appearance as well as the nature or constitution, of a given breed of stock may be altered and improved, without calling in the assistance of alien breeds. Even the Dutch bullocks were probably bred in England.

The Holdernefs breed, on their first introduction into the Vale, were said to be thin-quartered, too light behind, and too coarse before; large shoulders, coarse necks, and deep dewlaps. This form being found disadvantageous to the butcher, encreasing the quantity of the coarser parts, and reducing the weight of the prime pieces, the breeder endeavoured to enlarge the hind-quarters; and had he stopped when he had got to the happy medium, he would have wrought a good work. But the fashion was set; cloddy bullocks were in estimation; and their evil qualities were overlooked until they were rendered too obvious, and the consequences above mentioned had taken place.

The form and size of the present breed of the Vale may be seen in the following dimensions of a working ox rising five years old; above par as to form, but somewhat beneath it in point of size.

Height at the withers, four feet eleven inches.

— of the brisket from the ground, twenty inches.

Smallest girt, seven feet four inches.

Largest girt, eight feet five inches.

Greatest width at the shoulder, twenty-two and a half inches.

— at the huckle, twenty-three and a half inches.

Greatest width at the round-bone, twenty-one inches.

Length from forehead to nache, eight feet five inches.

— the centre of the shoulder knob to the centre of the huckle, four feet one inch.

— the centre of the huckle to the extremity of the nache, twenty-two inches.

Length of the horns, fourteen inches.

Width of the horns at the points twenty-two inches.

The eye full and quick.

The head and neck clean.

The bone somewhat large.

The chine and buttocks full.

The flesh soft and mellow to the hand.

The colour blood-red, marked with white.

But a variety new to the Vale is now creeping into it: the Tees-water breed; a variety of the short-horned species. This variety is established on the banks of the Tees, at the head of the Vale of York, and is held out as the true Yorkshire short-horned breed. Be this as it may, much attention has been bestowed on its establishment; and it appears to be at present a most valuable breed of cattle: valuable, I mean, to the grazier and butcher: the bone, head, and neck fine; the chine full; the loin broad; the carcase throughout large and well-fashioned; and the flesh and fattening quality equal, or perhaps superior to those of the present breed of the Vale; which, however, appear to be more active, more athletic, and fitter for the yoke or harness.

In forming that variety, a horn very different from that which is prevalent in the Vale has been produced. The buckle-horn is in this case, as in the other, somewhat lengthened; but the fashionable horn on the banks of the Tees is a clubbed down-hanging horn, as if in forming it, a dash of Craven blood had been thrown in: and it may be a moot point whether the horns of the two breeds, now particularly under notice, may have been produced by fashion alone; or whether the Tees-water horn may not have been altered from the original short horn, by a slight intermixture of the Craven breed; and whether the Holdernefs breed from which the Vale cattle have indisputably originated, may not have had a similar admixture of the middle-horned blood.

I wish to trace the origin and progress of the different breeds of cattle in the island; but I find it will be a difficult task to do it with strict accuracy.

The horn is the best criterion for distinguishing the different species, if the term be applicable, of cattle. It is a permanent specific character. The colour, though not altogether accidental, is changeable; and neither the form nor the flesh are permanently characteristic of any particular species. Good form and good flesh may be found in every species; though they are by no means equally prevalent nor equally excellent in all. But a horn six inches long was never yet produced by the Craven breed; nor one a yard long by the Holdernefs breed. And the middle-horned breed of Herefordshire, Suffex, and other parts of the island, appears to be as distinct a species as either of the former.

These are my only reasons for being so minutely descriptive of the horns of cattle. I am not a bigot to horns of any shape or length. I would as soon judge of a man's heart by the length of his fingers, as of the value of a bullock by the length of his horns.

If his flesh be good and well laid on, and his offal be proportionably small; if he thrive well, fat kindly at an early age, or work to a late one if required; I would much rather have him entirely without horns, than with any which enthusiasm can point out.

The doctrine of horns has long appeared to me as a species of superstition among farmers, and as a craft convenient to leading-breeders, in their respective systems.

But lest I should have cause to repent of my rashness in speaking thus irreverently of horns, I will here allow them all the merit which, in my opinion, truth entitles them to.

The horn has been mentioned as a permanent specific character of cattle. Hence in varieties it may have its use as a criterion. Thus supposing a male and female of superior form and flesh, and with horns resembling each other as nearly as the horns of male and females of the same variety naturally do, no matter whether short or long, sharp or clubbed, rising or falling; and supposing a variety to be established from this parentage, it is highly probable that the horns of the parents would continue for a while to be characteristic of the true breed, and might by inferior judges be depended upon, in some degree, as a criterion.

But it is indisputable that horns remain the same, while the flesh and fattening quality change; and every man of superior judgment will depend more upon the form and handle of the carcase, than upon the length and turn of the horn. For it is a notorious fact, that the individuals of a given variety may have exactly the same horns, without having exactly either the same fashion or the same flesh.

If there be any criterion or point of a beast which may be universally depended upon as a guide to the grazier, it is the EYE, not the horn. The eye is a mirror in which the health and habit of the animal at least may be seen with a degree of certainty."

The same author, in his *Economy of Gloucestershire*, says, the Herefordshire breed of cattle,—taking it all in all,—may, without risque, I believe, be deemed the first breed of cattle in this island.

This superior variety of the middle-horned breed has been noticed: and its oxen minutely described. In general appearance, the Herefordshire cattle resemble very much those of Sussex, except in their superior size: and still more nearly the present breed of the Vale of Pickering: notwithstanding these several districts are separated near two hundred miles every way from each other; with other breeds of cattle intervening. Their frame is altogether athletic, with the limbs, in most cases, sufficiently clean, for the purpose of travelling. The form of many of them, as beasts of draught, is nearly complete.

Besides their superiority as beasts of draught;—and their being eligible as dairy stock (being in this respect similar to those of Gloucestershire):—the females at least, fat kindly at an early age; the strongest proof of their excellency as fattening cattle. I have seen three year-old heifers of this breed to use a familiar phrase—"as fat as mud": much fatter than any heifers of that age, I have seen of any other breed;—the spayed heifers of Norfolk excepted.

Viewing the Herefordshire breed of cattle in this light, which I believe to be a true one; how unfortunate, for the rural affairs of these kingdoms, has been the choice of the spirited breeders of the Midland counties! The superior varieties of the Midland breed, beside being beautiful in their form, are indisputably well adapted to the grazier, when kept to a proper age: and other varieties are well enough adapted to the dairymen: but for the arable farmer as beasts of draught, they are far inferior to many other breeds: which, with a small share of the attention and expence that have been bestowed on the longhorned breed, might, I am fully persuaded, have been rendered equally or still more profitable, as milking cattle and grazing stock; and, at the same time, have been fit for the purpose of draught:—a use, for which, not the horns only, but their general frame unfits them. I have seen them no where, in common use as beasts of draught.

Nevertheless, we see the long-horned cattle, not only in full possession of the more central parts of the island, but overrunning the marginal districts in every direction. A circumstance, which to my mind appears to be of serious importance. The working of cattle is in the way of being, perhaps, irretrievably cut off; and whenever the spirit of breeding shall flag, and the art fall into neglect, the intire country will be burthened with a breed of cattle, naturally, the worst, perhaps, it ever knew. The long-horned cattle in a state of neglect, might, in figurative language, be called creatures without carcase: all horns and hide. With every assistance which genius and spirit can give them, they are barely, if at all, superior, even as grazing stock, to other breeds, which have remained in a state of comparative neglect.

These observations result not from an antipathy to this breed of cattle; nor from a want of respect for its present distinguished breeders. Nor did they, I trust, originate in a want of knowledge of the breed itself. There is no other breed of which I have had so much experience. If, however, after fifteen years acquaintance, I still remain a stranger to its merits, and have in consequence formed a wrong judgment, I wish and ask to be set right.

I am the more desirous to form an accurate judgment of the longhorned breed of cattle, as I hope to have, very soon, an opportunity of digesting my ideas respecting it, and of pursuing its excellencies as far as facts will enable me. There are undoubtedly, some varieties of it raised to an almost incredible height. And lest, infatuated with the fairness of their form I may, in their praise, be led beyond truth, I have, here, compared their general nature

with that of a breed, which I consider as the first the island affords, that, by having a standard to refer to, I may be the better enabled to regulate my judgment.

In Herefordshire, working oxen are the principal object of breeding. Great numbers of cattle are here in use, as beasts of draught. Half the plough teams appear to be of oxen; which are likewise, often used in carriages: The ox cart—provincially "wain"—is here a common implement. They are still, in general, worked double, in yoke: even in the deer-forested parts of the district; with however, some few exceptions.

One circumstance in the management of cattle, in this county, is to me a matter of some surprise. The spaying of female calves is not here a practice. This circumstance is the more remarkable, as the excellency of spayed heifers, not only as beasts of draught, but as fattening cattle, is indisputable: and still more extraordinary, as, Herefordshire not being a dairy country, numbers of female calves must every year be fatted for the butcher. How much more eligible management it might be to castrate, indiscriminately, the handsomest and cleanest, of such males or females, not wanted for the purpose of breeding, as drop in the rearing season.

The oxen are bred chiefly in the north-western quarter of the county; but more or less, in every other: except the Ryeland quarters. They are moderately worked until they be five or six years old; at which age they are sold mostly in good condition, but some times out of the yoke, to the graziers; principally, I believe, of Buckinghamshire, Wiltshire, Warwickshire, Gloucestershire, and the neighbouring counties.

Mr. Marshall says, that "At Hereford fair the 20 October (1786) there were about a thousand head of cattle: chiefly of this breed, with a few Welch cattle. A large proportion of them were grown oxen, full of flesh, and sold, or worth at the selling prices of the day, from twelve to seventeen pounds an ox. The most valuable collection of cattle I have met with out of Smithfield: and by much the finest show I have any where seen. Had they been arranged in a proper fairstead, instead of being huddled together, as they were in the streets of the town, they would have formed a still finer exhibition. The impropriety of continuing to shew cattle for sale in the streets of towns is evident at Hereford; whose streets having been newly paved in the London manner, the town's people to save their windows, and to preserve a passage to their houses, very prudently run a rope on the outside of the foot pavement; by which means the cattle are either crowded together in the middle of the street creating a state of confusion, I have no where else observed; or, if headed against the rope, stand with their fore feet in the kennel! An awkwardness which needs not to be described.

Mr. Marshall, relative to Gloucestershire, says, "Cattle are the natural inhabitants of a vale country; and in this Vale we find every description of them abound: cows, rearing stock, fattening cattle; and each of these of various species, or breeds.

Formerly, and perhaps not long ago, one breed of cattle might be said to possess the Vale; a breed which still predominates in some parts of it. It is known by the name of the Gloucester breed; and has, I understand, been common to the district time immemorial. Welch cattle, no doubt, may have long been brought into the district, as fattening cattle; and of late years some considerable numbers of Herefordshire oxen have been fatted in it. But still the cows and rearing cattle were of the Gloucestershire breed.

Of still later date, however, an alien breed of cows have been introduced: the long-horned breed of Staffordshire and the other Midland counties, by the name or the "north-country sort;" a breed, that, in a few years, has made rapid advances, and is likely to dispossess, in no great length of time, the naturalized species. In 1783, dairies were mostly of the Gloucestershire breed: in some a mixture of the longhorned sort was observable; and, in the lower Vale, a few dairies were mostly of that breed. Now few dairies are left without admixture; and, even in the upper Vale, are some entire dairies of the long-horned breed. In general, however, they are an unsightly mixture of the two species; with, not unfrequently, a third sort, a mongrel kind, reared from an awkward cross between them. In the fairs and markets of the Vale, scarcely any other than the north-country sort and this mule breed are to be seen.

Of the long-horned cattle of the Midland counties I mean to speak fully at a future time. Welch cattle are extremely various: every province of the principality seems to send out a separate breed. They are invariably of the middle-horned species; but in regard to size they vary, in regular gradation, from the largest ox to the lowest Welch runt. The Gloucestershire, therefore, is the only breed which requires to be described in this place.

The Gloucestershire breed of cattle is a variety of the middle-horned species. In size, it forms a mean between the Norfolk and the Herefordshire breeds. The head mostly small, neck long, shoulder fine, and all of them generally clean. The carcass mostly long, with the ribs full, and the barrel large in proportion to the chest and hind-quarters. The huckle of due width; but the nache frequently narrow. The bone, in general fine; the hide thin and the hair short. The characteristic colour dark red, provincially brown, with the face and neck inclining to black, and with an irregular line of white along the back. The horns fine and rather long; but, in some individuals, placed awkwardly high on the forehead, and near at the roots: in others, however, they stand low and wide, winding with a double bend, in the middle-horned manner.

The principal objections of the Gloucestershire breed of cattle are, a deficiency in the chine, and too great length of leg, giving the individuals of this description an awkward uncouth appearance.

But no wonder: the breed has not had a fair chance of excelling. I have heard of only one man, within memory, who ever paid any especial attention to it; and this one man, by some election strife (a curse in every county) was driven out of the Vale about seven years ago; so that at present it may be said to lie in a state of neglect. Nevertheless, it still contains individuals which are unobjectionable, particularly the remains of the Boddington breed; and, with a little attention, might, in my opinion, be rendered a very valuable breed of cattle.

For dairy cows, I have not, in my own judgment, seen a better form. It is argued, however, that the north-country cows, being hardier, stand the winter better in the straw-yard, and fat more kindly when they are dried off. It should be recollected, however, that Gloucestershire is a dairy country; and remember that it was the Gloucestershire breed that raised the Gloucestershire dairy to its greatest height. Beside, the breed has long been naturalized to the soil and situation, and certainly ought not to be supplanted, without some evident advantage; some clear gain in the outset; nor even then without mature deliberation, lest some unseen disadvantage should bring cause of repentance in future.

The three classes, enumerated at the head of this article, now require to be separately considered.

This being a dairy country, the procuring of cows, and the size of dairies, as well as the treatment, the application, and the disposal of cows, will require to be shewn separately under the article DAIRY.

Dairymen in general rear their own cows: some, however, purchase the whole, and others part, of their dairies.

The point of a milch cow which is here principally attended to, and which, no doubt, is the main object of attention, is a large thin-skinned bag: I have, however, heard a large tail spoken of, in the true tone of superflation.

The following are the dimensions of a cow of the Boddington breed. A genuine, and a fair specimen, as to form, but not as to size: the cows of that celebrated breed were, in general, considerably larger. As a milker she has had few equals; and, in my eyes, she is, or rather was, one of the handsomest and most desirable dairy cows I have yet seen. These dimensions were taken when she was five years old, off; she being then several months gone with her fourth calf.

Height at the withers four feet three inches.

—— of the fore dug twenty-one inches.

Smallest girt six feet and half an inch.

Greatest girt seven feet eleven inches.

Length from shoulder-knob to huckle four feet one inch.

—— from the huckle to the out of the nache twenty inches.

Width at the huckle twenty-two inches.

—— at the nache fourteen inches.

Length of the horn twelve inches.

The eye full and bright.

The ears remarkably large.

The head fine and chap clean.

The bosom deep, and the brisket broad, and projecting forward.

The shoulders thin with the points snug.

The thigh likewise thin, notwithstanding the great width at the nache.

The bag large and hanging backward, being leathery and loose to the bearing.

The teats of the middle size; gives much milk, and holds it long.

The tail large, the hide thin, and the bone remarkably fine.

The colour a dark brown, marked with white along the back and about the udder; with the legs, chap, and head, of a full, glossy, dark, chocolate colour.

The horns of a polished white, tipped with black.

The reasons given, by the dairymen of this district, for rearing their own cows are, "that they should soon be beggared if they had their cows to buy;" and "that they know what they breed, but do not know what they buy."

The latter has much the most reason in it; for, as they observe, if a heifer is not likely to turn out well, they sell her: on the contrary, if they went to market for their cows they must buy the outcasts of other breeders. Besides, they endeavour to breed from known good milkers; such as milk well, not only presently after calving, but will hold their milk, through the summer, and the latter months: whereas, in the market they are subject to chance, and the deceptions of drovers: the most they have to judge from is the size of the bag at the time of the purchase. In suitable situations, there can be little doubt of the propriety of every dairyman's rearing his own cows.

The place of purchase, in this district, is chiefly the market of Gloucester, held every Saturday; to which, in the spring, from fifty to a hundred cows, of different breeds, with calves by their sides, are brought, by dairymen and drovers; but principally long-horned cows, brought from a distance by the latter. In the Lady-day fair at Gloucester, there were not less than four hundred cows.

Mr. Marshall, in speaking of Cotswold Hills, says, "A good many cattle are kept in this district. Some cows are kept in the vallies; and on the skirts of the hills there are considerable dairies."

The species of cattle are the Gloucestershire, the long-horned, and a mongrel breed between those two.

In the higher townships, more particularly, perhaps, in the township of Northleach, cows are kept on "cow-downs" (old upland grass) in the day, and foddered in yards at nights, with weeds, rough grass, or other herbage, mown in the byeways and hedges. The craftsmen and farm labourers have each of them a cow: by this means they not only obtain a relief for their families, but acquire at the same time habits of industry. I mention this circumstance, as in all probability this was formerly the practice in most open upland townships throughout the kingdom.

The fattening of cattle is not the common practice of these hills: nevertheless they may boast of at least one good grazier. His practice is to buy in large Welch bullocks at Gloucester in autumn and winter. He gives them the run of the straw yard the first winter; and summers them on raygrass and clover leys, as companions to his fattening sheep, to eat off the bents of raygrass, and thereby not only give the sheep a freer better bite than they otherwise would have, but at the same time turns to a valuable purpose that which would otherwise (if not swept off with the scythe) remain an incumbrance to the surface. The ensuing winter, they are finished in stalls, with hay and secondary barley: a new, but an excellent practice.

His method of stall fattening merits particular notice. His fattening cattle are all tied up, some in single, some in double stalls. His reason for this practice is not altogether that of saving room; he is clearly of opinion that they do better, fat faster, than bullocks which are kept in loose stalls. His reasoning is fair: besides the indisputable advantage of their not being liable, in this case, to foul their meat and water; he holds out another which is not so obvious, but may nevertheless perhaps be equally true: cattle which are tied up are more cadish (tamer, less wild) than those which are kept in loose stalls. A loose bullock (some loose bullocks at least) when a stranger enters the shed, or any disturbance happens in it, will rise and fly into the yard for refuge; while a bullock which knows that he has not the power of flight will lie still and chew his cud. In the yards,

yards, loose bullocks are equally liable to disturbance; and quietness is no doubt essential to quick fattening.

Each bullock has two troughs; a small one for corn, a large one for hay, with a water trough, which runs the whole length of the shed, and is covered by a board; each bullock having a hole (large enough to admit the nose) to drink at. The water-trough (a hollow tree) forms, as it were, a top rail to the partition wall of the gangway. The others are beneath it, nearly level with the bed of the stall.

The corn is ground, and given to them, mixed among cut hay, two or three times a day; beginning with about half a peck, and encreasing to about a peck a day.

The method of feeding with hay, which in this instance is practised, does the practitioner infinite credit. He feeds his bullocks with hay as cart horses are usually fed with corn; giving it to them by handfuls at once: never more at a time than the two hands can grasp; continuing to feed them in this manner until they lie down, or until they refuse to eat. Thus they never have any hay to blow upon, (the great objection against tying up bullocks) even at night, they have not a mouthful left before them. The leading principle of this practice is, that fattening cattle should never be cloyed with food; should always eat with an appetite. In the morning they are fed with the worst of hay, (if any difference) for being then hungry, they eat it with an appetite. Thus the hay is eaten up clean, and the bullocks are preserved in a thriving habit, while the extraordinary expence, where a number of cattle are fatted at once, is inconsiderable. In this case it is proper to appropriate a man's time to their attendance, and he might as well be employed in feeding them by handfuls until they lie down, as in cloying them with armfuls, and idling the rest of their time away.

In Mr. Marshall's Rural Economy of Yorkshire, this experienced gentleman observes, that "Young cattle are, I believe, invariably, housed the first winter; generally loose, and are generally indulged with the best hay the farm will afford. Their summer pasture is such as convenience will allow them: mostly of a secondary nature. In the open-field state, the common was generally their summer pasture.

The second winter, oat straw is the common fodder of young cattle; generally tied by the neck in hovels, or under sheds. Their summer pasture, commons, woody wastes, rough grounds, or whatever best suits their owner's convenience.

At two years old the steers, provincially stots, are generally broke-in to the yoke; but are not, by good husbandmen, worked much at that age.

At two years old, also, the heifers, provincially whies, are generally put to the bull. This, however, is not an invariable practice. In the state of commonage they were frequently kept from the bull until they were three years old: now, in the state of inclosure and improvement, and at the present high rents, they are frequently suffered to take the bull when yearlings, bringing calves at two years old.

This is an interesting subject in the management of cattle. Farmers in every district differ in their opinions respecting it.

The arguments for bringing heifers in at two years old are, that they come sooner to profit; and that farmers cannot afford, at the present rate of rent, to let them run, unprofitably, until they be three years old.

On the other hand, the argument in favour of bringing them in at three years old is that, not being stunted in their growth, they make larger, finer cows than those which are suffered to bear calves at a more early age.

But I have not yet met with any man who even attempts to prove which of the two is, upon the whole, the more profitable practice.

The gardener seems to be well aware, that suffering a tree to bear fruit too early checks its growth; and there may be some analogy, in this respect between vegetables and animals. But even admitting this, if the cow receive no injury as to thriving, calving, milking, nor any other than that of being checked in point of size, the objection appears to me to fall. If, however, early production check not only the cow, but her progeny likewise, an objection no doubt will lie against it.

I have long been of opinion that it is, in general, the farmer's interest to let his heifers take the bull whenever nature prompts them. There is undoubtedly some pre-

sent profit arising from their coming in at an early age, and whether a middle-sized cow may not afterwards afford as much neat profit as one of larger stature, is certainly an undetermined point.

Much however depends upon keep. A starveling heifer will not take the bull at a year old. Nor ought any yearling heifer which has taken the bull, ever afterwards, to be stunted in keep. If she be ill kept while with calf, there will be danger at, or after, the time of her calving. If afterwards pinched, there will be danger of her not taking the bull the next year.

Hence we may infer, with a degree of safety, that the propriety, or impropriety, of bringing heifers into milk at two years old depends principally upon soil and situation.

On a good soil, and in a genial climate, in which heifers do not experience a check from the time they are dropped, they ought, I am clearly of opinion, to be permitted to take the bull whenever nature prompts them.

But in less genial situations, where lean ill-herbaged lands are to be pastured with young cattle, it appears to me equally evident, that heifers ought not, in strictness of management, to be suffered to come into milk before they be three years old.

The present dearth, arising beyond dispute from a real scarcity of cattle, appears to be a matter of serious import to the community. Had it not been for the immense influx of Irish cattle, which have, during the last three or four years, poured into this island, the grazing grounds could not have been fully stocked, nor the markets well supplied. There is not, generally speaking, any aged cattle left in this kingdom.

There can be only two reasons of this scarcity: either the consumption of beef must have lately increased, or the rearing of cattle must have diminished; or the effect must have been produced by the joint operation of the two causes.

I wish to bring the matter to a rational issue, and have endeavoured to collect evidences in the districts I have visited. This district affords two, which appear to be admissible.

Twenty or thirty years ago there was not, for the smaller markets of this district, a single beast killed (except upon some extraordinary occasion) during the winter, spring, or summer months. In autumn, particularly in the month of November, considerable numbers were butchered, to be salted and hung for winter provision; hung-beef being formerly a standing dish, not only in this, but in other districts. But the number which were then killed in autumn was small, compared with the much greater numbers that are at present butchered in the district; every market of which is now plentifully supplied with beef the year round; and this, notwithstanding considerable quantities are still hung in autumn. The market of Malton might well vie with the London markets. If only twice the quantity of beef be consumed in the district now, of what was consumed fifty years ago, the evidence is good.

Twenty or thirty years ago, great quantities of young cattle, bred in the common pastures, and in the rough grounds of the marshes, and other central parts of the Vale, were annually sent out of it. The number of lean oxen, too, which were sent out of the country was very considerable. Now, the Vale, perhaps, barely rears its own stock. A few young cattle may go out of it every year; but a number of Scotch and some Irish beasts, and generally more or fewer young cattle from the Tees-water quarter, are annually brought into it. A few lean oxen, (few in comparison with what formerly went out) and some barren cows; and a surplus of fat cattle driven to the ports of Whitby and Scarborough; may be said to be the only cattle which the Vale at present sends to market.

The causes of this decline are the increase of horses; the increase of tillage in the lower parts of the Vale; and the increase of the dairy upon its margins; an increase of grazing grounds in the richer parts; and, throughout, an increase in the consumption of beef.

This too may be fairly admitted as a circumstantial evidence, at least, of a growing scarcity of cattle at present in these kingdoms. I mean a scarcity comparative with the present consumption.

I shall, in their proper places, have other evidences, to produce. At present, therefore, I do not attempt any general conclusions.

Although grazing has of late years gained some footing in

in the Vale, it does not yet fall under the denomination of a grazing country. A detail of management must not therefore be expected: and the only incident of practice which has occurred to my notice, and which appears to be entitled to a place in this register, is the following: at once evidencing the propriety of finishing fattening cattle; and giving a favourable specimen of the Yorkshire breeds of cattle.

The subject of this incident is a cow which was bred and fattened in this neighbourhood. Her dam was of the improved breed of the Vale, with an admixture of the Craven or long-horned breed. Her sire a Tees-water bull of the first blood; being leaped at half-a guinea a cow; which, twelve years ago, was a very high price.

From the time of her being dropped she was remarked as a good thriver; she came in at three years old; had one cow-calf which was reared: and three bulls, all of which died before they were three weeks old! they being seized about that age with a numbness in their limbs; soon dying with jellied joints, and symptoms of a general mortification. Like most high-bred cows, she milked well for a few weeks after calving; but afterwards fell off her milk, and generally got to be good beef about Michaelmas.

After her last calf (in 1782) she was milked until August; when she was tolerable beef; worth, at the then low price of beef, about ten pounds. In autumn she had after-grass; in winter turneps, hay, and oat-sheaves (in the house), but no ground corn. In March 1783 she was sold for twenty pounds to return one guinea: consequently she paid more than six shillings a week for fattening.

Her dimensions, a few days before she was slaughtered, were these:

Height about four feet six inches (not accurately taken).

Smallest girt seven feet six inches.

Largest girt nine feet.

Length from shoulder-point to huckle four feet.

Length from huckle to the extremity of the nache, two feet two inches.

Width at the huckles from out to out, two feet two inches.

Her horns fine; of a whitish grey colour; sharp, somewhat resembling the Craven horn, but shorter; and turned upward at the points in the middle-horn manner: her head and neck small and clean; her legs short, and her bone throughout fine.

Her points as to fatness were not all of them full. Her kernel was small, and her shoulder bare; her fore-dug and flank not extraordinary; her chine and loin were well laid up; one dimple, but not regularly cloven; she was not what is called very fat upon: but her rib, her huckle, and her nache, were very good; and her twist remarkable; bulging out in an extraordinary manner.

She proved as follows: the quarters equal; exactly eighteen stones each; together seventy-two stones (fourteen pounds each); the tallow eight stones; the hide seven stones.

The weight is not remarkably great; but, that a small cow should lay it on in seven months is extraordinary.

Taking the dimensions of cattle, and describing their points with minuteness, is not merely a matter of curiosity. Nothing matures the judgment more speedily, nor gives a more adequate idea of the due proportions of the parts of a bullock. I never, however, understood that the admeasurement of cattle was reduced, any-where, to common practice, until lately. In the West of Yorkshire, I am told, the manufacturers, who kill their own beef, carry measuring tapes to market with them. The butcher by constant practice may be a match for the grazier with his eye alone: but it is certainly prudent in the clothier to take his measure with him also.

CAUTERY, a name given to a red hot iron, used by farriers to destroy fungous flesh, &c.

CAUTING-IRON, an iron with which farriers scar those parts of a horse that require burning.

CELLS, the small divisions in honey-combs, which geometers have observed, to be always regular hexagons.

CELLS, also denote the hollow places between the partitions in the pods, husks, and other seed-vessels of plants.

CENTAURY, the name of a weed abounding in arable lands, and generally called blue-bottle. See **BLUE-BOTTLE**.

CERES, a pagan deity, the inventor, or goddess of corn.

CERT-MONEY, a fine paid yearly by the residents of several manors to the lord thereof, and sometimes to the hundred, for the certain keeping of the leet.

CHAFF, the husks of corn that are separated by threshing and winnowing. See the articles **THRESHING** and **WINNOWING**.

CHAFF also signifies the rind of corn: thus, barley that has a thick rind is said to be thick chaffed.

CHAFF likewise implies straw, &c. cut small, and given to horses and other cattle, mixed with corn. See the article **CUTTING-BOX**.

CHALK, the English name of the white dry marl, with a dusky surface, found in hard masses.

Chalk is a lasting manure for such lands as it agrees with, which are particularly those of a cold sour nature, and stiff untractable clays. Pliny tells us, it was the custom of the ancient Britons to chalk their lands, by which they received a great and lasting improvement.

Farmers are apt not to distinguish sufficiently between the different kinds of chalk. The hard, dry, and firm, is much the fittest for burning into lime: but the fat unctuous chalk is by far the best to be used crude. This oily, viscous sort of chalk, is used in many places instead of marl, to which it is nearly allied, though of an inferior quality. It is even called marl in the isle of Wight, where their chalk is of a remarkably fat soapy nature; and they sometimes lay twenty-five waggon-loads of it upon one acre of ground. *Lisle's Husbandry*, vol. I. p. 66.

A correspondent of the editors of the *Museum Rusticum* strongly recommends chalk as a manure for clay-lands; but adds, it should be laid on rough, in large clods whereby the land will gradually receive the greater benefit by it. The salts in the air will penetrate, and crumble the clods; and the land on which the chalk is laid, will soon be brought into a state of fermentation, reduced and pulverised in a special manner, inasmuch, that afterwards, one ploughing will go as far towards bringing it into tilth as two before.

The quantity of chalk should be proportioned to the stubbornness of the soil; from fifteen to thirty tumbril loads on an acre.

The virtues of this manure are not exhausted unde, at least twenty years; nor are they much perceived till the third year; but for twelve or fourteen years the farmer will have reason to thank those who advised him to the step of chalking his clay lands: and happy is he who can afford to do it, provided he has a long lease; for lands not worth five shillings an acre have, by this means been, in a year or two, worth twenty. *Museum Rusticum*, vol. II. p. 305.

An old experienced farmer in the hundreds of Essex has, in the same work, given an excellent account of the benefits resulting from chalk laid on clay-lands, where, he justly observes, it insinuates itself into the small pores, and, raising a fermentation, exposes the clay more to the operations of the frosts, rain, sun, and air, by which means its too coherent particles are loosened, and it is reduced to a state of pulverization.

"We all know, adds this intelligent husbandman, that clay, when reduced, either by fermentation or attrition, into small and minute particles, is an excellent soil for affording plenty of nourishment to almost every kind of vegetable: it is therefore neutral to us, when possessed of a stiff clay, to go in search of means for producing these desirable effects.

"Chalk has been long allowed the palm in this respect: our ancestors, the ancient Britons, used it with great success; and the practice, as warranted by constant experience, has been handed down to the present age: is it not then a pity but a custom so profitable should not be made known to every part of his majesty's dominions?

"The chalk we use in Essex is mostly brought from Kent: it agrees well with our clays, and many fine fortunes have been made in this country by chalking farms: yet what may appear very strange, but is not less true, this same chalk, when laid on the clayey lands in Kent near the pits, does by no means answer the farmer's expectation.

"It has been a common saying among farmers, that chalk lasts only for a certain number of years, after which it leaves the land in a worse state than that in which it found it: but this is probably a mistake, owing to prejudice, negligence, or ignorance.

"When land has been chalked under a notion it cannot be hurt by cropping, they generally keep it in almost constant

constant tillage, and it pays well for the ploughings; but then the soil being, by such constant working, reduced to the pulverized state, the chalk escapes through the now-enlarged pores of the clay, and forms a crust under the loose stratum on the surface of the hard clay beneath, being washed down by the rains.

"The particles of clay being now deprived of their coatings of chalk, adhere one to the other, enlarge their surface, and become at length a coherent mass of stiff soil, like what it was before the land was chalked at all, not worse in quality, but nearly in the same state. Probably the chief reason which induces farmers to think the land impoverished by chalk, is, because they have, whilst the manure acted with its full vigour, being for many years used to great crops, forgetting, or perhaps never knowing, what crops the land yielded before any chalk was laid on it.

"A great deal of care is requisite in land after it is fresh chalked: if the large lumps are buried before they are strongly impregnated with the influences of the atmosphere, they will lie under ground undissolved, in a hard mass, for a great number of years, without benefitting the land in the least. For this reason, the farmer must not be in a hurry to bury his chalk: in fact, the longer it lies above ground the better, as it will then gradually be reduced into an impalpable powder, which, being mixed and incorporated with the clay, lessens the cohesion of its parts, enlarges its pores, and disposes it to yield that nourishment to vegetables, which, in its natural state, it is too retentive of.

"Clay is, by nature, possessed of a large stock of the food, whatever it be, which plants most delight in; but it is a stubborn soil, and will not, till compelled to it by some extraneous cause, give forth any of its riches. If it is pulverized by the instruments of husbandry which act by attrition, it becomes a proper bed for the reception of the roots of vegetables; but this pulverization is not to be effected without great expence of time and trouble: and it was the difficulty of this operation that induced our ancestors to search for some easier and shorter method for reducing the solid particles of clay; they effected it by means of fermentation, and this fermentation was raised, for the most part, by rotten horse-dung.

"When this manure became scarce, and difficult to be procured, it was necessary to have recourse to some other remedy to correct stiff soils. Chalk was found well adapted to the purpose: the use of it was after many years almost universally adopted, and experience has now, for many ages, justified the practice.

"It has been already observed, that chalk improves clay, not by adding to it any vegetative quality, but by mixing intimately with its substance, and lessening the cohesion of its parts.

"Let us, by way of illustration, suppose any given quantity of clay mixed and incorporated with a proper proportion of chalk, it will be found that the clay will possess a degree of lightness, which nature has denied it. Let this mixed earth be spread on a floor exposed to the weather in winter time; let it be frequently sprinkled with water, and be stirred about several times a day for some months: on an examination, it will then be found, that the chalk has subsided, and the clay become more compact than it was, but not so compact as it was before any chalk was mixed with it.

"The subsided chalk will form a complete stratum under the bed of clay.

"I have been the more particular in this account, because on the principle of subsidence I have founded a practice, which I have experienced to be profitable to myself, and therefore I think it not totally improper to be recommended to the notice of others.

"I had heard it long complained of, that the benefit resulting from chalk ceased after a course of years. I always thought, and indeed found, that the chalk subsided: this made me form an opinion that the chalk, even after it had subsided, might, in part at least, be retrieved; for the earth, which had been loosened to a certain depth, was, at the bottom of the loose mould, a hard compact body, which the chalk could not penetrate: here therefore it must, of course, rest in its subsidence, forming a thin coat on this hard body.

"About forty years ago I chalked the greater part of my farm in the manner prescribed by the custom of this country. For about fourteen years I enjoyed very good

crops; but at the end of that time they began to fail a little. As necessity is the mother of invention, I came to a resolution of trying an experiment on a field of twenty acres: accordingly, when the time came in which it was to receive a whole year's fallow for a crop of wheat, I caused the whole of it, soon after harvest, to be ploughed twice in a place, one plough following another in the same furrow.

"By these means I turned up an entire new earth, on which I immediately laid in the proportion of about three loads of chalk an acre, suffering it to lie rough all the winter.

"In the spring I gave it a second ploughing, and bestowed on it three more ploughings before Christmas, when I again left it rough for the winter.

"I must not, however, fail observing, that in all the ploughings after the first, the share went only the ordinary depth.

"In the second spring I raised as fine a mould as I could; by various operations, and sowed the field with barley, of which I had, at harvest, a crop to my entire satisfaction: my next crop was wheat, on which I sprinkled some clover-seed, which brought the land into the usual course of husbandry.

"The reason why my land begins to fail, in about fourteen years after chalking, is because I allow more ploughings to each crop than any of my neighbours, and these frequent stirrings cause the chalk, as I imagine, to subside sooner.

"My method answered so well, that I managed all my chalked land in the same manner with good success; and had, in consequence, a succession of good crops for ten years more.

"When the ten years were expired, I gave my land another trench-ploughing, which never failing to recover the chalk, I renew it at regular intervals, but lay no fresh chalk on it after the first trench-ploughing, being in all the rest content with what is already in the land.

"This method has stood the test of many years experience, and I have not the least reason to ascribe it to any thing peculiar in the quality of my soil: why, therefore, should it not succeed as well with others as it has done with me?

"Let me persuade such of your readers, as it may any ways suit, to make the experiment; it cannot be any great expence, and the result may turn out very greatly to their advantage.

"This doctrine of the subsidence of chalk is certainly founded on reason; the predominant natural soil will always precipitate that which is only adventitious, and in smaller quantity; for the same observation holds good when clay is laid on chalk.

"This subsidence may also be observed when clay is laid on sand, or sand on clay, as a manure; and might, perhaps, be extended to many other articles, so as to be deemed a general principle.

"Few know the benefits resulting on some occasions from deep ploughing: but in this, as well as in every other matter, discretion is to be the grand guide; and I would, by all means, advise the farmer to examine into the depth of his soil, by remarking what is thrown out of his ditches, or by the help of a borer. Let him judge by this, and he cannot well go astray.

"I must also give another caution to my honest brethren the farmers, which is, not to be in too great a hurry to crop a field after it has had a trench-ploughing; for the soil turned up from any considerable depth will be somewhat crude in its nature, till it is meliorated by the influences of the sun and air.

"I have generally found that one whole year's fallow is sufficient to effect this; but two winters and a summer I never knew to fail: it is chiefly frost which contributes to pulverize the chalk, and sweeten the soil; not but that it receives great benefit from the rain and sunshine, and particularly from snow, which is strongly impregnated with nitrous particles: all I mean to insinuate is, that one day's frost contributes more to sweeten a stiff, rough soil, than two days sunshine, rain, or snow.

"Let me in this place hazard a conjecture, which may, however, prove a fact: the reason why frost so much contributes to disunite the particles of clay, may be owing to its swelling the clods, and increasing their surface: the cavities occasioned by this swelling are filled with ice: when a thaw comes on, wherever the ice was, is a vacuum, and

the particles of which the clay is composed, being separated one from the other, crumble and fall in pieces; when they are in this state, and the land has been chalked, a single ploughing, well-timed, will cover their surfaces with the chalk-powder, and prevent them from speedily adhering one to the other.

"Your readers, who have been in countries where there are quarries of stone, must have observed, that, whilst in the quarry, it works better than after it has been exposed to the sun; for it hardens considerably after it has been out of the quarry some time. It is the same with chalk, which is apt to be hardened by lying a summer in the sun: for this reason, it is advisable, that the chalk intended for manure should be dug as soon as the winter sets in, and laid presently on the land. This method and time of chalking may occasion some increase in the expence; but the farmer will be paid for it in the end, and he will, by this management, soon reap the benefit of his labours.

"Let it not be imagined from any thing I have said here, that I trust solely to chalk for bringing me good crops: no, I always bestow, once in a course of three or four years, a reasonable coat of compost dung. I do not lay on the chalk with any intention that it should enrich the clay: my desire is, that it should bring it to the nature of a loam, as the dung will then take effect, and ensure the farmer a large crop, provided he guards himself against the depredations of weeds, which are too apt to have their seeds mixed with the dung made of long straw, and often grow faster than the corn, with which the corn should be cropped. Dung, when prudently applied, is, like many other things, of great use; but it is dangerous in the hands of an ignorant land-holder. The expence of procuring it in quantity will ruin him, and his crops will go near to be choaked by the encroaching weeds." *Museum Rusticum*, vol. III. p. 198.

This letter of the Essex farmer merits the particular attention of all those who have clayey, or very strong land, and are within a moderate distance of chalk, which is without doubt an excellent manure for such land. And it has been found that chalk, particularly the fat soapy kind, is likewise a very valuable manure for loams, and other lands much lighter than clays; and though in the lighter soils the chalk is apt to subside in a shorter time than it does upon clays, it is more easily recovered, and brought up again by ploughing a little deeper than ordinary, and at somewhat a smaller expence, than can be done when it subsides in a very strong land. Chalk therefore is a manure that appears to be of almost as general use as marle; of which indeed it seems to be a species, and not improperly called marle in the Isle of Wight.

"If chalk, says Mr. Lisle, be laid on clay, it will in time be lost, and the ground again return to its clay; and if the clay be laid on chalk, in time the clay will be lost, and the ground return again to its chalky substance. Many people think the land, on which the other is laid for a manure, being predominant, converts the manure into its own soil; but I conceive, in both cases, the chalk and clay is filtrated through the land on which it is laid, by time, and, being soluble by rains into small corpuscles, is washed through the land on which it is laid; for neither of these manures is able to unite, in its finest corpuscles, with the corpuscles of the land on which it is laid, so as to form so strict an union and texture with it as the land doth with itself, and is therefore liable to be borne downwards with rains, till no sign of it be left.

"It is said to be a common practice with many tenants in Hampshire, three or four years before they leave their farms, to chalk their meadows; by which means they will for three or four years sling out a great crop of grass, but that they will be much the worse for it ever after. This seems to carry some reason with it; for the chalk so mellow and opens the pores of the meadow, that it enables the land to exhaust its strength in all parts: for chalk does not carry so much fatness as dung does to the land it is laid on; but it disposes the land to bear such crops by its sweetness, and well disposing of, and correcting an ill quality the land had before: but still I do not see that this is any objection to the chalking of meadows, provided, whilst, by virtue of the chalk, they are bearing such burthens, you take care to refresh them with dung.

"Though chalk laid on meadows enables them to give a great crop for three or four years, and will then improve them, yet I take it to hold quite contrary in pasture; for the grass being thereby so much sweetened and increased,

keeps constantly so much the more stock, by which it is maintained always in the same vigour.

"It is probable, that chalk spread on sandy or wood-seary ground, laid up for pasture, may wash and sink in, and fill up the interstices, and thereby consolidate and mend the texture of such ground, and sweeten it; as it is a great alkali; and though in time most of the chalk may be washed downwards, so that the ground may loose its virtue, yet I do suppose the strength of the ground may still continue much better, by reason that such manure having made the sward of the grass come thicker and sweeter, the good pasturage on both accounts enlarges the quantity, and betters the quality of the dung the cattle leave on it, which, in return, maintains a better coat and surface to the ground: and as chalk fills up the vacuities of sandy, on wood-seary ground, so, on the contrary, it insinuates its particles into obstinate clayey and strong land, and divides it, by making, in a manner, a fissure, thereby hollowing and mellowing it; so that the two contrary extremes are cured by chalk.

"Chalk laid on hop-clover and rye-grass is a mighty sweetener and improver of these grasses, being laid upon it after harvest, at the beginning of the winter, or whensoever one can best tend it; the benefit will be soon conspicuous, especially if the ground be of a four clay, and apt to run to coarse grass." *Lisle's Husbandry*, vol. I. p. 66.

CHALKEY-Lands, are those which are impregnated with chalk, and from their white colour, are in some countries called white-lands.

The best produce of corn in chalky lands, is barley and wheat; oats will do well on them. Their natural produce for weeds is poppies, May-weed, &c. For grass-feed, saintfoin, trefoil, and, if rich, clover. The best manure for these lands, is rags, dung, folding of sheep, &c. These lands, if rain happens to fall on them just after sowing, before the corn gets up, will cause the earth to bind so hard, that the corn cannot get through it; but may be much helped by a light harrowing.

In Hertfordshire they manage these lands for corn in the same manner as they do their clay-lands. In Oxfordshire they commonly manure these lands with half-rotten dung, which, they say, prevents the binding of it, and some mix it with sand, which causes it to work short, especially if any thing dry; they commonly sow them there with wheat, mangel, and barley; only after wheat they sow pease or vetches: in sowing of which they are obliged particularly to take care to have fine weather, because of the land's binding; but if they have only two nights dry weather, they will do well enough. *Mortimer's Husbandry*, vol. I. p. 68.

Mr. Young, in his *Annals of Agriculture*, vol. ii. says, "that in Essex they use chalk as a manure. It is brought from Malden in Kent; a waggon load costs at the quay 10s. The method employed is this; the teams of five horses and a waggon and two men, go out about 12 at night, load at Malden, return, unload, bait, go again with the same waggon and horses, and return and unload, and all over by one o'clock at noon. This is, I think, the severest work I ever heard of: 24 miles with so heavy a load, twice to be loaded and twice unloaded by the same men, yet it is here common; they reckon that every load costs in the whole 20s. They lay from five to eight on an acre, either upon a clover lay while feeding, or on a summer-fallow; the effect exceeds any thing I have met with; a very thin dressing of it is seen immediately to an inch, like rotten dung, and lasts 20 years; 15 in great heart. I was shewn a field of wheat hanging on the side of a hill at the distance of half a mile, one part of which was evidently much inferior to the rest which was in general laid; that part was the only spot not chalked, the farmer not having time to finish the field; he was present and confirmed the account. The same farmer having chalked a field, brought some in a cart as they returned from the field, and spread it thinly on one spot in a piece of poor dry land; the whole was sown with turnips: during the whole season, from their coming up, that spot was to be seen at a great distance, and the roots were far larger than any where else.

"They think their lands will do nothing without chalk, insomuch, that the whole country will, in a few years have all been chalked. The soil on which it does such wonders is loam; they have very little clay, and no sand. On gravels the effect is but slight; it is good sound loam in which it answers like the richest dung.

It is a general opinion among them, that land which has once

once been chalked will not take it again, and this opinion seems to prevent the trial; they acknowledge, however, that mixed with earth and dung it is even then excellent. A very particular circumstance they have observed, is, that laying a slight dressing of chalk and earth, or dung, on a field never chalked, will take so much effect, that the same field will not then answer to chalk completely. Another remark they have also made, is, that the chalk presently gives the land a red colour; so that a part of a fallow that has been chalked will, from the tinge, be discernible at a distance.

"Upon my asking if they ever laid chalk upon meadows? I was informed they did not require it; besides, they supposed it would do harm, as they observe that it is a strong enemy to grazing; that is, to the ground covering itself with good grass. A field which before chalking will run of itself to a fine head of white clover, no longer does it after chalking: this is very remarkable, for one would suppose what is manure for corn would be so to grass.

"The chalk is not soft, but rather hard; the sharpest frosts leave very many lumps unbroken, so that they break them with pick-axes; and the hard bits that break to a clear white they say come from the bottom of the pit, and are esteemed better than the pieces which crumble between the fingers. I tried some pieces in vinegar and water, the effervescence with the former is pretty considerable though not near equal to what I have seen; but in water it falls very slowly, if at all.

"Some farmers have tried lime, and with great success, upon the soils proper for chalk; this is a fresh instance that the excellence of these manures much depends on the soil whereon they are laid; on good loams they take full effect, but on poor lands they find nothing to work on. About Enfield the same chalk does wonders, which at North-Mims has very little effect; the one is a rich loam, the other a poor gravel."

In the 4th vol. of the same work, Mr. Young gives an extract from a letter of Mr. Legrand's, of Guilton-House, near Sandwich, in Kent, wherein he says, "Chalk will improve, in some degree, any soil foreign to it. In a very high degree it will improve a sandy soil. I have paid in one year 50l. merely for the carriage, besides what I have fetched with my own teams. Quantity 40 loads per acre, at 40 bushels per load. It gives tenacity to a sandy soil, wonderfully improves it, and totally exterminates that pernicious weed the wild marygold, commonly called here the yellow bottle, so abundant in sandy soils. It is a received opinion, that chalk is slow in its operation; it is not always so. In the winter of the year 1783, the soil being hard frozen, and wheat upon the ground, I chalked over four acres, part of a field of 12; the produce 58 qrs. 5 bushels. The part chalked so greatly superior to the rest as to astonish every beholder.

"Through me (I say it not boastfully, I say it with pleasure) the dressing with chalk is widely extended in this neighbourhood.

"I have frequently tried chalk upon pasture land, but without the least success."

Mr. Young, in his *Experiments on Manures*, says, "The effect of chalk deserves notice. I have often remarked the wonderful degree to which some soils abound with the vitriolic acid; to lay on such large portions of a calcareous earth must naturalize this acid, and the salts thus produced are selenites; the crops have been the better for the chalk, resulting probably from that action on the acid; but not so much better as to give any reason to suppose the neutral body beneficial. Hence, therefore, upon these soils, chalk is only to be used as the means of improving that basis, whereon you in future intend to lay mucilaginous manures: how far this will answer does not appear; but I should observe, that the chalked portions were always drier, and more friable than the rest, which is a very great advantage."

CHANFRIN, the fore-part of a horse's head from one hand to the other.

CHANGE of crops, a very judicious part of husbandry, consisting in a change of different species of grain on the same soil.

Experience soon taught men, that even the most fruitful soil cannot constantly yield the same grain; and this of course laid them under a necessity of seeking for means to remedy the defect. They found the plough the most ready and perhaps the most effectual: and hence all the ancient writers so highly commend a thorough ploughing. At the same time the apparent loss of the produce of the ground,

during the year of fallow, put them upon enquiring how this inconvenience might be prevented, consistently with keeping the land in good heart. Repeated observations convinced the Romans, the most attentive of all nations to every thing relative to husbandry, that, besides the alternate resting of the land, wheat may, as Pliny observes, be sown after lupines, vetches, beans, or any other plant which has the quality of fertilizing and enriching the soil. This, says Mr. Lisle, deserves to be well noticed, because our farmers imagine they cannot make their rent, if they pay twelve shillings an acre, without sowing their land every year; nor will they be persuaded to lay it down to grass.

A judicious change of crops, is without doubt of great importance in the common tillage husbandry; as they enable the farmer to save the expence, and loss of crop in the fallow year; and to conquer his great enemies the weeds, by attacking them at different seasons in the year, and in different periods of their growth; especially when the intermediate crops are hoed, as those of beans and pease; for the repeated hoeings not only destroy the weeds; but also very much enrich the land. The benefit of changing the crops appears to arise from these, and the other circumstances above-mentioned, rather than from the different food that the several crops are supposed to extract from the soil; because the new husbandry proves, that the same kind of crops may be continued, without change, from year to year in that husbandry, so long as the hoeing culture is continued.

The most rational change of crops hitherto pointed out by any writer, is the following, planned by Camillo Tarello, and which he presented to the senate of Venice in the year 1566:

"Let the ploughings; hitherto given to corn-land divided into two portions (each of which being rested every alternate year, receive four ploughings that year) be transferred to the half of one of those portions; so that it be ploughed eight times, including the seed-ploughing; I mean that every farm in tillage be divided into four equal parts; and that only one of these parts, taking them alternately, be sowed with corn in any one year, after it has been ploughed eight times. Two of the other parts should be laid down to grass, and the fourth should be fallowed a year, during which it should receive the above-mentioned number of ploughings.

"He therefore who has now, for example, ten acres under corn, should for the future sow only five, and so in proportion for a larger or lesser extent; and all the manure and labour formerly bestowed upon his ten acres should be appropriated to the five only; that is, he should plough them eight times, unless the soil be extremely light.

"The husbandman should begin to plough in October or November, about ten months before he sows, or sooner if he can; but always in dry weather. He should lay on his dung before the last ploughing; and should not sow more than two thirds of the quantity of seed hitherto commonly used, and that seed should be of the growth of the country.

"Whoever follows this method may always depend of reaping the following advantages:

"1. This way of cultivating land lessens the expence and labour, it being easier to plough one acre eight times, than to plough two acres four times each; because, after the third time, an acre and a half at least may be ploughed as soon as an acre could have been before; and if he begins his work in October or November, while the land is in good condition for ploughing, he may continue it the following year, at such times as he will have little more urgent business, so as to have four ploughings done about the end of May. By this means the four summer ploughings will not require such strong ploughs as some people now use, to the great hurt of their cattle, and fatigue of the ploughman, because the ground will be already well loosened.

"2. These repeated ploughings will destroy the seeds and roots of weeds, which rob the corn of its food, choke it, and hinder it from growing.

"3. A field rested, and then prepared in this manner, will yield more than double the produce of two equal spaces of land cultivated in the common manner, as I have often experienced. This is more than doubling one's income.

"4. Over and above this great advantage, we likewise save two-thirds of the quantity of seed hitherto commonly used; for by sowing only a quarter instead of half of the
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the land in tillage, there is an immediate saving of half of the seed formerly required; and by sowing only two-thirds of the usual quantity upon that quarter, we again save two twelfths, that is, one sixth of all the former seed: now half and one sixth makes two thirds, to be deducted from the former usual quantity.

" 5. We shall have a sufficiency of straw of every kind for all our uses; especially for litter and dung, so indispensably useful.

" 6. We shall have hay and fodder enough to keep many cattle, because we may, and should sow one half of our ground with grasses, which will thrive extremely well, while the land is thus rested for two years, in order to be afterwards broken up, ploughed, and sowed with corn in its turn: for I again advise sowing only a quarter part of the whole farm with corn, and breaking up another quarter immediately after seed-time, before winter; and, on the contrary, neither of the other quarters should be ploughed during two years. But as the earth is destined continually to yield productions of one kind or another, even while it rests, we shall do well in following the path pointed out by nature, by helping it to produce clover, and other plants fit for fodder, which are of singular service to us, not only on account of the hay we reap from them, but also because their roots greatly improve the soil. In the country about Brescia, plentiful crops of the finest flax are reaped from fields where a quantity of clover has been lately mowed; and lands are let there for a great price, not only because the soil is rich, and can be watered, but also because it has just been under clover. If such value is set upon land intended only for flax or millet, how much more would good wheat-land justly deserve?

" 7. A seventh advantage will be, that land rested regularly for two years (I say, with Virgil, that it rests when it is not ploughed) being well-conditioned, afterwards well prepared, ploughed, enriched by the roots of the grasses, and kept clear of weeds, will yield crops more than twice as great as any we now reap; a truth which I have practically experienced, which the most sensible and most judicious husbandmen that ever lived have long told us, and of which a trial will soon convince the most incredulous.

" 8. One of the most considerable advantages attending this method, is the ease with which a great number of cattle may be reared, by means of the increased quality of hay and green fodder. We shall consequently have more horses, more oxen, more cows, more sheep, and more poultry. Every one knows of what infinite service all these are, to feed us, to cloath us, and to help us in our work. He, therefore, who has hitherto been obliged to have two yoke of oxen, will, in this method, want only one, and may, instead of the other, feed two or three cows: for as the labour is hereby lessened, and the quantity of good fodder increased, two oxen will be sufficient to plough the land, especially as the soil will by this means be brought daily into better and better tilth.

" 9. From hence naturally arises a ninth advantage, which is, the quantity of manure produced by the increase of cattle and fodder; an advantage which no good husbandman will neglect to purchase, if the means of doing it are but pointed out to him.

" The tenth and last of the advantages which I shall here enumerate, as resulting from this new method of culture, is, that poor and barren lands are hereby rendered, by degrees, good and fertile: for such is the constitution of the earth, that ploughing and manuring alter its very nature, and improve it more and more, as experience repeatedly demonstrate. Valerius Maximus instances the striking example of Masinissa king of Numidia, who made agriculture flourish so much, that he left his country, which he found barren and desolate, stored with riches and every good thing. It is in our power to do the same. On the contrary, it is not less true, that even though the earth be rich and good, it will yield but little fruit, if it be not well cultivated; resembling therein the capacity of the human mind, which, according to Cicero's fine comparison, is enlarged only by study and exercise. Industrious labour will not only procure us the necessaries, nay the superfluities of life, but will even change a barren country into a kind of garden." *Ricordo d'Agricoltura di Tarello.*

M. Duhamel, after observing that the French farmers, in general, change their crops, not on any principle dictated by reason, but merely because it was the custom of their forefathers, or they themselves perhaps have occasion for

some particular growth, draws a parallel between the practice of dividing arable land into three part, or into two, in order to their being alternately sown, and rested. "I have," says he, some acquaintance with the methods of practice in Guienne and in part of Normandy; and am obliged to M. le Baron de Sournia, governor of Querebus, for enabling me to give an account of the methods used in the neighbourhood of Perpignan, where his estate lies.

" In this hot climate they sow their lands in September, and begin to cut wheat about the 10th of June; so that their harvest is generally finished by Midsummer.

" They divide their lands into two portions only; so that in one year they sow wheat, and the other the land should be suffered to rest. But, on such part of their lands as are most valued, they have several crops during the year of rest: this impoverishes their lands, and they are obliged to sow their wheat too late, which lessens the crop. We shall mention an instance given by M. Sournia.

" In land they can water, they sow clover immediately after wheat-harvest, scattering the clover-seed among the stubble. The land is then immediately watered, and is afterwards several times repeated during the summer: in the winter they feed it with sheep and lambs. Such as have no flocks sell their pasture to the upland farmers, who have flocks but no winter fodder, their land being covered with snow: this pasture therefore fetches a very high price.

" In spring, when the green fodder has been eaten down by cattle, they water the land, and by that means the clover sprouts apace; when it is in blossom they mow it, make it into hay, and lay it up with the rest.

" Immediately after this crop, they dung the land; and such as are not afraid of exhausting it, plough it, and sow either kidney-beans, or small millet: but as they cannot plough for wheat till these crops are off the ground, there is not time sufficient for giving the land proper tillage, the sowing is retarded, and the rich particles of the dung are partly consumed by these crops, while the manure might be more usefully employed on lands they cannot water. M. de Sournia is, by repeated experience, convinced that, to have good crops of wheat, they must be contented with the crop of clover, and only sow kidney-beans, millet, &c. in small quantities for the use of the family.

" In Guienne, as well as in Anjoumois, they raise a crop of maize, which is a great impoverisher of the ground, during the year of fallow.

" The good husbandmen also think, that in the rich lands, which they cannot water, it is the best, in a farm of three hundred and fifty acres of wheat, to be careful to give proper tillage to the one hundred and fifty acres that should be in fallow, to make them proper for the reception of wheat. This is also the practice of some districts of Normandy, where the climate being colder, and the soil more backward, they have scarcely an opportunity of having any crop but wheat. However, when the land has been well dunged and tilled for maize, as they bestow three ploughings on that plant, there is commonly the next year a very good crop of wheat.

" It is evident, that by dividing a farm that has three hundred acres in tillage, into two equal portions, which are sown alternately every other year, the tenant, during a nine years lease, will reap one thousand three hundred and fifty acres of wheat; whereas, if the land be divided into three portions, it will amount to nine hundred acres only. But in the latter case, the former has nine hundred acres of spring corn, which being estimated at half the value of the wheat, make it just equal to one thousand three hundred and fifty acres of wheat. It follows therefore, that in grazing countries, where they plough with oxen, and use but few oats, it is most advantageous to divide the land into two portions; but that this is not to be done in farms that are tilled with horses, because the necessary purchase of oats would amount to the value of four hundred and fifty acres of wheat extraordinary.

" The farmers about Bayeaux, in Lower Normandy have two methods of changing their crops.

" According to one of those methods, 1. They sow buck-wheat towards the end of June. 2. When the roots and stems of this plant are dead and withered, which is about All-Saints day, they plough, and immediately sow wheat: the wheat is therefore sown on one single furrow. These lands have indeed been ploughed for buck-wheat, and even thoroughly dunged; and plenty of manure can supply the place

place of good tillage, and the latter can supply the place of the former. 3. After reaping the wheat, they plough in the stubble as soon as possible; and, after giving the land a second ploughing in February or March, they sow it with oats; or a third ploughing is bestowed upon it, in order to crop it with barley. 4. They plough in the barley stubble in winter, and after giving the land one spring ploughing, sow either peas or tares. 5. Immediately after this crop is off, they turn down the land, that it may receive two ploughings before October, when it is sowed with wheat. 6. The following year they sow oats mixed with a little clove-seed; after which it is laid down in pasture for three or four years. It would be needless to mention that the farmer varies the order of his successive crops, according to the nature of the soils, and his own occasions; but by this method six crops are reaped in six years; two of wheat, two of oats, one of buck-wheat, and one of peas or turneps; and the field is then left in clover to be fed for four years.

"According to the other method, they sow no buck-wheat on the land they break up; it is left in fallow from February or March, when it is turned up, till October; and during this interval they manure it, and give it several ploughings to prepare it for wheat. In this case the crop is generally more plentiful than when buck-wheat has been sown. In other respects, the change of crops is the same as was mentioned before." *Culture de Terres, tom. VI. p. 34.*

The changing of crops, upon rational principles, though of infinite consequence in agriculture, seems to have been neglected, and even forgotten, after the time of the ancient Romans, till Camillo Tarello pointed out its great importance, as we have already observed in this article; nor do we, since him, find much attention paid to this essential part of husbandry, till very lately, when the culture of turneps probably gave the useful hint; the farmer observing, that his land, instead of being impoverished by that root, was enriched, and prepared to yield a better crop of barley in the spring. This might naturally suggest to him, that other succulent plants, which cover the earth with their leaves, might have the same effect. The success has answered his utmost expectation: for it is now found that a fallow does not become necessary in several years; the ground being kept in heart by a variety of crops, when rightly timed, and properly managed. The Society for the Improvement of Agriculture in Scotland, from whom we shall borrow the following judicious instructions, have the honour of setting this discovery in its proper light.

They observe, "That some crops, as peas, beans, clover, and all plants of the pulse kind, are enrichers and cleaners of the earth; while wheat, oats, barley, and the whole tribe of vegetables, whose roots are fibrous, and spread far, impoverish and rob the ground. The latter are also foul-ers of it, by giving way to weeds and grass, which, being the natural product of every soil, are more readily nourished by it than any plant which it does not spontaneously produce; and if the earth be fed with any sort of manure, it will, while the weeds and grass remain undestroyed, like a tender mother, cherish and nourish them in proportion to the food she receives.

"Wheat and oats are great robbers of soils. Wheat remains a long time in the ground, during which the land untills itself, coalesces, and becomes of the nature of uncultivated earth; while the weeds, meeting with no opposition, ripen, and shed their seeds. Oats do not continue so long: but they bind the soil by their strong roots, and give many weeds time to ripen. Barley, as it stands only a few months, and several ploughings are given for it, binds the earth less than either wheat or oats. Peas, beans, tares, &c. are supposed to draw much of their nourishment from the atmosphere, and that in proportion to the succulency of their stems and leaves, whereby it is probable their roots discharge a moisture under ground; and their leaves, covering the surface of the earth, return the moisture and dews descending through them, which mellow and rot them into a kind of manure." *Maxwell's Collection, p. 219.*

From the above observations, the farmer will be able to vary his crops in such a manner as always to keep his ground in heart, and free from weeds; particulars which cannot fail of producing very great advantages.

CHANNEL, of a horse, is the hollow between the two bars of the under jaw-bone, in which the tongue is lodged.

CHARCOAL, a sort of fuel, consisting of wood charred, or half burnt.

The dust of charcoal has been found, by repeated experience, to be of great benefit to land, especially to such as is stiff and sour. It is to be used in the same manner as foot and wood-ashes. See the articles ASHES and SOOT.

Mr. Marshall, in his Rural Economy of the Midland Counties, says, "that great quantities of charcoal are still used in the iron forges of this country: for although it has been discovered that iron, for common use, may be made with pit-coal; yet, for particular purposes, where a toughness of texture is wanted, as for wire-drawing, &c. charcoal is found to be requisite.

"In this country there are sets of men whose trade is the burning of charcoal. They cut and cord in the winter, and burn during the summer season.

"The minutiae of the process is this: The site or hearth being determined upon, the turf is pared off, and the sods laid on one side. The wood, about ten cord, is then laid in a ring, somewhat wider than the intended hearth; beginning on the outer circumference of the ring, with the smallest of the round wood, laying the larger pieces of top-wood, and the cloven roots or butt-ends, towards the center. With these last, some of them nearly as large as bushel-blocks, they begin to make their pile, leaving a kind of chimney in the middle (a vertical aperture from a foot to eighteen inches wide), and round this core of roots set up the top-wood (which has previously been cut at the time of cording, in such a manner that no forkedness nor other awkward crookednesses are left; or, if not cut in this manner, or cut improperly, it is prepared by the colliers themselves, previous to laying it ready for setting), joining the blocks, or rather fitting them in, as close to each other as possible; placing the convex side of the logs outward, forming the pile in the shape of an inverted bowl, nearly semiglobular.

"The pile being formed, it is tiled with sods; which are pointed, to keep in the heat the better, by filling up the seams with fine pulverized mould.

"The chimney is now filled with short pieces of dry wood; near the top a live coal is put; over this one layer more of dry pieces; and, upon these, a close cap of sod is placed: nevertheless, this one coal, not larger than the fist, and excluded from the open air, is sufficient to set the whole pile on fire.

"As the pieces in the chimney burn away, they are replaced with fresh ones: thus feeding the fire with fresh fuel.

"Paled hurdles are placed on the windward side of the heap, to prevent the fire from acting partially.

"When the fire begins to work itself out, at the outward skirts of the bottom of the pile, it is known that the coal is fully burnt (or rather the wood sufficiently charred) which it will be, in a pile of ten cord, and in fine dry weather, in seven or eight days.

"The fire, during the whole time, is carefully kept from breaking out, by throwing mould or ashes upon the weak part: so that, though the fire passes through every part of the wood, little or none of the phlogiston, or matter of fire, escapes.

"It is observable, that notwithstanding the intense heat, no part seems to be consumed; not the bark only, but even the moss upon it, comes out as entire as when it went in; the only apparent change is in its being rendered friable, and of a black colour. Wood that is charred seems to be only very highly dried. It shrinks considerably during the process of charring; but there is no visible derangement of parts. One of the smaller pieces, which is not broken in the drawing, appears as entire when it comes out as when it went into the pile. The brittleness after charring, however, shews that the texture of the wood is altered by the action of the fire.

"As soon as the fire is out of the coal, on the outside of the heap, the workmen begin to draw; which is done by running a peel between the coal and the hearth, raising up the coal in such a manner as to let the mould and ashes of the sods fall through between the pieces, upon the inward parts still full of fire. If this makes its appearance in any particular spot, a peel full of ashes is immediately thrown against it.

"Having got sufficiently near to the fire, the coals raised by the peel are raked off with long wide-toothed iron rakes; the teeth about a foot long, and standing about six inches

inches apart; the handle and head of wood, except a plate of iron on the back, with which the small coal is gathered together. No sieve, nor any rake with finer teeth than the above, is used. The coal being light, it is readily brought to the surface of the ashes and dirt; and, being there, is easily collected (though with a kind of slight) with the back of the rake.

"The side, thus drawn, being rounded up and secured with ashes, another, the coolest part, is drawn in the same manner.

"The drawing is an infernal business: the men work among fire and phlogiston enough to suffocate Satan himself.

"Such pieces as still retain fire, after they are drawn, are quenched with water; which the workmen have in plenty standing by them, in pails. If a large piece contain much fire (which hides itself chiefly in the chinks of the large pieces), it is plunged, bodily, into the water. If the heap itself prove too refractory to be kept under by the ashes alone, a sufficient quantity of water is thrown upon it, to keep the fire under. Such large pieces as are suspicious are laid on one side; in order that those which take fire may be the more readily discovered.

"A waggon attends to take away the coal, as fast as it is drawn. For, if it take fire, or get wet, in the hands of the burners, it is at their risque: and while in the waggon, it is at the risque of the waggoner. Every particle burnt is so much entire waste.

"The quantity of ashes arising from a charcoal hearth is considerable. There has been already four cart loads taken up from two small hearths, and a load or two more remaining.

"Charcoal ashes are in good esteem, here, as a manure; particularly for turneps, and for fining grass land. They arise principally from the sods used in covering; but, in part, from the bits of coal which break off in raking it out of the ashes."

CHARLOCK, called also *Chadlock*, *Catlock*, *Corlock*, and *White Rape*, is a weed too generally known to need a particular description: the figure we have given of it on plate V. fig. 32. will be abundantly sufficient. Almost the whole plant is covered with bent pellucid hairs.

There are two sorts of charlock, one bearing white, and the other yellow flowers; but they seem to be only a variety of the same plant. The young plants of charlock so nearly resemble those of turneps, that they are not easily distinguished but by the taste; the charlock being hot and bitter, and the turnep mild. Farmers should therefore be very careful in weeding their turneps, lest they mistake them for charlock.

Mr. Lisle observes, that cold wet lands are always more subject to charlock than white or chalky lands: because the charlock-seed being very oily, resists putrefaction, and is not easily opened or penetrated by moisture, whereas white and light earth is soon dry after rain, and the water does not continue long enough on it to make such seed germinate so effectually as in the other. By an experiment which he made in sowing charlock-seed and turnep-seed at the same time, he found that the turneps will appear in three days, but the charlock in not less than ten. A hint that may prove very useful to the husbandman." *Lisle's Husbandry*, vol. II. p. 297.

Mr. Mortimer after remarking that both the white and yellow charlock are very prejudicial to corn, and that some lands are very subject to it, especially if manured with cow-dung alone, which he thinks increases it more than any other manure, unless it be mixed with horse-dung, or some other hot manure, mentions his being told of a person who had vast quantities of this weed in a field of barley, mowed the whole when the charlock was in flower, and ready to seed, which is commonly about the middle of May, as low as he could, without taking off more than just the tops of the blades of the barley; and that this gave the corn an opportunity to get above it, in such a manner, that he had four quarters of barley on an acre. He adds, that where a fallow is full of charlock, it will be right to turn in sheep, which will eat it very readily. *Mortimer's Husbandry*, vol. I. p. 311.

Charlock is a more agreeable food to sheep than turneps: for I have seen where sheep have broke into a field of turneps, they have eat down the charlock almost to the ground, and have not touched any of the turneps.

CHASE, a word used in some counties to signify a row or rank. Thus in the planting of quicksets, a single chase implies a single row; a double chase, means another row planted below the first, not immediately underneath the up-

per plants, but under the middle of the intermediate spaces. *Lisle's Husbandry*, vol. II. p. 405.

CHATS, the keys of trees, such as the ash, sycamore, &c.

CHEDDER-CHEESE, a name given to a very large kind of cheese made at Cheddar, a village near Mendip-hills in Somersetshire, famous for its pastures. It is common in this place for three or four dairies to join their milk to make one great cheese, which generally weighs from one hundred and fifty to two hundred weight; and which they often sell at six-pence per pound on the spot.

CHEESE, a well-known species of food, prepared from curdled milk, pressed from the whey, and afterwards dried for use.

Mr. Marshall, in his *Rural Economy of Norfolk*, says, "To render my residence more commodious, as well as to gain some information on the subject of cheese-making, an art I was then a stranger to, I rented a small dairy of cows. I took them the rather as I had then in my service an excellent Wiltshire dairy-woman: who, I was in hopes, might be able to make some improvement on the Norfolk method of making cheese; which, I had been given to understand, was execrable.

"Having long considered this interesting subject as being allied to experimental philosophy, I placed it in that light, and paid as much attention to the different processes as an active scene of employment would permit me. What I have been able to do is only an essay; but it is sufficient to convince me, that with leisure and application, much might be done towards bringing this, at present mysterious, but important subject to some certain and fixed principles.

"In registering the information I have been able obtain, to it will be proper to digest it under the following heads:

The preparation of the rennet.

The coagulation of the milk.

The management of the curd.

The management of the cheese.

"The curd which happens to be contained in the stomach of the calf when butchered, together with the hairs and dirt which are inseparable from it, are used by the dairy-women of this country to coagulate their milk: hence, probably, the rancid flavor of the Norfolk cheese; perfectly resembling in scent the parent curd; and this, as nearly as may be, its more matured self.

"The rennet which I made use of was prepared in the following manner:

"Take a calf's bag, maw, or stomach; and, having taken out the curd contained therein, wash it clean, and salt it thoroughly, inside and out, leaving a white coat of salt over every part of it. Put it into an earthen jar, or other vessel, and let it stand three or four days; in which time it will have formed the salt and its own natural juices into a pickle. Take it out of the jar, and hang it up for two or three days to let the pickle drain from it; resalt it; place it again in a jar; cover it tight down with a paper pierced with a large pin; and in this state let it remain until it be wanted for use. In this state it ought to be kept twelve months: it may however, in case of necessity, be used a few days after it has received the second salting; but it will not be so strong as if kept a longer time.

"To prepare the rennet for use; take a handful of the leaves of sweet-briar, the same quantity of the leaves of the dog rose, and the like quantity of bramble-leaves; boil them in a gallon of water, with three or four handfuls of salt, about a quarter of an hour; strain off the liquor, and, having let it stand until perfectly cool, put it into an earthen vessel, and add to it the maw, prepared as above. To this is added a sound good lemon, stuck round with about a quarter of an ounce of cloves; which give the rennet an agreeable flavor.

"The longer the bag remains in the liquor, the stronger of course will be the rennet: the quantity, therefore, requisite to turn a given quantity of milk, can only be ascertained by daily use and observation.

"When the rennet is sufficiently strong take out the bag; hang it up two or three days for the rennet to drain from it; resalt it; put it down again into the jar; and thus continue to treat it, until its virtues are exhausted; which will not be until it has been used several times.

"By sufferings one or more bags to remain in the liquor, the rennet thus prepared may be raised to a very high degree of strength, as will appear in the following observations.

"The leaves and the spice, it is probable, have no other effect than that of doing away the ill flavor of the maw; which

which, if ever so well cleaned, retains a faint disagreeable smell ; whereas the rennet prepared as above, is perfectly well flavored.

" It is however, I find, an idea among the Wiltshire dairy-women, that the leaves correct any rankness or evil quality in the milk, arising from a rankness of pasture : they being further of opinion, that different pastures require different sorts of herbs to correct them ; and some of them, it seems, are, or pretend to be, so deeply versed in this art, that they will undertake to correct any milk, so as to prevent the rising, heaving, or blowing of the cheeses made from it ; and, consequently, the rancidness which usually accompanies a porous cheese.

" This is, no doubt, a grand object of cheese-makers ; but it is not, I apprehend, to be obtained by so small a proportion of vegetable juices as pass with the rennet into so large a proportion of milk. Nevertheless, it appears to me highly probable, that this grand desideratum lies within the reach of the chemical art ; and that by a course of judicious experiments, some vegetable or mineral preparation, adequate to this valuable purpose, may be discovered.

" Coagulation. Next to the art of correcting the milk (an art as yet in its infancy) seems to claim the attention of the experimentalist.

" It is known, from daily experience, that the warmer the milk is, when the rennet is put to it, the sooner it will coagulate, with a given quantity of rennet of a given strength.

" It is equally well known that the cooler the milk, and the longer it is in coagulating, the more tender and delicate the curd becomes : on the contrary, if the milk be too hot, and the coagulation takes place too rapidly, the curd proves tough and harsh.

" But it seems to be a fact, equally well established, that a cheese made from milk, which has been coolly and slowly coagulated, is longer before it become marketable than one made from milk which has undergone a less deliberate coagulation ; and which, being drier, and of a harsher texture, sooner becomes cheesy, and fit for the taster.

" Therefore the great art in this stage of the process lies in—

The degree of warmth of the milk when *set* ; that is, when the rennet is put to it ; or, in—

" The degree of heat retained by the curd when it *comes* ; that is, when the coagulation has sufficiently taken place ; or, in—

" The length of time between the *setting* and *coming*. Which length of time may be regulated either—

" By the degree of the warmth of the milk when *set* ; or—

" By the state of warmth in which it is kept during the time of coagulation ; or—

" By the quantity and strength (taken jointly of the rennet.

" To endeavour to gain some information on this subject, I made the following observations :

" 1781. June 5. Twenty-three gallons of milk, heated to ninety-six degrees of Fahrenheit's scale, with two tea-cup-fulls of weakish rennet, came in one hour ; the curd delicate and good.

" June 6. The same quantity of milk, of the same heat, with the same quantity of rennet, came in nearly the same time ; the curd somewhat tough ; owing, probably, to the milk having been burnt to the kettle in which it was heated.

" June 7. Twenty-seven gallons of milk, heated to ninety-four degrees, with the same quantity of rennet, came in about two hours ; the curd very good.

" June 8. Twenty six gallons of milk, heated to one hundred and two degrees, with one tea-cup-full of rennet, came in two hours and a half ; curd very good.

" June 9. Twenty five gallons of milk, heated to one hundred degrees, with a tea-cup-full and a half of rennet, came in about one hour and a half ; the curd good, but somewhat tough ; owing, perhaps, to the milk being kept too warm in the cheese-tub, by being covered up close with a thick cloth.

" Note, on the seventh and eighth, the whey retained a heat of about eighty-eight degrees, whereas the whey this morning was ninety-two degrees : so that, perhaps, it is not the heat when it is *set*, but the heat when it *comes*, which gives the quality of the curd.

" June 10. Twenty-five gallons : ninety-six degrees : two cups : uncovered : came in two hours and a quarter : whey eighty-seven degrees : curd very tender.

" June 11. Twenty-three gallons : one hundred degrees : more than a tea-cup : uncovered : did not come in two hours ; owing to the rennet being lower in strength than before : therefore, added in a little more rennet : which brought it in about three hours from first setting ; the whey eighty-seven degrees : the curd uncommonly delicate.

" June 12. Twenty-four gallons of milk : one hundred degrees : two cups of rennet : uncovered : came in two hours : whey eighty-nine degrees : curd uncommonly tender.

" June 13. Twenty-eight gallons of milk : ninety-two degrees : three cups (lay strongly renneted) : covered up with a coarse linen cloth : came in one hour and a half : whey eighty-six degrees : curd very good, and of a very fine colour : though perhaps would have handled tenderer, if it had not stood some time, after it came before it was broke up.

" Perhaps much depends on its being broke up in the critical minute.

" June 14. Twenty-eight gallons : one hundred degrees : two cup-fulls : uncovered : came in one hour and a quarter : whey ninety-four degrees : curd somewhat harsh, but of a good colour.

" The change of colour is therefore owing to the change of pasture.

" Note, The milk should be covered to make it come together : this came and grew hard at the bottom, half an hour before it was set at the top.

" June 15. Twenty-eight gallons : milk heated to ninety five degrees : with two cups of rennet ; and covered after it had stood three quarters of an hour : came in one hour and a half : whey eighty-nine degrees (the morning warm) : curd very good and tender.

" June 16. Thirty gallons of milk heated to one hundred and three degrees ; but lowered by two pails-full of cold water to ninety-six degrees ; with two cups and a half of rennet ; and kept close covered : came in one hour : whey ninety-four degrees : curd pretty good but not sufficiently tender.

" June 17. Twenty-eight gallons : ninety seven degrees : two and one-half cups : covered ; but not close : came in one hour and a half : whey not tried : curd somewhat tough.

" Note, the toughness is owing, perhaps, to some milk of a new-calven cow being among it.

" Note also, to try the exact heat of milk immediately from the cow, immersed a dish in the pail while milking. After it had lain long enough to receive a degree of heat equal to that of the milk in the pail, emptied it, and immediately milked into it from the teat (the cow being at this time about half milked) ; the heat ninety-five degrees.

" Note also, the cheeses of yesterday (the 16th of June) press remarkably elastic, and spongy (like a fungus) : perhaps owing to the milks coming too hot ; or perhaps to two or three of the cows being then a-bulling ; or perhaps, being made thicker than usual, the press was not heavy enough for them ; or perhaps this ill quality is owing to the cold water being put into the milk.

" I afterwards found that milk of a cow, on the day of amour, retained, after having stood some times in the pail after milking, ninety-eight degrees of heat. This shews that the state if not the quality of the milk is altered by the heat of the cow ; and a cautious dairy-woman always endeavours to keep such milk out of her cheese-tub.

" June 18. Thirty gallons : ninety-five degrees : covered : came in one hour and a half : whey ninety-two degrees : curd pretty good.

" June 19. Thirty gallons : ninety-two degrees : two cups covered : curd very good.

" June 21. Thirty gallons : ninety-eight degrees : lowered by half a pail of cold water of ninety-five degrees : the curd good ; but the cheeses like those of the 16th press, hollow and spongy.

" Therefore, it is probable, from these two incidents, that lowering the heat of the milk with cold water has an evil effect.

" June 23. (Evening) fifteen gallons of new milk warm from the cow, retaining a heat of ninety-two degrees, with two cups and a half of new weak rennet, and closely covered, came in three quarters of an hour : whey eighty-eight degrees : curd very delicate and good.

" June 25. Forty gallons of half-skim milk, heated to eighty-seven degrees, with three cups of rennet, slightly covered, came in three quarters of an hour : whey seventy-

seventy-nine degrees : curd remarkably good of this sort.

" Sept. 8. In observing the effect of some remarkably strong rennet, I found that an ordinary tea-cup-full coagulated sufficiently upwards of forty gallons of milk, heated to only eighty-eight degrees, in thirty-five minutes.

" From these observations it appears, that curd of a good quality may be obtained from milk heated from 87 to 103 degrees of Fahrenheit's thermometer ; provided the rennet be so proportioned, that the time of coagulation be from three quarters of an hour to two hours and a half ; and provided the milk be kept properly covered during the process of coagulation.

" And from these as well as from a variety of other observations, which I made in the course of the summer, but which are not minuted, it appears to me, at present, that from 85 to 90 are the proper degrees of heat ; that from one to two hours is the proper time of coagulation ; and that the milk ought to be covered so as to lose in the process about 5 degrees of its original heat.

" But climate, seasons, the weather, and the pasture, may require that these bounds should sometimes be broken. A few observations, made in one season, and in one place, how accurately soever they may have been taken, are by no means adequate to the entire illustration of this very abstruse subject.

" In Norfolk this stage of the process is very short. Part of the whey being laded off, the remainder, with the curd, is poured into a cloth : the whey drains through ; the curd is shook in the cloth ; kneaded down into a vat ; put under a light press, or perhaps under a stone ; the cloth once changed ; the curd once turned ; and lo ! a Norfolk cheese appears. The cows are milked and the cheese completed in ten or twelve hours.

" The practice in my dairy has been uniformly this, as soon as the curd is come at the top, firm enough to discharge its whey, the dairy-woman tucks up her sleeves, plunges her hands to the bottom of the vessel, and, with a wooden dish, stirs the curd and whey briskly about : she then lets go the dish, and, by a circular motion of her hands and arms, violently agitates the whole ; carefully breaking every part of the curd ; and, at intervals, stirs it hard to the bottom with the dish ; so that not a piece of curd remains unbroken larger than a hazel-nut. This is done to prevent what is called slip-curd (that is, lumps of curd which have slipped unbroken through the dairy-woman's hands), which, by retaining its whey, does not press uniformly with the other curd, but in a few days (if it happen to be situated toward the rind) turns lived and jelly-like, and soon becomes faulty and rotten. This operation takes about five or ten minutes ; or, if the quantity of curd be large, a quarter of an hour.

" In a few minutes the curd subsides, leaving the whey clear upon the top. The dairy-woman now takes her dish, and lades off the whey into the pail ; which she empties into a milk-lead to stand for cream, to be churned for whey butter.

" This is a practice peculiar to the cheese counties, and forms no inconsiderable part of the profit of a dairy in those counties. In Norfolk, the whey, even from new milk, passes from the cheese-vessels immediately to the hog-tub.

" Having laded off all the whey she can, without gathering up the small pieces of the loose curd floating near the bottom of the vessel, she spreads a straining-cloth over her cheese-tongs, and strains the whey through it, returning the curd retained in the cloth into the cheese-tub. When she has got all the whey she can, by pressing the curd with her hand and the lading-dish, she takes a knife and cuts it into square pieces, about two or three inches square. This lets out more of the whey, and makes the curd handy to be taken up, in order to be broken into the vats.

" A dairy should be plentifully furnished with vats, and some of them of different sizes ; for when three or four cheeses are made at each meal, a number of vats become actually in use ; and if there are not still a number empty, the dairy-woman becomes confined in her choice, and cannot proportion exactly her vats to the quantity of curd she happens to find in her cheese-tub ; and keeping a little overplus curd from meal to meal frequently spoils a whole cheese.

" Having made choice of a vat or vats, proportioned to the quantity of curd, so that the cheese, when fully pressed, shall neither over nor under fill the vat, she spreads a cheese-cloth loosely over the vat ; into which she re-breaks the curd ; carefully squeezing every part of it in her hands ;

and, having filled the vat heaped up and rounded above its top, folds over the cloth, and places it in the press.

" Much depends on the construction and power of the press. The excellency of construction depends upon its pressing level : if it has too much play, so as to incline and become tottering or leaning one way or another, and do not fall perpendicular upon the cheese-board, one side of a cheese will frequently be thicker than another ; and, what is still worse, one side will be thoroughly pressed while the other is left soft and spongy. Its power may be given by a screw, by a lever, or by a dead weight, and ought to be proportioned to the thickness of the cheese.

" I had one constructed on the above principles ; the power, a dead weight of stones, contained in a cubical box, moving in grooves so as to keep its bottom horizontal ; the medium weight, 1 cwt. 2 qrs. but regulated, by the stones, agreeably to the thickness of the cheese or cheeses to be pressed.

" In autumn, when the weather got cool and moist, the curd was scalded, to make the cheese come quicker to hand, (that is, sooner saleable) and to prevent a white woolley coat from rising. It is done thus : If from new milk, scalding water (boiling water with a small quantity of cold whey mixed with it) is poured over the whole surface of the curd as it lies at the bottom of the cheese-tub : if from skimmed or other inferior milk, the outsides only are scalded, after the curd is in the vat, by first pouring the scalding water on one side, and then, turning the cheeseling, pouring it on the other. For if in this case the curd were to be scalded, it would render it hard, and spoil the taste and texture of the cheese. In the scalding the cheeseling, the curd is first put into the bare naked vat, and the upper part scalded : the cheese-cloth is then spread over it, and the vat being turned, the curd falls into the cloth : the curd, with the cloth under it, is then put into the vat ; the outer edges pared off ; the paring broke, and rounded up in the middle ; and the scalding water poured upon it as before ; the folds of the cloth laid over, and the vat set in the press.

" The whey being pretty well pressed out, and the cheeseling (whether it has been scalded or not) having got firm enough to handle, which it will be in about half an hour, the dairy-woman takes it out of the vat ; washes the cloth in a pail of clean cold water ; spreads it over the vat ; turns the cheeseling upon it ; squeezes it gently into the vat ; folds over the cloth ; tucks in the corner with a wooden cheese-knife and replaces the vat in the press.

" Supposing the cheeseling to be made in the morning, it now remains in the press, untouched, until the evening ; when it is taken out, salted, put into a fresh dry cloth, and left in the press all night.

" The method of salting is this : The salt being well bruised, and the lumps thoroughly broken, it is spread plentifully on each side of the cheeseling, so as wholly to cover it, about one-tenth of an inch in thickness, more or less, in proportion to the thickness of the cheese. If this be of a considerable thickness, as suppose three inches and upwards, some salt is put into the middle of it, by stopping when the vat is half filled with curd, strewing on the salt, and on this putting the remainder of the curd.

" Next morning, if the curd be rich, or has been cold-run, the cheeseling is turned into another dry cloth, and left in the press till evening : but if on the contrary the curd be from poor milk, or from milk which before setting had acquired any degree of sourness, or if it has been run hot and quick, the cheeseling should in the morning be bare-vatted ; that is, be put into the vat without a cloth round it, and be put again into the press until evening.

" The use of bare-vatting is to take out the marks of the cloth, and thereby evade a waste of labour in bringing the cheese to a smooth glossy coat. The reason for the above distinction is, therefore, obvious ; for the harder the curd, the longer the marks of the cloth are in pressing out.

" In the evening, that which was turned into the dry cloth in the morning, is now bare-vatted ; and that which was bare-vatted in the morning, is now turned in the vat ; and, having stood in the press until morning, the process is finished. The cheeses are taken out of the vats, and placed upon the shelf.

" Thus, supposing the cheeseling to be made on Monday morning seven o'clock, it is, between eight and nine, taken out of the vat ; the cloth washed ; and immediately placed in the press again. On Monday evening, it is salted, and, if wanted, pared ; put into a dry cloth ; and replaced in the press. On Tuesday morning it is bare-vatted, or the cloth changed ;

ed; the cheesling, in either case, being turned, and again put into the press. On Tuesday evening it is again turned; and on Wednesday morning finally taken out of the vat and press.

"The objects of this most laborious department of cheese-making are, to preserve the cheese sound in itself, and to give it such an appearance as will recommend it to a purchaser.

"Cheeses newly made, naturally acquire a white scurfy coat; which, besides hiding, if not causing, the defects of the cheese, is at least unsightly, and is a certain mark of the slovenliness of its maker. This scurf arises more plentifully on a poor than on a rich cheese. Cold moist weather encourages it; but in warm weather, the oily exudation of a rich and well-made cheese goes near of itself to eradicate the white, and bring on that desirable blue coat, which is at once a criterion of the goodness of the cheese and of the skillfulness of the dairy-woman.

"The Norfolk dairy-woman, however, pays little regard to appearances; and, to speak truly of her, is equally ambitious to please the eye and the palate. Her method is this: the cheese (or rather as yet a bundle of curd) being taken out of the press, is salted upon a large earthen platter, in the same manner a piece of beef or pork is salted; and, having lain some time in salt, it is put upon a shelf to dry and stiffen.

"Being in a manner unpressed; never cleaned; and but seldom turned; it is no wonder, that in a short time the white scurfy coat gets full possession of it; or that its surface should appear bloated and wrinkled; or that its rind should be divided by innumerable fissures; or that its appearance, altogether, should be that of a sugared plumb-cake, rather than of a cheese.

"However, with respect to appearances, the Norfolk dairy-woman may plead in excuse that her customers are familiarized to the sights which she prepares for them: but when she follows a practice which subjects her produce, if not sold off while yet in an unripe state, to almost inevitable destruction, she is highly culpable.

"Cheeses made in this country are attacked by an enemy little dreaded, or wholly unknown, in the cheese counties; namely, a species of maggot, whose unlimited mischievousness seems to be confined to this part of the kingdom.

"The fly, which is the cause of this serious mischief, is of a species somewhat small, slender, black, and shining; very much resembling the small winged ant. Wherever it finds a crack or other defect in the rind, be it ever so minute, it turns its tail towards the aperture; and, by the insertion of a slender sheath not unlike the sting of a bee, there deposits its eggs. If the fissure be sufficiently large and deep, it enters its hind-parts also: if still deeper, it crawls backward into the cheese; leaving only its head in sight, and thus injects its eggs to a considerable depth.

"As the maggots rise into life, they travel still farther into the substance of the cheese; and, if it happens to be porous, soon pervade every part of it; in a few weeks working its total destruction: for not only the parts they immediately inhabit, but the whole cheese becomes bitter, and entirely inedible; except by some of the good people of the country, to whom custom has rendered even the maggots grateful.

"The first week or ten days, the new-made cheeses are carefully turned once a day; great care being had not to break the yet tender rind in turning; nor to suffer it to be cracked by too free an admission of a dry, parching air.

"As soon as they are become firm enough to be handled with safety, they are cleaned in this manner: some skimmed whey being put into a milk-lead, or other broad, shallow vessel, so as to cover the bottom of it half an inch or an inch deep, the cheeses to be cleaned are taken from the shelf and placed in the whey. One side being thoroughly moistened, the other side is placed downward: the edges too are wetted with a cloth, so as to make the whole coat of the cheese soaking wet. The dairy-woman then takes a hard brush, and brushes every part of the cheese; frequently dipping her brush in the whey, to eradicate the white coat more readily and more effectually. This done, she places them again on the shelves; but before they be quite dry, while their coats are yet moist, she rubs them over with a cloth, on which a piece of whey, or other common, butter has been spread. This keeps the rind supple, and free from cracks; checks the scurfy coat from rising; and, by stopping the pores and fissures of the coat, prevents the fly from depositing her eggs. If the rind be rough, from the marks of the cloth or other cause, she scrapes them

with a knife, or other instrument: this last operation, however, is as yet performed with great care and delicacy.

"Having thus washed and scraped them two or three times (in the course of about a week from the first cleaning) she removes them from the dairy-shelves into some spacious airy room, with a firm even floor, which she first rubs plentifully with green succulent nettles, so as to give it a temporary greenness, and then places her cheeses in rows upon the prepared floor. She now washes them no more; but if the coat be yet rough, and the scurf continue to rise, she scrapes them more freely than before; and, as the rind gets harsh, softens it with butter; thus continuing to treat them, and still continuing to turn them once a day, until they acquire a rich golden polish, and the blue coat begin to shew itself.

"This crisis, namely, the appearance of the blue coat, is not altogether regulated by the age of the cheese, but depends on its quality and the state of the weather. Perhaps it may appear before the cheese be one, perhaps not until it be more than two, or even three months old; therefore, no certain number of cleanings can be fixed; these rules, however, may be observable: scrape and rub them, until they be perfectly smooth; mellow the rind with butter, whenever, for want of natural exudation, their coats get dry and harsh; thus continuing to keep them smooth, yellow, and glossy, until the blue coat begin to make its appearance, voluntarily; and then, but not before, begin to encourage the blue coat.

"This ingenious process is thus conducted: having rubbed the floor thoroughly with fresh nettles, the dairy-woman places such of the cheeses upon it as she judges to be ready for coating; and upon the top of each cheese puts three or four vine-leaves; or, for want of these, a cabbage-leaf. This, if the cheese be good, will in a day or two bring up the desired vestment: but an inferior cheese will take a longer time in coating; and as the leaves lose their greenness and succulence, she replaces them with fresh ones; and as she turns the cheeses, which is now done every second or third day she re-covers the upper sides with leaves; but wipes their edges hard with a clammy cloth; so that the edge, and a narrow ring round each side, ever retain the polished yellow hue.

"When the cheeses were properly coated, and their edges had got sufficiently firm, they were placed on edge in a cheese-rack, and, without further care, (except once a week moving them a little round, and now and then wiping their edges) there remained until the time they were sent to market.

"Cheese-racks save labour in turning, collect the cheese into a small compass, and put it out of the way of vermin. They may be variously constructed. The plate-rack, with four or five tier one above another, seems to be the best form. If the cheeses be nearly of one size, the rack should be made the same width at the top as the bottom: but if they be of different sizes, it ought to be made narrower at the top than at the bottom; and if they be of different thicknesses as well as of different diameters, the spaces for the respective cheeses should likewise be varied. A small rack may be slung with a rope and pulleys at each end; so as to be drawn up and lowered down at pleasure: but a large one is difficult to sling, in a common room, in that manner; it ought therefore to stand on legs about two feet high, with a broad base-board projecting over the legs, so as to prevent vermin from climbing up into the rack.

"If from one year's experience I might venture to dictate in the art of making cheese in Norfolk, it would be in this way:

"To make use of a clean well-flavoured rennet.

"To pursue the method now in use of separating the curd from the whey: for, although the method above described may be eligible on rich land (and is practised in the counties of Wiltshire, Gloucestershire, and Warwickshire); yet, on a leaner soil, it may be prudent to preserve as many of the butyraceous particles as possible in the curd, rather than to suffer them to escape from this, and pass through the whey into butter; provided cheeses of a sufficient texture to secure them from the attacks of the fly, can be produced by the method of separating the whey now in practice in Norfolk.

"It is, however, observable in this place, that, in point of neat profit, it is highly probable that the certain advantage arising from the butter would more than overbalance any probable advantage which the quality of the cheese would receive by retaining in the curd a part of this butter.

" To let the cheeses remain in the press until they have acquired a sufficient degree of firmness, and their rind such a degree of toughness, that they may, on being taken out of the press, be safely handled, without danger of cracking.

" To keep their coats supple and clean ; the first, to prevent, as much as possible, their cracking afterwards in turning ; and the latter, to discover with greater readiness, and to remedy with greater ease when discovered, any flaw which, through accidents or oversight may happen.

" If through accident or neglect the fly should be suffered to make an impression (which is easily discoverable by a dimple in the rind and its softness to the touch), cut out the part affected (perhaps not yet larger than a walnut), dust the wound with pepper, fill it up with butter, and close it with a piece of soft paper : thus forming an artificial rind, which will secure it from further injury, until it has acquired an age sufficient to recommend it to a purchaser.

" By these rules, I am of opinion, that cheese of a middle quality as to richness, and secure against the fly, might be produced in East Norfolk ; provided the present method of separating the whey, will give the cheeseling a sufficient degree of texture to be handled with safety.

" My doubts, respecting this matter, arise not more from the loose crumbly texture of Norfolk cheeses in general, than from the following practice ; which, likewise, strengthens my apprehensions of the richness of the cheese in question being lowered by the curd having been broken too finely in the whey.

" A gentlewoman, who lives in this neighbourhood, who pays a personal attention to her dairy, and whose abilities in matters of household are indisputable, says, that when she wishes to make a cheese of a superior degree of richness, for her own table, she takes the curd and whey out of the cheese-tub very gently, with a fleeting dish (before they have been any way disturbed) and puts them immediately into the vat ; upon which she places a broad hoop ; by means of which she is able to pile up a sufficient quantity of this whey curd to fill the vat when pressed. She then folds over the cloth, and lets the press down upon it, very gently and gradually ; so as to squeeze out the whey, and at the same time retain that rich milky liquor which is mixed among the curd, and which by much breaking before it be put into the vat, is lost among the whey. With care, she says, the whey may be drawn off quite green and clear ; leaving the buttery particles behind in the cheese. By this means, she says, she has made cheeses which have tasted as fat as Gloucestershire cheese : but adds, that great care is necessary in handling a cheeseling thus made ; for if it crack, no pressing will ever close it again.

" If not, I am certain, that by adhering closely throughout, to the practice above registered, a wholesome good cheese, palatable to men in general, and proof against the fly, may be made in East Norfolk, with a great degree of certainty."

These observations, this ingenious gentleman indulged the public with in the year 1787 ; and two years after, in his Rural Economy of Gloucestershire on the same subject, says, " The art of making Gloucestershire cheese was originally one of the principal objects which induced me to make choice of Gloucestershire as a station. Being convinced, that in the quality of cheese, although much depended upon soil and herbage, much is certainly due to management.

" Gloucestershire has long been celebrated for its excellency in this art ; and where shall we study an art with so much propriety, as in the place where it excels, having had sufficient experience to enable me to make accurate observations on the practices of others.

" The objects of my attention have been,

Quality of milk,	Management of the curd,
Colouring,	Management of the cheese,
Rennets,	Defects and excellencies.
Method of running,	

" The management of the Vales of Gloucester and Berkeley differ in one most material article ; the quality of the milk. In the Lower Vale, the milk is run neat from the cow (or nearly so). In the Upper Vale, it has been already said, the prevailing practice is to set the evening's meal for cream ; in the morning to skim it ; and then to add it to the new milk of the morning's meal. The cheese made from this mixture is termed two-meal cheese : that from the neat milk, one-meal cheese or best-making.

" Besides this difference in produce, or species of cheese, there are other differences in the practices of the two Vales. It

will therefore be proper to register them separately ; left by mixing them, the perspicuity, which is requisite in describing the minutiae of an art so complex and difficult as this under consideration, should be destroyed.

" Of the Upper Vale the subjects to be noticed in this place are,

The season of making,
The quality of the milk,
Colouring,
Rennets,
Running,
Management of the curd,
Management of the cheese.

" The season of making, from the beginning of May to the latter end of October, including seven months, may be considered as the season of cheese-making, in this district.

" The mixture for two-meal cheese has been mentioned, in general terms, to be one part skim milk (namely milk which has stood one meal for cream) and one part new milk, neat from the cow. But this is seldom, I apprehend, strictly the case. A little fraud is, I am afraid, generally practised. A greater or less proportion of the morning's meal is set for cream, and returned the next morning to the cheese cowl, robbed of its better part. This is a trick played upon the cheese factor : but he being aware of the practice, little advantage, probably, is got by it. However, where the soil is superiorly rich, a small proportion may be kept out, and the cheese, nevertheless, be of a fair quality.

" Colouring is another deception which has long been practised by the Gloucestershire dairy-women ; and which, heretofore, probably, they practised exclusively. The colouring of cheese, however, is now become a practice in other districts.

" The practice has no doubt arisen from the Gloucestershire dairy-women's having observed, that, on some soils, and in some seasons, cheese naturally acquires a yellow colour ; and such cheese having been found to bear a better price, (either from its intrinsic quality, or because it pleased the eye better) than cheese of a paler colour, they set about counterfeiting nature ; and in the outset, no doubt, found their end in it.

" There is some difficulty, however, in this as in other cases, to copy nature exactly. Much depends on the material ; and something on the method of using it. If the colouring material be improperly chosen, or injudiciously used, the colour appears in streaks, and instead of pleasing the eye, offends it. On the contrary, with a suitable material, properly used, the artifice may be rendered undetectable.

" The material which has at length obtained universal esteem ; and which, I believe, is now almost invariably used, is a preparation of annotta ; a drug, the produce of Spanish America. It is brought to England (for the use of the dyers principally, I believe) under the appearance of an earthy clay-like substance ; but is well known to be a vegetable production.

" Annotta is the produce of *bixa orellana* of Linnæus. Miller describes the plant and its propagation. It is a tallish shrub, somewhat resembling the lilac : the colouring material is the pulp of the fruit, among which the seeds are bedded in a manner somewhat similar to those of the rose, in the pulp of the hip. It is a native of the West-Indies, and the warmer parts of America.

" Rennets are here learnedly spoke of by those who are superficially acquainted with their use. Experienced dairy-women, however, speak modestly on the subject : what they principally expect from rennet is the coagulation of their milk, having little faith in its being able to correct any evil quality which the milk may be possessed of.

" The universal basis is the stomach of a calf ; provincially a vell, from which an extract is drawn, in various ways, according to the judgment or belief of the dairy-women.

" The preparation of the vell, namely the cleansing and pickling, is generally done to their hands. Besides the internal supply, London and Ireland furnish this country with great numbers of vells, which are brought in casks, in pickle, and sold by the grocers and other shopkeepers. The price of English vells is about sixpence a piece, of Irish about fourpence ; these being comparatively small.

" In the dairy which I more particularly attended to in the Upper Vale, the rennet underwent no established mode of preparation. The prevailing method is this : some whey, being salted until it will bear an egg, is suffered to stand all night to purge itself : in the morning it is skimmed and racked off clear : to this is added an equal quantity of water-

ter-brine, and into this briney mixture is put some sweet briar, thyme, hyssop, or other sweet herbs; also a little black pepper, salt-petre, &c. tying the herbs in bunches, and letting them remain in the brine a few days. Into about six quarts of this liquor, four English vells, or a proportionate number of Irish ones, are put; and having lain in it three or four days, the rennet is fit for use. No part of the preparation is boiled, or even heated; and frequently no other preparation whatever is used, than that of steeping the vells in cold salt and water. Indeed, in another dairy, which I had an opportunity of observing in the Upper Vale, no other mode of preparation was used; and few if any dairies make better cheese: I speak from my own knowledge.

"Therefore, from the evidence which I have collected in the Upper Vale it appears that, provided the vells be duly prepared, be thoroughly cleansed and cured, no subsequent preparation of rennet is necessary. Nevertheless, were I to recommend a practice in this case, it would be that of doing away the natural faint flavour of the vells, by some aromatic-infusion: but I should prefer spices to herbs for this purpose.

"In this, as in every other stage and department of cheese-making, there are shades of difference, in the practices of different dairy-women. No two conduct the business exactly alike; nor is the practice of any individual uniform. There are at present, no fixed principles to go by. Every thing is left to the decision of the senses; uncertain guides. Nevertheless practice, carried on with attention, and assisted by good natural abilities, will do much; though it cannot alone attain that degree of perfection, which, when joined with science, it is capable of reaching.

"The mistress of the dairy, whose practice I am more particularly registering, has both natural and acquired advantages, which render her dairy, though not of the first magnitude, a proper subject of study. Her father was possessed of the best breed of cows in the Vale, and was one of the largest dairy farmers in it. Her mother, the first among its dairy-women, and herself possessed of that natural cleverness, without which no woman, let her education be what it may, can conduct, with any degree of superiority, the business of a cheese-dairy.

"In giving a detail of my own practice of Norfolk, I mentioned some known principles of coagulation, as well as some received opinions of dairy-women, respecting the nature of this process. The same opinions are held in this district, in which some other received ideas prevail: namely, that the quantity of curd is in proportion to the length of time of coagulation; there being the least curd when longest in coming.

"That setting the milk hot, inclines the cheese to heave: (a defect which will be spoken to hereafter.)

"And that lowering the heat of the milk with cold water (when made too hot) has a similar effect.

"To give some idea of the practice of the Upper Vale, in this most delicate stage of the art, I will detail the observations made, during five successive mornings, in the dairy which has been spoken of.

"Tuesday, 2 September, 1783. The quality of the milk, that which has been described. Part of the skimmed milk added cold; part warmed in a kettle over the fire, to raise the whole to a due degree of heat, coloured in the manner described; an estimated sufficiency of rennet added; the whole stirred and mixed evenly together; the exact heat of the mixture 85° of Fahrenheit's thermometer; the morning close and warm, with some thunder; the cheese-cowl covered, but placed near an open door; the curd nevertheless came in less than forty minutes, much sooner than expected, owing probably to the peculiar state of the air. The retained heat of the curd and whey, when broken up and mixed evenly together, 82° . The curd deemed too tough and hard, though much the tenderest curd I have observed.

"Wednesday, 3 September. The morning moderately cool; the heat of the milk when set $83\frac{1}{2}^{\circ}$. The cowl partially covered, and exposed to the outward air as before, came in an hour and a quarter; the heat of the curd and whey mixed evenly together 80° ; but at the top, before mixing, only 77° ; the curd extremely delicate, and esteemed of a good quality.

"Thursday, 4 September. The morning cool, a slight frost; the milk heated this morning to 88° ; the cowl more closely covered, and the door shut part of the time; set at half past six; began to come at half after seven; but not

sufficiently hard to be broken up until eight o'clock—an hour and a half. The whey, when mixed, exactly 80° . The curd exceedingly delicate.

"Thus it should seem, that it is not the heat of the milk when it is run; but the heat of the whey, when the curd is sufficiently coagulated, which gives the quality of the curd. My own practice led me to the same idea; and the Gloucestershire dairywomen, by their practice, seem fully aware of the fact. As autumn advances, the heat of the milk is increased; and accordingly as the given morning happens to be warm and cool, the degree of warmth of the milk is varied.

"Friday, 5 September. This morning, though mild, the curd came exactly at 80° ! what an accuracy of judgment here appears to be displayed! Let the state of the air be what it will, we find the heat of the whey, when the curd is sufficiently coagulated, exactly 80° , and this, without the assistance of a thermometer, or any other artificial help; but what will not daily practice, natural good sense, and minute attention accomplish.

"Saturday, 6 September. This morning the curd came too quick; the heat of the whey (after the curd had been broken and was settled) full 85° ! The curd much tougher and harder than it should be. Here we have a proof of the inaccuracy of the senses, and of the insufficiency of the natural judgment in the art under consideration: it may frequently prove to be right; but never can be certain. Some scientific helps are evidently necessary to uniform success.

"The management of the curd has five distinct operations belonging to it: breaking, gathering, scalding, vatting, preserving spare curd.

"In breaking, new ideas pour in. The curd, while suspended in the whey, is never touched with the hands. The curd is broken, or rather cut, with the triple cheese-knife, which has been described. This mode of separating the curd and whey, though not universal, appears to be highly eligible: the intention of it is that of keeping the fat in the cheese: a matter which, in the manufacture of two-meal cheese, is of the first consideration. The operation is performed in this manner:

"The knife is first drawn its full depth across the cowl in two or three places; and likewise round by the sides; in order to give the whey an opportunity of escaping as clear as may be. Having stood five or ten minutes, the knife is more freely used: drawing it briskly in every direction, until the upper part of the curd be cut into small checquers. The bottom is then stirred up with the dish, in the left hand; and, while the lumps are suspended in the whey, they are cut with the knife in the right; thus continuing to stir up the curd with the dish, and separate the lumps with the knife, until not a lump larger than a bean is seen to rise to the surface.

"The curd having been allowed about half an hour to settle in, the whey is laded off with the dish, passing it through a hair sieve into some other vessel.

"The principal part of the whey being laded off, the curd is drawn to one side of the cowl, and pressed hard with the bottom of the dish; the skirts and edges cut off with a common knife, and the cuttings laid upon the principal mass, which is carried round the tub, among the remaining whey, to gather up the scattered fragments that lie among it. The whole being collected, the whey is all laded or poured off, and the curd left in one mass, at the bottom of the cowl.

"It is, I believe, the invariable practice of the dairywomen of Gloucestershire to scald the curd. This accounts for their running the milk so comparatively cool. Were the delicate cool-run curd of this district to be made into cheese without previously scalding, the cheese made from it would require an inconvenient length of time to fit them for market.

"The method of scalding the curd here varies from that mentioned in the Economy of Norfolk. There it was scalded in the mass, pouring hot water over the surface, as it lay at the bottom of the cheese-tub: but here the mass is broken, first by cutting it into square pieces with a common knife, and then reducing it, with the triple knife, into small fragments, mostly as small as pease: none of them is left larger than a walnut; and among these fragments the scalding stuff is thrown, stirring them briskly about, thereby effectually mixing them together; and, of course, scalding the whole as effectually and as evenly as this method of scalding will admit of.

"The

"The liquid made use of here, for scalding curd, varies in different dairies. Some dairywomen scald with whey, violently objecting to water, while others use water, objecting with equal obstinacy to whey, while dairy-women in general, I believe, mix the two together.

"It seems to be understood, that different grounds require different kinds of scalding liquor.

"The quantity is in proportion to the quantity of curd; enough to float the curd, and make the mixture easy to be stirred about with the dish.

"Part of it is heated to near boiling heat, and this lowered with cold liquid to a heat proportioned to the state of the curd: soft curd is scalded with hot, hard curd with cooler liquid.

"In scalding, therefore, the dairy-woman has a remedy for any misjudgment her sense of feeling may have led her into, in the stage of coagulation: let the curd come too soft or too hard, she can bring it to the desired texture, by the heat of the scalding liquid. And here seems to hinge, principally, the superior skill of the Gloucestershire dairy-woman: by running the milk cool, she can, in scalding, correct any error which has been committed in running.

"Saturday, 6 September. This morning, the curd being too tough, the whey was used cooler than it was yesterday morning, when the curd was sufficiently tender. Yesterday morning 140°, this morning 125°.

"Tuesday, 9 September. This morning the curd came at its proper heat 80°, and the heat of the scalding whey was 142°.

"The curd being thoroughly mixed and agitated among the whey, and having had a few minutes to subside in, the dairy-maid began immediately to lade off the whey. This, however, is not the universal practice: in some dairies the curd is suffered to remain among the scalding stuff half an hour: thus (as has been observed) there are shades of difference in every stage of the process.

"Wednesday, 24 Sept. This morning the curd came too tender, and the morning being cool, the scalding whey was heated to 161°, and stood upon the curd near ten minutes: this changed it from a state of jelly as to softness, to the same tough hard mass it is always left after scalding.

"The scalding liquor being mostly laded off, a vat is placed on the cheese-ladder, laid across the tub, and the curd crumbled into it with the hands, scrupulously breaking every lump, squeezing out the whey as the handfuls are taken up, and again pressing it with the hands in the vat, which is every now-and-then set on edge to let the whey run off.

"The vat being filled as full and firmly as the hand alone can fill it, and rounded up high in the middle, a cheese cloth is spread over it, and the curd turned out of the vat into the cloth; the vat washed or rather dipped in the whey, and the inverted mass of curd with the cloth under it, returned into the vat. The angles, formed by the bottom of the vat, are pared off and crumbled upon the top, with which they are incorporated by partially breaking the surface, and rounded up in the middle as before; the cloth folded over and tucked in; and the vat with its contents placed in the press.

"It is observable that only one cheeseboard is used in the Gloucestershire dairies, let the number of vats be what they may. The bottoms of the vats being made smooth and even, they answer the purpose of cheeseboards to each other, the uppermost only requiring a board. No sinking boards are ever made use of here, as they are in other districts, the vats being rounded up with curd in such a manner as, from experience it is known, will just fill them when sufficiently pressed.

"Preserving the overflowings of the last vat of to-day's curd, to be mixed up with that of to-morrow, is a common practice of this country, where cheeses, if they be intended for the factors, are obliged to be made of some certain size. The vats are all nearly of the same bigness, and cannot be proportioned to the curd, as they may when vats of various sizes are made use of.

"In the neighbourhood of Gloucester, when the quantity of spare curd is considerable, as four or five pounds, it is frequently made into a small cheese for the Gloucester market, in which it may be sold, in a recent state, (namely at three weeks to two months old) from 2½ to 3½ a pound, according to its age: three pence a pound is the ordinary price for such little two-meal cheeses.

"When the quantity of spare curd is small, or where the making of the little cheeses is not practised, the whey is pressed out and drained off as dry as may be, and the curd

preserved in different ways. In the Upper Vale I have seen it put into an earthen vessel and covered with cold water. The next morning it is re-scalded thoroughly once or twice; broken as fine as possible, and either mixed evenly with the fresh curd; or, less eligibly, put into the middle of a cheese: This, however, is, with good reason, objected to by the factors. A harsh, crumbly, ill tasted seam is formed in the middle of the cheese; a disagreeable circumstance, which, in cutting a cheese, is too frequently met with. Mixing the stale curd more evenly among the fresh has an effect almost equally disagreeable: the particles of the stale curd ripen faster than the rest of the cheese, which is thereby rendered unsightly and ill-flavoured.

"In a small dairy it is impossible to make cheeses sufficiently sizable for the Gloucestershire factors, and at the same time avoid having, frequently, spare curd. But in a large dairy, where three or four cheeses are made from one running, it might, by a proper number and assortment of vats, be generally avoided, and the cheeses be at the same time made within size.

"The management of the cheeses requires to be subdivided agreeably to the different stages of management:

"The management in the press. The management while on the dairy shelves. The operation of cleaning. The management in the cheese-chamber.

"Having stood some two or three hours in the press, the vat is taken out; the cloth pulled off and washed, the cheeseling turned into the same cloth and the same vat, (the cloth being spread under and folded over as before) and replaced in the press.

"In the evening, at five or six o'clock, it is taken out of the press again, and salted in this manner: the angles being pared off, if wanted, the cheeseling is placed on the inverted vat, and a handful of salt rubbed hard round its edge, leaving as much hanging to it as will stick. Another handful is strewn on the upper side, and rubbed over it pretty hard, leaving as much upon the top as will hang on in turning. It is now turned into the bare vat, without a cloth; and, a similar quantity of salt being rubbed on the other side, is again put into the press.

"Next morning it is turned in the bare vat; in the evening the same; and the succeeding morning taken finally out of the press, and placed upon the dairy-shelf.

"Each cheese therefore stands forty-eight hours in the press. At the second or third it is turned in the cloth; at the tenth, the cloth is taken off and the cheeseling salted; at the twenty-fourth, it is turned in the bare vat; at the thirty-fourth, the same; and at the forty eighth finally taken out.

"The method of making green cheese, in this district, is the following: For a cheese of ten or twelve pounds weight, about two handfuls of sage and one of marigold leaves and parsley, are bruised and steeped one night in milk. Next morning the greened milk is strained off, and mixed with about one third of the whole quantity to be run. The green and the white milks are then run separately, keeping the two curds apart until they be ready for vatting. The method of mixing them depends on the fancy of the maker. Some crumble the two together, mixing them evenly and intimately; others break the green curd into irregular fragments, or cut it out in regular figures with tins for this purpose. In vatting it the fragments or figures are placed on the outsides. The bottom of the vat is first set with them, crumbling the white or yellowed curd among them. As the vat fills, others are placed at the edges, and the remainder buried flush with the top. The after-treatment is the same as that of plain cheeses.

"In the management on the dairy-shelves, the young cheeses are turned every day, or every two or three days, according to the state of the weather, or the fancy or judgment of the dairywomen. If the air be harsh and dry, the window and door are kept shut as much as may be: if close and moist, as much fresh air as possible is admitted.

"Having remained about ten days in the dairy (more or less according to the space of time between the washings,) they are cleaned, that is, washed and scraped, in this manner: a large tub of cold whey being placed on the dairy floor, the cheeses are taken from the shelves and immersed in it, letting them lie perhaps an hour or longer, until the rind become sufficiently supple. They are then taken out, one by one, and scraped with a common case-knife somewhat blunt, guiding it judiciously with the thumb placed hard against its side, to prevent its injuring the yet tender rind;

rind; continuing to use it, on every side, until the cloth marks and every other roughness be done away; the edges more particularly being left with a polished neatness. Having been rinsed in the whey and wiped with a cloth, they are formed into an open pile (in the manner raw bricks are usually piled) in the dairy window, or other airy place; to dry, and from thence are removed into the cheese chamber.

"The floor of the cheese chamber is generally prepared, by rubbing it with bean-tops, potatoe-haulm, or other green succulent herbage, until it appear of a black wet colour. If any dirt or roughness appear upon the boards, it is scraped off with a knife, and the floor swept clean with a hair broom. The cheeses are then placed upon it regularly in rows; and kept turned twice a week, their edges wiped hard with a cloth once a week, and the floor cleaned, and rubbed with fresh herbs once a fortnight.

"The preparation of the floor is done with the intention of encouraging the blue coat to rise. To the same intent the cheeses are not turned too frequently; for the longer they lie on one side without turning, the sooner the blue coat will rise. If, however, they be suffered to lie too long without turning, they are liable to stick to the floor, and thereby receive injury. If, by accident or otherwise, the coat come partially, it is scraped off. This however seldom happens in a rich-soiled country, and all the care and labour requisite, in this stage, is to turn them twice a week, wipe their edges once a week, and to prepare the floor afresh once a fortnight. If the cheese chamber be too small to admit of the whole being placed singly, the oldest are doubled; sometimes put three or four double.

"It is striking to see how well cheeses of this district bear handling at an early age: even at the time of washing, the dairymaid will frequently set the cheese she is scraping on-edge upon another, lying flat on the table, without injury. At a month old they may be thrown about as old cheeses. Their rinds appear as tough as leather. This must be owing to the scalding: it cannot be owing to their poverty. They are evidently richer, fatter, than the new milk cheeses of many districts.

"In large dairies in the Upper Vale, cheese is sold and delivered three times a year, namely in July; again at Michaelmas, and finally in the spring. In small dairies only twice: about the latter end of September, and again in the spring.

"It is bought principally by cheese factors, who live in or near the district. The same factor generally has the same dairy, year after year, frequently without seeing it, and, perhaps, without any bargain having been made previous to its being sent in. There is, indeed, a degree of confidence on the part of the buyer and seller, which we seldom meet with among country dealers.

"In summer and early autumn the factors will take them down to six weeks old, provided they be found firm marketable cheeses; that is, neither broken nor hove: a defect which even the best dairywomen cannot always prevent. During winter, provided their coats be perforated to give the internal air an opportunity of escaping, the swollen cheeses will generally go down, and, in the spring, become marketable.

"Mr. Marshall, having treated of the Vale of Gloucester, thus proceeds with the Vale of Berkeley, in which he says "It will be proper to remark; that the hundred of Berkeley, which forms a considerable part of that district, has ever been celebrated for the superior quality of its cheese. What in the kingdom at large is termed Gloucester cheese, particularly double Gloucester, is in Gloucestershire called Double Berkeley: not more on account of the superior quality of the cheese of this district, than because the principal part of the thick cheese of Gloucestershire is made within this hundred.

"It will likewise be proper to apprise the reader, that the cheese of this district was in higher repute some fifteen or twenty years ago than it is at present; as otherwise some expressions which occur would be obscure. It must, however, be understood that there is no cheese of the first quality now made in the Vale of Berkeley: all that is meant to be conveyed is, that the cheese of Berkeley hundred is not so uniformly excellent as it was some fifteen or twenty years ago.

"In this case, as in that of the Vale of Gloucester, on the same subject, it will be proper, before the objects be separately examined, to take a view of

Managers, Utensils,
Dairy-rooms, Milking.

"The three last, however, vary so little from the description already given of those of the Upper Vale; that it is unnecessary to repeat the descriptions here. Therefore the only thing requisite, in this case, previous to an account of the particular objects; is some account of the managers of the Lower Vale; especially those from whom I gained my information, and whose practice I am about to register.

"A superior dairywoman is so highly spoken of, and so highly valued, in this district, that one is led to imagine every thing depends upon management. Instances are mentioned of the same farm, under different managers, having produced good and bad cheese: even changing a dairy-maid has been observed to make a considerable difference in the quality of the produce.

"On the other hand it has likewise been frequently seen that the same managers, the same dairy-woman, the same assistants; and the same cows, which on one farm produced cheese of the first quality, have not, on being transferred to another, been able, on their first removal (at least) to produce marketable cheese. Indeed it seems to be generally understood throughout the two Vales that it is necessary to know the ground, by two or three years experience, before good cheese can be made with any degree of certainty.

"These two circumstances tend to prove the same fact: namely, that very much depends upon management.

"I had an opportunity of seeing different dairies in the Vale of Berkeley, and of observing the practices of different dairywomen; but the dairy which principally engaged my attention was that of Maherley, near Berkeley, whose manager, Mrs. Wade; whether we consider her education, her natural abilities, or her experience, ranks, most deservedly, among the first dairywomen of the district. Her mother was mistress of an hundred cows; herself of forty or fifty, during the last twenty or thirty years. What renders her practice singularly valuable, is that of its being the old established practice, which brought the Berkeley cheese to its highest degree of excellency, unaltered; as that of most dairies has been, by modern deviations.

"From this I was led to a modern dairy, equally distinguishable, that of Mr. Bigland of Frocester, the man most capable of giving me information, in every department of the subject I was investigating. As purchaser of, perhaps, half the cheese which is made in the Vale of Berkeley, he is, of course, intimately versed in the quality of cheese. As proprietor of a dairy of more than fifty cows, the business of a dairy farm is familiar to him. And, as a man of science; he has paid more attention to the minutiae of the art, most especially under consideration, than any other man I have conversed with on the subject. His ability of information, however, was exceeded by his liberality in communicating it. He not only gave me free admittance into his dairy, but led me over his warehouses, and, in the most disinterested manner, made me acquainted with the good and bad qualities of cheeses; of the defects they are liable to, and the excellency they are capable of.

"The objects of the dairy of this district are, in species, the same as those of the Upper Vale: namely,
Calves, Milk, Butter, Cheese:

"In the management of the two first, I met with nothing new or noticeable. The quantity of milk-butter made here in summer is small. Every pound is plunder. Cheese-making was the object which led me into the district, and was the almost only subject which engaged my attention.

"The species of cheese is, in respect to quality, uniformly new milk, one meal, best making; but in regard to size the species varies. It is either double or single, thick or thin. The thin cheeses, when marketable, weigh from nine to twelve pounds each; the thick from fifteen to twenty-five pounds. The width of the vats is for both species the same, namely about fifteen inches, the size being varied altogether by thickness.

"The requisite subdivisions of the subject, in this case, are the same as in the Upper Vale.

"The season of making thin cheese, is from April to November; but the principal season for making thick cheeses is during the months of May, June, and the beginning of July. If made late in the summer, they do not acquire a sufficient degree of firmness, to be marketable the ensuing spring.

"Here, as in the Upper Vale, the milk is seldom genuine; it being, I believe, an universal custom to keep a little out. The practice has two conveniences attending it; it brings in a little easy-got ready-money to go to market with, (while

(while the trades-people in return are furnished with better butter than otherwise they might have) and the skimmed milk is found useful in lowering the too great warmth of milk immediately from the cow. If the proportion skimmed be not great, the crime committed is venial, the milk of this country being much above par as to richness: even lowered as it is, the cheeses made from it will sometimes, in hot weather, exude an oleaginous liquid which might be collected in spoonfuls from their surfaces.

"Colouring is here considered as a thing of the first importance in the art of cheese-making. A good material is highly valued, but is not always to be easily come at by dairy-women, who, perhaps, have only one market to go to. For this reason it is here a pretty general practice for the cheese-factor to furnish the dairies, whose cheeses he expects to purchase, with colouring of the best quality.

"Thus we find the crime of colouring cheese is not an act of darkness, done clandestinely by the dairywoman, to deceive the factor; but, on the contrary, an open, known department in the business of cheese-making, to which the factor gives his assent and his assistance. The dairy-woman's motive is evidently that of obliging her customer the factor. Should it be asked what can be the factor's motive for encouraging this adulteration of an article of human food, the answer is evident: he can have no other than that of obliging his customers, the cheesemongers, who as evidently encourage this abominable practice, for the base end of obliging their customers, the consumers. The truth is, men in general prefer well-coloured cheese to that which is ill coloured; or, in other words, highly-coloured cheese is at present fashionable. The cheesemongers knowing this, will not purchase pale coloured cheese of the factors; and, for this reason, the factors object to a pale-coloured dairy of cheese.

"In the infancy of the art, the colouring of cheese was a crime, because it was then done with an intent to deceive: but dairy-women, at present, have no such intention. They colour it now, through a kind of necessity, and with intentions as innocent as those of other manufactures who change the colour of their raw materials. If the eaters of cheese were to take it into their heads to prefer black, blue, or red cheese, to that of a golden hue, I will venture to pass my word for the dairywomen, they would do their best endeavour to gratify them.

"If, in the colouring of cheese, any pernicious substance be made use of, the consequences to the community may be of a serious nature: but whether the preparation of annotta, which is now in common use for that purpose, be pernicious or salubrious to the human frame, no man perhaps has ever attempted to ascertain: it may, for any thing the declaimers against it appear to know to the contrary, be the most salutary alterative human invention can devise. It may, however, be destructive to human health, and its medical qualities ought certainly to be enquired into.

"It is, no doubt, a fact, that annotta belongs to a class of plants, many individuals of which are of a poisonous nature. The fastidious, however, have less to fear, since the celebrated *thea* (tea) stands not only in the same class, but in the same order, with *bixa orellana*.

"It appears by observations sufficiently accurate, that one ounce avoirdupoise of this preparation will colour, sufficiently, more than two hundred pounds of cheese. The number of grains in one ounce avoirdupoise are 437½. So that each pound of cheese, moderately coloured, contains two grains of the preparation.

"Few men, perhaps, eat more than a pound of cheese a day each (I speak of men whose principal food is cheese). It ought without dispute to be enquired into, whether two grains of that preparation, taken daily, is or is not injurious to the human frame. As to the small quantity which is eaten by men in general, on a stomach already cloyed with other aliment, it does not seem to be an object of enquiry. If so inconsiderable a portion were capable of doing any degree of injury, thousands must long ago have been poisoned by eating cheese. It might, nevertheless, be well, both for the manufacturers and the consumers of cheese, if some regulation could be made respecting the material of colouring.

"The prudent manager of the Maberley dairy cures her own vells, under a conviction, resulting from long experience, that more depends on the vell itself, than on any particular method of preparing rennet from it.

"Her method of preparing the vells is the same as given before. Being first made perfectly clean by washing, they

are salted and laid down, in an earthen vessel, for a few days. They are then taken out, the first pickle drained from them, re-salted, and put down into jars. She seldom uses them under one year old: she sometimes keeps them two or three years before she uses them.

"Her ordinary method of preparing her rennet is to lay the vells in salt and water, which has been boiled with a little black pepper in it, and to add a lemon stuck with cloves, which (the lemon) she thinks gives the rennet a quickness; but says, that she has put the vell into a little cold water, and made as good a cheese from it as ever she did with prepared rennet. She never uses the vells a second time.

"The rennet made use of at Frocester was prepared in this manner: to two gallons of water, made salt enough to bear an egg, add one pennyworth of mace, one pennyworth of cloves, a handful of sweet briar and hawthorn buds, a small quantity of alum (about the bulk of a small walnut) the same quantity of sal prunellæ, a small quantity of cochineal, (a small pinch, the bulk of half a hazle nut) and, if to be had, two or three bay leaves. Pound the alum, salt prunel, &c. and having mixed the several ingredients with the salt and water, add five vells; or, if small, six or seven. In about ten days the rennet will be fit for use.

"Another recipe which I was favoured with in this Vale is the following: three handfuls of common salt to three quarts of water: a quarter of an ounce of salt petre, as much black pepper as will lie upon a shilling, a small quantity of agrimony, a sprig of sweet-scented thyme, a handful of sweet briar, a handful of the red buds of hawthorn, four heads of sage. Add the ingredients, and boil the water a quarter of an hour. To the liquor, when cold, put one vell. The rennet may be used the next day.

"I mention the different methods of preparing rennet, because they, in reality, form a part of the practice I am registering. They are facts which ought not to be omitted. Nevertheless, from what I have been able to learn from men who have an opportunity of observing the effects of different rennets, their efficacy reaches no farther than to do away the faintness of the vells, and thereby render the rennet perfectly sweet.

"It is well understood that the quality of curd varies with the degree of heat of the milk at the time of coagulation. Milk immediately from the cow, especially in summer, is, in this district, considered as being much too warm for running, requiring to be lowered to a desired degree of heat, before the rennet be added. If the skim milk of the preceding meal be not adequate to this intention, cold water is added, to reduce it to the required heat; and no evil effect is perceived from the practice. In my own experience, cold water had, in this case, a probable bad effect.

"In the Upper Vale I found the use of it, for this purpose, cautiously avoided. Nevertheless, in this Vale, there are dairy-women of the first character, who will throw a pailful of cold water among their milk, without being apprehensive of any evil effect. It is highly probable that much depends on the specific quality of the water used for this purpose. The water of the Upper Vale is not of the best quality. The waters of Cheltenham, or those of Harrogate, might have a still worse effect.

"Maberley, 4 Oct. 1783, half past seven in the morning. Heat of the air in the dairy-room 58°, of the milk when stirred up with the rennet 86°; covered with cheese-cloths, came at half past eight, one hour, at 84°. the curd untender.

"Note—the small loss of heat in this instance is probably owing to the quantity of milk and the closeness of the morning.

"Maberley, 4 Oct. 1783. Half past four in the afternoon. The air 64°, the milk 84°. came at half past five, one hour, at 81½°. The curd delicate.

"Frocester, 9 Oct. 1783. Twenty minutes before eight in the morning. Heat of the air in the room 53°. of the milk 81°. Covered first with cheese-cloths, and afterward with a thick woollen cloth. At a quarter before nine, the coagulation having then begun to take place, the surface was broken with a skimming-dish to hasten the coming: a practice not uncommon in this dairy, where the milk is run peculiarly cool. At nine the coagulation was complete, one hour and twenty minutes. The heat of the whey 76°. The curd extremely soft and delicate.

"Maberley, 4 Oct. 1783. Morning. The curd broken with a double cheese-knife, and also with the hand, keeping it in motion with the dish.

"In this dairy the cheese-tub is scarcely left from the time the curd comes, until it be gathered in a mass. As the curd settles, the dairywoman keeps collecting it, with her hands, to one side of the cowl, carrying the mass round the tub, from time to time, to collect the scattered curd the faster. The whey is laded off, into a large oval tub, to stand for cream. The curd being laid bare, the skirts of the mass are cut off and piled upon the rest; at the same time gathering the body of the mass, to let out the whey which may have been shut up in gathering. The remaining whey is strained through a sieve, to collect the crumbs of curd, of which the Gloucestershire dairywomen are scrupulously tenacious.

"The curd being thus freed from the principal part of the whey, but not yet from the whole of it, it is put into naked vats, (pressing it well in with the hands, rounding it up in the middle, in the usual way, throwing a loose cloth over, and tucking it in) and the vats set in the press, in order to free it the more effectually from the remaining whey.

"Having stood ten or fifteen minutes in the press, it is turned out of the vats into the cheese tub again, broken small with the hands, and cut still smaller with the double knife.

"It is now scalded with water lowered with whey, about three parts water to one part whey. The heat, in the instance under notice, 108° . The quantity a pailful, thrown upon the crumbled curd, and the whole stirred briskly about; mixing the curd and the scalded stuff evenly together. The heat of the mixture 84° .

"Having stood a few minutes for the curd to subside, the liquor is laded off, the curd collected, and vatted in this manner: an assistant takes the curd out of the tub, the manager trimming it into the vats, both of them pressing it hard with their hands, freeing it all they can from the scalding liquor.

"The vat about half full, a little salt, about an ounce, is scattered over the surface, and worked in among the curd, the vat filled up, and the mass turned two or three times in the vat, the edges being pared and the middle rounded up, each turning. At length it is turned into a cloth, in the manner which has been described in the Upper Vale, and placed in the press.

"Note.—In this instance one of the vats being found too full, and another not sufficiently, a thin slice was shaved off the one and laid upon the other, without any breaking or intermixture, to make the parts incorporate.

"Maberley, 4 Oct. 1783. Evening. The method of breaking, collecting, and freeing from the whey, the same as in the morning. The heat of the scalding liquor in this instance 106° , which was lowered by the curd to 90° , the quantity and quality nearly the same as in the morning.

"Note.—The quantity of curd being in this instance considerably less than it was in the former, the heat of the mixture became of course greater than it was in the morning. Here lies a delicacy of management: it is not the heat of the scalding liquid, but that of the mixture, which gives the texture of the curd; a circumstance this excellent dairywoman is fully aware of. She therefore keeps some of the hot liquor back, and having stirred the mixture, adds, or withholds it, as her judgment directs her, regulating the heat of the mixture to the state of the curd: thus she scalded 84° , with 84° — $81\frac{1}{2}^{\circ}$, with 90° .

"Frocester, 9 Oct. 1783. The curd broke with a double (one-edged) knife alone, without using the hand, immediately, in the operation; keeping it moving, as in the other instances, with the dish; the operation taking up about ten minutes.

"Having stood about twenty minutes to settle, the curd was collected with the dish, hands, and arms, to one side of the cowl; the whey laded off, the curd collected nearer together, pressed gently in the bottom of the cowl, and put into vats and the press, to free it from the remaining whey.

"Note.—Here we have a material difference in the practices of the two Vales: in the Upper Vale it is recommended to get the curd hard together with the hands in the bottom of the cowl; but subjecting it to the power of the press is a much higher kind of compression. There the curd is, through the species of milk, leaner than it is here, where a little fat is not missed; and thus squeezing the curd, while soft, may, perhaps, assist in freeing it from that superfluous richness which may promote its heaving.

"Having remained full twenty minutes in the press, the curd was returned into the cowl, cut small with the double

knife, and scalded with a pailful of hot water; lowered by a dash of whey, to 124° , which the curd reduced to 95° .

"Note.—The scalding liquor, in this instance, almost wholly water, became, after it had stood some time upon the curd, as rich to all appearance as whey: a yellow oil swimming on the surface.

"The cheese management in the press. Maberley;—having stood about an hour in the press, they are turned in finer cloths; and, about two hours afterward, salted the first time, and turned into the same cloths. The presses, which I saw in this Vale, were mostly loaded with gravel, in cubical boxes, raised by rollers, and made to fall horizontally on the cheeses. The Maberley press is double; each division of it holding six or eight thin cheeses. In very large dairies, especially where much thick cheese is made, three or even four presses are requisite.

"In the evening, those made in the morning are again turned, and again salted; and the same repeated next morning: the surface of each cheese being salted three times, besides the little strewed among the curd. The ensuing evening they are bare-vatted; and the next morning finally taken out: each cheese standing four meals in the press.

"The method of salting, in this dairy, varies from that which has been described. The cheese is salted in the vat. On taking it out of the press the cloth is thrown back and the upper side salted: the edges are then raised up with the cloth (one part after another) high enough above the rim of the vat to be conveniently salted: the cheese being turned, (in the same manner as it would be if the salting were not done) the other side is salted; the cloth spread over; and the vat returned to the press.

"Frocester;—the cheese having stood some five or ten minutes in the press, they are turned into dry cloths, of the same degree of fineness as those taken off. In these, they stand in the press, until the next meal; when they are salted the first time. The second meal they are again turned into the same cloth, and salted the second, which is the last time. The third meal the cloths are taken off; the cheeses being then put into the bare vats; in which they remain so long as there is room for them in the press; perhaps three or four days.

"I observed a different management of spare curd, here, to that described in the Vale of Gloucestershire management. Here I found it cut into slices, salted, and left spread upon an inverted vat, until the ensuing meal: when it was broken and mixt promiscuously with the fresh curd. But under this management (though kept only one meal) it is found injurious to the cheese; and is therefore to be avoided with all possible care.

"Where a large dairy of cows are kept, the dairy-room shelves are not sufficient to contain the young cheeses; which, in large dairies, are carried, immediately from the press, into an upper room, fitted up with shelves for their reception. Here they are turned, generally once a day; and remain under this treatment, until they have acquired a sufficient degree of texture, to enable them to undergo the operation of washing: a work which is gone through every three, four, or five weeks, as convenience, or want of room, may require.

"Cleaning is done, here, in a manner similar to that which is described in the Vale of Gloucester. In some dairies, water is used; not whey; and in autumn, when the weather gets cold, the water is moderately warmed. Hot water is thought to soften the rind too much, and is deemed improper.

"Note.—In the operation of washing, the firmness or solidity of the cheeses is seen in their specific gravity; by observing which of them sink and which of them swim in the water. If they sink, they are of a sufficiently close texture: if they swim, they are hove; that is, either porous, or hollow in the middle. This is a very simple, and it seems, a very certain ordeal.

"Cheeses rich in quality, and well manufactured; more especially, I believe, the produce of some particular soils; acquire, by age, a variegated colour; particularly at and near the surface; which becomes clouded with red. This natural effect is not unfrequently observable in Cheshire cheese: which being (until very lately) suffered to appear in its natural colours, the reddening parts show themselves evidently, through the paleness of the ground they appear in. I have also seen an instance of this effect in some Gloucestershire cheese, of a curiously fine quality, and great age.

"The exact time when the imitation of this natural effect took

took place, or by whom it was first practised, I have not been able to learn; with any degree of certainty; notwithstanding it is a late invention. Like the internal colouring, it probably originated in fraud. It was, perhaps, in the first practisers, an artful trick; an imposition on the purchaser. At present, however, it is practised through very different motives. The dairywomen, one and all, dislike it. The labour and expence of colouring they bestow with cheerfulness; but the act of painting, though done with less trouble and less expence, is set about with reluctance, and spoken of with disgust; especially by experienced dairywomen; who prefer the blue disk and the yellow edge to any artificial redness.

"At present, the painting of cheeses is practised merely as a characteristic. It is done at the request of the immediate purchasers; who cannot dispose of them (without being suspected at least of imposition) as Gloucestershire cheese, unless they bear its characteristic.

"Formerly, Gloucestershire cheese was known by the height of its internal colour. Colouring was then its characteristic. At length, however, the art of colouring began to travel into other districts; it is now become in a manner general; and colouring has not, for some years past, been characteristic of Gloucestershire cheese. The cheese of this district, however, has ever been, and probably will continue to be, in high esteem. Some evident mark, some specific character, is therefore required, by the dealer at least, to distinguish it, at sight, from that of other districts: and it may be a moot point whether the practice of painting originated in fraud; or whether it was first intended to be, what it really has been, a characteristic of Gloucestershire cheese. Be this as it may, it seems to be almost certain that it will not long be able to maintain its character; if it has not already lost it. The art of painting has begun to travel; and will, in all probability, soon become the general practice.

"Thus it appears, that the Gloucestershire dairy is suffering through its own artifice. Had it not first taught the art of colouring, its cheeses might still have been distinguishable, in their native colours, by the superior blueness of their sides, and the golden hue of their edges. It likewise appears evidently, that Gloucestershire is able to give the fashion to the colour of cheese. The Gloucestershire dairywomen have therefore, now, a fair opportunity of atoning for the sins of their ancestors; and of giving a characteristic to their cheeses, which cannot be universally counterfeited: namely its own natural colour. Could they muster courage enough to leave it to nature for one season only, the characteristic would be established, and the fashion for uncoloured cheese would be set. Other districts would in consequence follow the example; and the present filthy practices be got rid of, in a way more ready and more effectual, than by any compulsory means that could be made use of. If a certain noble earl would signify a wish that the cheeses produced upon his estate should appear in their natural colours; his tenants love his lordship too well, to suffer them to go to market in any other.

"The cheeses being cleaned, and afterwards disguised in a way unworthy of record,—they are taken to the cheese chamber; entering what I call the second stage. In some dairies, the floor is prepared with succulent herbage, in the manner which has been described; and in others it is only rubbed clean with a cloth. Cheeses bedizened in scarlet require not a blue coat: nevertheless, the succulency of the herbage is thought by some to keep the rind supple and free from cracks, and to kill or prevent mites. Nevertheless, as an actual operation in the present practice of Gloucestershire, it ought to be mentioned. The materials Spanish brown, and Indian red; sometimes mixed; sometimes used separately. The method varies: some dab on the colouring, wet, with a cloth; others, while the surface is moist, throw it on, dry, in pinches, irregularly; rubbing it in with the hand. The latter is allowed to be the more mistressly manner.

"In the cheese-chamber, they are turned twice or three times a week, and wiped with a cloth about once a fortnight; remaining in this stage until they are firm enough to set on-edge, or put into piles.

"From the cheese-chamber they are removed into other rooms; and placed in rows on-edge, or put into piles, of a height proportioned to their degrees of dryness. Here they remain until they are sent to market. If, in a large dairy, they do not go off regularly, at the accustomed

times, every room in the house, every upper room at least, will be full of cheeses.

"Three species of produce deserve notice:

"The produce of a given quantity of milk:

"The year's produce of a cow.

"The annual produce of the district.

"By a pretty accurate calculation, in the Upper Vale, I found that a cheese weighing somewhat more than 11 lb. (namely a ten to the cwt.) took about 15 gallons of milk (ale measure) or one gallon and one third to 11 lb. of two-meal cheese. From two instances, minuted with tolerable accuracy in this district, the proportion appears to be in one instance somewhat more, and in the other somewhat less than 11 lb. of curd to one gallon of new milk. These proportions, however, are offered merely to convey a general idea of the subject. The milk was gauged with a common rule, and the curd estimated by the vats: nevertheless, the calculations are sufficiently accurate for this intention.

"A dairy of 40 cows made, in October, about 60 lb. of cheese a day. But the cows were then going off their milk: suppose, that in summer they produced 70 lb. a day; and calculate on seven months, at 65 lb. a day. On this calculation, the forty cows produced 121 hundred weight; or three hundred weight (of 112 lb.) each cow. A dairy of 100 cows produced, on a par of years, five hundred pound worth of cheese yearly. Supposing the par price was 3s. 4d. a hundred; the weight, under this supposition, was 300 cwt: or, as before three hundred weight each cow.

"In conversing on this subject, with the man best able to adduce the requisite data, we were led into calculations; which, though they only prove, with respect to the annual produce of cheese in this district, the well ascertained fact that it produces from a thousand to twelve hundred tons a year; yet, in other respects, they are interesting; and place the rural economy of the district, as a dairy country, in a more striking point of view, than could, perhaps, be effected by any other means.

"It is, however, sufficiently ascertained, by annual experience, that three hundred weight of cheese may be taken as a fair estimation of the produce of a cow. From two hundred and a half to three hundred and a half, according to a variety of circumstances, includes, perhaps, the produce of every dairy in every year. It appears to be likewise sufficiently ascertained, by a long course of experience, that the aggregate produce of the district, is, on a par of years, eleven hundred tons. Hence it follows, on these premises, that the number of cows applied to the purpose of the dairy is seven thousand three hundred and odd. Consequently, if we allow four acres to a cow, the number of acres appropriated to the dairy, in this district, is somewhat less than thirty thousand.

"But the hundred acres, on which the above calculation was founded, are above par as to quality; and it is probable that, on a par of land each cow occupies more than four acres.

"On the whole we may venture to set down, in numbers sufficiently accurate to convey general ideas, that the Vale contains fifty thousand acres of surface; that two thirds of it are occupied by cows; that the cows are in number from seven to eight thousand; and that their annual produce of cheese is from one thousand to twelve hundred tons."

After Mr. Marshall had treated thus largely on the management of the Gloucestershire cheese-making, he proceeds as follows, on the method observed in North Wiltshire; and says:—"The species of cheese made here are various. Early in spring, soft thin cheeses are made, and sent up weekly to the London market. Some dairies, it seems, put the whole, or a principal part, of their make in nets. But the common make of the district consists of

"Thin cheese,

"Broad-thick, and

"Loaf-cheeses.

"The thin and the broad-thick sorts are similar to those of the Vale of Berkeley; and are, I understand, sold in London as double and single Gloucester. It is the narrow loaf-cheese, which goes under the name of North Wiltshire cheese; and which has of late years become so high in fashion as to fetch fifteen or twenty shillings a hundred-weight more, at market, than thin cheese,—of perhaps a superior specific quality.

"It may reasonably be asked, why is any other species made

made in the district. The answer is, every one makes loaf-cheeses who can, with any degree of certainty. They not only require more skill, and more labour, than thin cheeses; but it is generally believed that much depends upon the ground from which they are to be made. The fact is, I understand, that more than half the make of the district goes to market, in the form of thin cheese, which, at present, is not worth more than 27 to 28s. a cwt. while not one fourth of it is sent in loaves, which, notwithstanding the low price of cheese in general, is worth from 45 to 50s. a cwt.

"Loaf cheeses, however, have their disadvantages; though not equal to the present disproportion of price. They require not only more labour, but more press-room; and what is still more inconvenient, especially to the necessitous, they do not come so quick to market; requiring a much longer time to ripen in, than thin cheeses: consequently more loft-room is likewise necessary.

"Nevertheless, these inconveniences are inconsiderable, when compared with the advantage they have at market. Every man, therefore, whose skill and grounds will permit him, and who is not in necessitous circumstances, makes loaf, or thick cheese; which, in general, bears a price approaching to that of loaves.

"The management now requires to be particularised.

"In large dairies, cheese-making is continued throughout the year. Not only cheese for the family; but factor's cheese, also, is made through the winter season. In one dairy, I saw a very considerable parcel of broad-thick cheese, which was literally made in winter. Many tons of factor's cheese is every year made, in this district, entirely from hay; which, if good, is said to afford not only closer, but richer cheese, than grass. Winter-made cheese, however, is long in ripening, and is liable to be scurfy and white-coated. But time overcomes one of these disadvantages, and a coat of red paint the other.

"The specific quality of the milk is not here debased. The milk is run neat, or nearly neat, from the cow. The Gloucestershire practice of keeping a little out, for milk butter, is not here in use. It is not, at least, the common practice of the country for the cheesemakers to sell milk butter. In one or two instances, which I attended to more closely, not a drop was added to the new milk neat from the cow.

"The colouring of cheese has been long a practice, in this district. The oldest dairywoman I conversed with (sixty or seventy years of age) does not recollect to have seen cheese made with its natural colour. She remembers very well the introduction of the stone-colouring; the preparation of annotta, now in use; and has herself made use of the powder-colouring, faunders, which she says was usually boiled among a little milk, previous to its being put into the cowl.

"At present, the material, and the method of using it, is the same as in Gloucestershire; except that a new species has lately made its appearance; giving the milk and the curd a beautiful yellow hue; very different from the redness communicated by a superfluity of the common colouring. The base appears to be annotta; the difference being in the preparation.

"The colour preferred, by the cheese-factors of this district, is that of well-coloured bees-wax. Cheese of this colour will fetch more, by some shillings a hundred weight, than pale under-coloured cheese, or that which is too highly reddened.

"I met with nothing new, in this district, respecting rennets, except in one dairy; in which a peculiar mode of preparation is made use of.

"The usual method is to make as much, at once, as will last several days; perhaps weeks; or the whole season. But, in this instance, it is made fresh every day: that is, fresh brine is added every day; and never more than two vells—here provincially, rades—are suffered to lie in the jar at once. The older of them is marked with a skewer; and as soon as it grows stale, is taken out, and a fresh one added.

"This method of preparing rennet has been now continued through two or three generations. All I can say farther of it is, that the dairy, in which it is used, produces (if any one dairy has a decided preference) the best cheese of the district: but whether from the rennet, the ground, or the management, or from the three jointly, is by no means evident.

"The milk is universally run as it comes from the cow;

or as it happens to be lowered by the little skimmed milk, which is put into it. Its degree of heat I never saw tried; not even with the hand. It is said that, in very close weather, the first milking is sometimes kept in separate vessels, or spread thin in a whey-lead; but in general, I apprehend, its degree of heat, during the summer season, is never attended to. A fact, which I could not have believed, had not my own observation, strengthened by the thermometer, convinced me of it. I had conceived, that the superior excellency of the Gloucestershire management consisted very much in running the milk cool; and expected to have found it run still cooler in Wiltshire. But the following memorandums, accurately taken, are a convincing proof of the contrary.

"Swindon, Monday evening (21 July, 1788). Heat of the air in the dairy-room 60°: milk 8½°: uncovered: came in one hour and ten minutes: whey 85°: curd of a middle quality.

"Deyhouse, Tuesday evening. Air 63°: not covered: came in half an hour: too much rennet: whey 86°: the curd untender; but far from being of a bad texture.

"Westleycot, Wednesday morning. Air 60°: uncovered: came in three quarters of an hour: whey 84°: the curd of a good quality.

"Shaw, Wednesday evening. Air 62°: milk 87°: not covered: came in about an hour: whey 86°: (quantity very great:) the curd of a good quality.

"Avon, Thursday evening. Air 60°: milk 88°: closely covered with a thick woollen cloth, to make the top and the bottom come together: came in about an hour: whey 87°: the curd very good.

"Foxham, Friday evening. Air 60°: milk 91°: covered with a thin cloth: came in one hour: whey 89°. Nevertheless, the curd delicately tender.

"The management of the curd depends, in some measure, on the species of cheese. Thin cheese requires the least care and labour; and thick cheese less than loaves; which require the best skill and industry of the manager.

"In this department of the cheese manufactory the North Wiltshire dairywomen excel. It appears to be their forte. In it they seem to think the principal art consists. It will therefore be proper to descend to its minutiae.

"Breaking is done entirely with the hand and the dish: no knife in use, here, as in Gloucestershire. In some dairies, great caution is observed in the first fracture of the curd; which is done, either with the hand, or the dish, moved gently in the centre of the cowl; dividing the curd into large fragments, so as to let out the whey, leisurely, to prevent its carrying off with it the fat of the curd. When the curd has sunk a little way down in the whey, it is broken more freely; and having stood again to subside, and the clear whey on the top being laded off, it is reduced to a degree of fineness proportioned to the species of cheese. For thin cheese, it is broken as fine as curd generally is in Gloucestershire; for thick cheese, still finer; and for loaves, it is reduced, as it were, to atoms.

"In some dairies, it is violently agitated among the whey, with the hands, throwing it up from the bottom of the cowl, making it boil up at the top, like a strong spring gushing out from below the surface. This is called beating it: a practice which is objected to by judicious dairy-men; though I see most dairywomen do it, more or less, in the last breaking in the whey.

"One general remark, respecting the dairywomen of North Wiltshire, requires to be made. It is customary, even in the largest dairies, for the ostensible manager, whether mistress or maid, to perform the whole operation of making cheese; except the last breaking, &c. and the vating; in which she has an assistant. But this, in a dairy of eighty or a hundred cows, is too great labour for any woman: it is painful to see it. In one instance, in this district, a man was employed in this laborious department: and, in a large dairy, it is certainly man's work. A curd-mill in Yorkshire would lessen the labour considerably.

"It is in the final breaking the curd-mill is used. The labour of doing it by hand, when a large quantity of curd is to be broken, is almost intolerable. In a large dairy, a curd-mill must be found very valuable. This utensil consists of two rollers working in a thin deep chest, one above the other; on the principle of the common cyder-mill of the southern counties. The upper one is stuck with iron spikes, an inch long, and 1½ inch asunder. The lower one is closely set with bevel-headed nails, rising with a sharp angle about a tenth of an inch out of the surface of the roller.

The curd, partially broken, is put into a hopper, the bottom of which is the upper roller; which working against the side of the box, prepares the curd for the bottom roller; which being finer, and working closer, grinds it down to small granules. The rollers are about six inches diameter, and fifteen inches long. They are both of them turned by one crank, put on one end of the axle of the upper roller. On the opposite ends of the rollers are fixed two even-toothed wood wheels; working in each other, and giving motion to the lower roller.

"The ordinary practice is to lade off the whey as it rises; pressing down the curd with the bottom of the lading dish; to sink it the faster, and render it the firmer.

"In one instance, and this in a dairy whose practice is intitled to the first degree of attention, the curd, instead of being pressed with the back of the dish, is, while yet suspended in the whey, gathered, with the bowl of it, to one side of the cowl; first carrying it gently round the cowl to collect the curd more effectually. The whey by this means is got off much clearer, greener, than it is when the curd is pressed, in a soft pappy state; a practice which, undoubtedly, impoverishes the cheese.

"Most of the whey being got off, the cowl is heeled (in the practice) to get the curd into a mass on one side of it. The cowl is then replaced upright; the skirts of the mass cut off and piled upon the rest; the mass gashed with a long knife; and the whey laded off; fopping it up dry with a cloth.

"The mass of curd is now pared down slice after slice, (about an inch thick) and piled on the opposite side of the cowl; at intervals, pressing it close with the hands, and gashing it with the knife, to let out the whey more effectually. The whole being thus gone over, the whey, which has been by this means extracted, is laded off and fopped up with a cloth, as before; and the curd piled a third time; and, in some dairies, a fourth time; slicing, gashing, and pressing it with the hands; making it, by this means, in a manner perfectly free from whey. A practice, which was new to me, and which is, perhaps, peculiar to North Wiltshire.

"In one instance, and that in the practice of a most intelligent and experienced dairywoman, I observed an improvement of this method of freeing the curd from the whey. Instead of pressing the pile, at intervals, with the hands (a power which, when the quality of curd is large, has but little effect) a vat was put upon it, and loaded with cheese weights; a cloth being spread over the bottom of the vat to prevent their sliding. As the pile was carried up or gashed, the vat was moved from part to part, so as to give an even pressure to the whole. By this means the whey is, in a manner, wholly extracted.

"Some few dairies, it seems, double press the cheeses: that is, put the curd in the press before it be scalded, agreeably to the Berkeley practice. But it is considered as an inferior method. It certainly reduces the richness of the cheese, more than the practice which is here described; and which, alone, fell under my observation, in Wiltshire.

"The ordinary method of scalding, here, is similar to that which has been described in the Gloucestershire practice. The mass of curd is broken to different degrees of fineness; proportioned not to the species of cheese, altogether; but according to the skill of the dairywoman. In a first-rate dairy, making loaf-cheeses, I saw it broken very roughly.

"The quality of the scalding liquor too, varies here, as in Gloucestershire. Some scald with whey; some with water; others with water lowered with whey.

"The heat of the scalding liquor likewise varies, even in the ordinary practice of the district, very considerably: not, however, as in Gloucestershire, according to the quality of the given curd; but according to the custom of the given dairy. Custom, however, which may have been founded on long experience, and may be peculiarly adapted to the ground, from which the curd is produced.

"In the ordinary practice of the district, the North Wiltshire dairywomen may be said to scald highly. Five, out of the six dairies, whose scalding liquor I tried with the thermometer, heated the liquor from 102° to 140°. The heat of the mixture of the liquor and curd being from 92° to 110°. So that, in the ordinary practice of the country, the milk is not only run, but the curd is scalded, much higher than in the Vale of Berkeley. A circumstance which I did not expect to find in North Wiltshire; whose cheese is characterised by a soft saponaceous texture; dia-

metrically opposite to that hardness, toughness, which scalding appears to give to the curd in the first instance.

"But if a degree of surprize arises from the ordinary practice of the district, an excentric practice; which I was favoured with the inspection of; must be a matter of some astonishment. What renders this instance of practice the more interesting, is its being struck out and pursued, by one of the oldest, best experienced, and most intelligent dairywomen I have any where conversed with. In this instance the curd is literally scalded, with almost boiling water qualified by a dash of cold water, before it be thrown into the cowl; to prevent its catching the curd. The actual heat 192°.

"It is proper to be understood, however, that, in this case, the curd is not crumbled, or broken in the usual manner, before the scalding liquor be thrown among it; but is cut into checkers, or dies, of about a cubical inch each: with the same knife, used in nearly the same manner as in slicing it.

"Another peculiarity of this practice is, that the curd is salted before it be scalded, a handfull of salt, to every cheese, being strewed over the checkers, spread regularly on the bottom of the cowl, and worked in evenly among them.

"This is done in conformity with the general principle of this practice: namely, to keep the fat in the cheese; the salt being thought to harden and close the outsides of the cubes; thereby preventing the butyraceous particles from being extracted by the scalding liquor. The fact is, the water, instead of being made as rich and thick as butter-milk, is left in the cowl after the curd is taken from it, thinner than the clearest whey, and without a speck of oil on its surface.

"In one dairy, which I had an opportunity of observing, in this district, the scalding liquor was covered with a sheet of oil, which might have been skimmed off its surface in quantity: while in others, whether they were scalded higher or lower than this, not a drop of oil was to be seen; though the management in every respect was similar. The ground, therefore, seems to be the cause of this difference; which, to me, appears to be a circumstance singularly interesting.

"Nor is scalding with boiling water, cutting the curd, and salting it before scalding, the only peculiarities of that singular dairy. The dies of curd having been stirred among the scalding liquor, and lain a minute or two to be thoroughly heated, are taken out of the scald, which yet retains a heat of 130° with dishes, and immediately put into the vats, as hot as the hands can possibly bear. They press into the vats like bees-wax, that has been very much softened by heat, or as cheese, which is slightly toasted. Two or three vats being filled, they are set in a shallow tub, placed on the dairy floor, and a loaded vat put upon them, to close the curd while warm: in my opinion, an admirable stroke of practice: it had long struck me, in theory, as being likely to be eligible; but was among the last things I expected to meet with in actual practice.

"Thus, not only richness and a closeness of texture are probably obtained, by this course of treatment; but the farm on which it is used is considered as being difficult to make cheese from: and it is believed, that the method of treatment which is here described, is the means of preventing the cheeses from heaving. The fact is, the cheese (thin cheese) appears to be, with this treatment, above par as to quality.

"The methods of vatting in the other dairies, which I examined, were various. In some, the scalding liquor was laded off, and the curd rebroke and salted in the cowl; while in others, the curd was taken warm out of the liquor, and salted in the vat; thin cheese with a small handfull in one layer; thick with two small handfulls in two layers, loaves with two handfulls in three or four layers; spreading and rubbing in the salt evenly among the curd.

"The dairy which has been mentioned, as being celebrated for cheese of a superior quality, scalds highly (130°) and vats the curd warm out of the scalding liquor; while it retains 105° of heat. Nevertheless, in a neighbouring dairy, which makes very good cheese, the curd is put cold into the vats.

"What can we infer from the aggregate of these circumstances? There appears to be but one alternative. Either different grounds require very different management, or the art of cheese-making is less mysterious than has hitherto been imagined. To make good cheese sometimes, from some grounds, is, I believe, a very easy matter; but to make

make good cheese at all times, and from all grounds, on a certainty, is what no person has yet been able to perform. Nevertheless, I am more and more clearly of opinion; that with leisure and perseverance; assisted by a degree of chemical knowledge, and a proper apparatus, this object, difficult and desirable as it may be, is attainable.

"1. The management of the cheese in the press is, here, much the same as in Gloucestershire. They are generally salted twice; (only one instance of the contrary;) and remain in the press a time proportioned to the given thickness: thin cheese, three or four meals: thick cheese, four or five meals: loaves, five or six meals.

"From the press they are carried into rooms, fitted up with shelves, for their reception: some of them very commodiously: an entire lining round the walls, and, perhaps, a stage or two in the middle of the room; with only gangways, wide enough to pass conveniently between them.

"On these the young cheeses remain until they be cleaned, or until the shelves be full; turning them as often as the weather and their respective ages require.

"The method of cleaning varies: in some dairies, the summer cheeses have nothing done to them, except having their edges wiped. The blue coat rises soon enough, and sufficiently, to hide their roughnesses. In others, they are only scraped dry (by the milking man,) and in others washed and brushed with a pail-brush, without being scraped. I met with no instance, in which they are soaked by the hour in water, and afterwards scraped, as in Gloucestershire. Some object even to wetting them: all to soaking them; not only as making them soft, thereby checking their ripening, and backening their sale, but as being dangerous to the cheeses; which, if they have the smallest cracks, absorb the water, and receive irreparable injury.

"No painting; except of winter-made cheese; which generally throws out a white scurfy coat, difficult to be got rid of, in any other way. These are covered with a uniform coat of paint: but the general make of the country are, as yet, permitted to go to market in their own blue coats.

"From the shelf-room they are taken to other rooms, provincially lofts, and spread over the floor; which is repeatedly cleaned, by rubbing it with cloths; but not prepared with succulent vegetables; except for old thick cheeses, in order to prevent or kill the mites, which thick cheese is liable to be infected with, before it be ripe enough for market. In this case the leaves of the alder are, I believe, principally used.

"In one dairy, (Deyhouse) I observed an admirable arrangement of cheese-rooms. The shelf-room is immediately over the dairy-room. And the lofts, over the shelf-room; with trap-doors in each floor to hand the cheeses through. A plan which saves much awkward carriage, and might well be adopted in every dairy that will admit of it.

"The cheese of this district, like that of Gloucestershire, is bought up principally by factors, who live in and near the district, and who send it mostly to the London market; the younger by land, the older by water-carriage. One factor (or copartnership of factors) is said to send seven or eight hundred tons annually.

"The small cheeses are generally drawn from the larger dairies once a month; and down, perhaps to five or six weeks old. The large cheeses require a much longer time before they be marketable. The winter, and early spring-make, go off in autumn: the latter make the ensuing spring.

"The produce of milk I had not sufficient opportunity to attend to accurately. To that of cows by the day I was most attentive. This ran in every instance, except one, from 2 lb. to 2½ lb. a cow. The one exception, somewhat below 2 lb.—2½ lb. has, I am told, been produced from cows which came well in together, and were in full milk.

"The produce of cows by the year is, in this district, almost incredible. Three to four hundred weight a cow, is, I was assured on all hands, the common produce. Four and a half not unfrequent. Four hundred nearly the par produce. There is a well-attested instance, in which a small dairyman sold thirty five hundred weight from seven cows; besides what was used in his family. But the cows were in their prime, and extraordinary milkers.

"There are two reasons, why the produce of cows in this district exceed that of cows in Gloucestershire. The cows are larger, and the season of making longer: cheese

is here made the year round; whereas, in Gloucestershire, the season of making lasts little more than several months of the twelve.

"The annual produce of the district has not, perhaps, been calculated: I met with no estimate of it. Supposing one third of the district to be appropriated to cows, and allow that each acre thus occupied yields one hundred weight of cheese (calculating on four acres and four cwt. to a cow) the aggregate produce is, at least, one hundred thousand hundred weight; or five thousand tons a year.

"Admitting that there is a market for the whole produce of the district, in loaf-cheeses, and taking the medium disparity of price between loaf-cheeses and thin cheeses, to be ten shillings a hundred-weight, or ten pounds a ton; and allowing that, at present, half the produce of the district, sent to market in the form of thin cheese, North Wiltshire is sustaining, annually, a loss of twenty-five thousand pounds, through the present imperfection of the art of cheese-making."

Mr. Marshall, in a very able manner, then makes some general observations on the subject of cheese made in Gloucestershire and Wiltshire; and says, "The species of cheese, produced in this island, are various. Its markets, however, are principally filled with two species: the one of a dry loose contexture, and of a rough austere flavour: the other, milder to the taste, and of a close waxlike texture. The former is sold under the name of Cheshire cheese; and is, I believe, chiefly the produce of that county: the latter under the name of Gloucestershire cheese; provided its quality entitle it to that distinction: if not, it takes, I believe, in general, the name of Warwickshire cheese; but, in reality, is produced in several counties. The products of Somersetshire, Wiltshire, Berkshire, Oxfordshire Gloucestershire, Worcestershire, Warwickshire, Leicestershire, Staffordshire, and Yorkshire, are very similar: all of them as different from the produce of Cheshire, as if they were manufactured from a different material.

"It is this milder species, which is a principal article of food, of various classes of working people; and which, therefore, claims the first and the highest attention.

"Gloucestershire has long held a decided superiority in the production of this article of human food. At present, North Wiltshire is a competitor, and bids fair to take the lead. The practices of the two counties are here, I believe, accurately, and the more difficult passages, fully registered, down to their lowest minutiae.

"Therefore, without any view to blazon my own industry, or to set off, unfairly, the work I am executing, I will venture to suggest, that whoever shall examine, with attention, the three separate practices, which are here registered, will know more of the subject under examination, than any individual of the two counties knew at the time of registering.

"The knowledge, even of practitioners, is in a manner wholly confined to their individual practice; or perhaps to that of some few confidential neighbours.

"The manufacturing of cheese is not like the cultivation of lands. This is a public employment, open to any one who travels across the site of cultivation; that, a private manufactory, a craft, a mystery, secluded from the public eye: and what may appear extraordinary, the minutiae are seldom familiar, even to the master of the dairy in which they are practised. The dairy-room is consecrated to the sex; and it is generally understood to require some interest, and more address, to gain full admission to its rites.

"The information I have been favoured with, while it shews the superior skill of the Gloucestershire and Wiltshire dairywomen, and exhibits the best practice of the kingdom at this day, proves, in a striking manner, the imperfection of the art; even in these long-experienced and enlightened districts. Gloucestershire acknowledges a degree of decline; and Wiltshire, notwithstanding the spirit of improvement has evidently been some time on the wing, confesses, with equal frankness, that it has not yet been able to reach any degree of certainty, much less perfection.

"At present, the art is evidently destitute of principles. So far from being scientific, it is altogether immemorial. It may be said to be at present, a knack involved in mystery. Therefore, its fair professors, though they may claim a degree of natural cleverness, to which we have no pretension, and which, only, could have raised the art, in the extempore way, in which it is at present practised, to the height it

It has attained; having tried their skill, alone, without obtaining the requisite degree of excellency, can have no good objection, now, to let us try our joint endeavours. And I call upon every man of science, who has opportunity and leisure, to lend them his best assistance. And would wish to recommend to intelligent dairy-farmers to be more attentive than they appear to be at present, to what so nearly concerns their interest.

"This in apology for the following observations:

"Attending to the minutiae of different dairies, and seeing the effects of different modes of management, a variety of ideas would, of course, rise spontaneously. Some of them fancying improvements, in the particular management I was observing, and other proposing a transfer of it, to the different districts of the island. Such of them as appear to be entitled to attention, and are not interspersed in the foregoing relations, will be given in this retrospective view of the subject.

"As a ground-work, it will be proper to ascertain the good and evil qualities of cheese; the excellencies to be obtained; and the defects to be avoided. In defining these, however, we must not pay regard to the palates of individuals. There is a kind of depravity in some men's tastes, with respect to the article of food under consideration, which would frustrate every attempt at definition. We must, therefore, have an eye to those good and bad qualities of cheeses, which raise them in value, or depreciate them at market. Qualities of which the different dealers, in this article, have ideas sufficiently accurate for our purpose.

"Cheese of the first quality; that which comes as near perfection as the nature of it admits of, or as art can probably approach, is of a close even contexture; of a firm but unctuous consistency; of a mild flavour, while young; acquiring, by age, an agreeable fragrance. If a cheese of this quality be ironed, it has somewhat the appearance of firm butter; or of wax moderately warmed. If the plug be gently rubbed, the substance of the cheese seems to melt under the finger which wears it down, as it would fine clay duly moistened. If the end of the plug be pinched, it yields to the pressure without crumbling; grinding down, between the fingers, to an impalpable matter, cheese of this description, like wine of a good vintage, improves, by age, in mellowness and flavour.

"The defects of cheese, in this district, are, porousness, hollowiness, dryness, and partial rottenness: the fly, so much to be dreaded in Norfolk, is not known here, where maggots are thought to breed naturally in good cheese.

"The substance of cheeses, having this defect, may be sufficiently unctuous and cohesive; but the contexture is broken, by cells of different magnitudes; and the flavour invariably bad, being pungent to the taste, and offensive to the smell.

"Hollowiness appears to be, generally, though not always produced by the same cause, operating in a different manner. In that, the expanding air is distributed: in this, it is collected: cleaving the cheese in the middle: making it bulge out generally in the center; but sometimes partially toward one edge. The effect, too, is the same: both of them leaving, in most cases, a pungency of taste, and disagreeableness of smell; qualities which are increased by age. Porousness seems to be a weaker effort; hollowiness a higher state of defect.

"The contexture of cheese, under dryness, is loose and incohesive. If a plug be drawn, it is hard and dry to the touch; and crumbles under pressure. It wants unctuousness and flavour; being insipid to the taste, and inodorous to the smell. This description of cheese is likewise liable to cleave in the middle.

"Whey-botches appear on the surface; and are understood to be caused by what is called slip-curd, namely curd, from which the whey has not been duly expressed. This theory, however, does not appear to me to be altogether satisfactory.

"The causes of the other defects are important objects of enquiry.

"The dryness is understood to be owing to some degree of acidness in the milk, at the time of coagulation; and may originate in other circumstances.

"The cause or causes of the other defects may be still more involved in uncertainty. Since the doctrine of airs has been agitated, a general idea has been suggested, that fixed air is the latent cause. But I have not met with any reason tending to explain how this fixed air is let loose; or

why it should leave; invariably, a pungency of taste and rankness of smell behind it.

"That an expansion of air takes place is evident; but the efficient cause of this expansion may be difficult to explain. It may, however, be taken for granted, that whatever is the primary cause of the pungency and rankness, which follows, is the primary cause of the expansion; which, indeed, is not, in this place, the object of enquiry. For it is not the expansion, but the pungency and rancidness, which constitute the defect.

"To endeavour to ascertain the cause of the pungency and rancidness, I made some experiments with cheese, possessed of these qualities in a superior degree.

"The specimen subjected to these experiments was of the porous kind. The pores or cells varying from the size of a mustard-seed to that of a bean: all of them glazed within; and to the naked eye, apparently varnished with a yellow resinous substance; but, in a glass there appeared to be no coat of matter. On being scraped with the point of a needle, the insides of the cells rose in the same snowy flakes, which every other part of the substance afforded: the colour of the loosened particles purely white; notwithstanding in their consolidated state they were of a dark yellow; a wax-colour; the cheese having to all general appearance been coloured; yet not a particle of the colouring material discoverable. One minute bundle of resin-like matter I found lodged among the substance; but none in the cells. The smell fetid; the taste bitter.

"Experiment I. Tenth of July, 1788. Placed two pieces about a cubical inch each, in separate glasses: covered one of them with cold, the other with boiling water.

"Eleventh of July. The colour of the surfaces of both of them is changed. That subjected to the cold water is become pale: that to the hot, purely white. The water, in both cases, fetid. The cold water, the stronger-flavoured, and the higher-coloured; the hot, milder and paler. On the top of the hot, a few small particles of oil swim; on that of the cold some large specks appear.

"The heat of the boiling water has softened the pulp, but not the rind of the cheese, so as to disfigure the cube, and fix it to the bottom of the glass. On pouring off the water and raising up this piece, the part which was in contact with the glass is still of a yellow colour; and retains its fetid smell; while the upper surface is pale and in a manner scentless. The scent of the other piece is weakened; but much of it still remains. The taste of both pieces lessened; especially that of the heated piece.

"Experiment II. Eleventh July. Covered a piece of the same specimen, (an inch square and about a quarter of an inch thick) with rectified spirit of wine. And put another piece, (a quarter of an inch cubical) into a vial of the same spirit.

"Twelfth July. No apparent change of colour or contexture except that the piece in the phial is somewhat paler than when it was immersed. The glazing on the insides of the cells is still perfect. Nevertheless, the smell is entirely gone, and the taste rendered perfectly mild: the bitterness lost. But quere, are they dissipated, or only disguised by the spirit?

"Experiment. III. Twelfth July. Bruised some of the pulp of the same specimen (dry and hard) with the blade of an ivory knife; the granules small, but not evenly reduced. The colour, after bruising, nearly white. Put equal quantities of it into three separate glasses: covering one with cold water, one with boiling water, and the third with spirit of wine.

"Fourteenth July. That upon which the spirit was poured, underwent no evident alteration; except that it regained part of its colour. This settled down and laid close, but loose at the bottom of the glass. The smell entirely fled, or disguised.

"The cold water effected no change, even of colour. The subject would not mix freely with it. Part of it sunk; part swam on the surface. Yesterday, not having been disturbed, it afforded little or no smell; but this morning, on being stirred up, it proves as fetid as the original cheese. The crumbs, which now subside, have a somewhat curd-like appearance.

"The hot water produced, immediately, a milky liquor; which presently divided into curd and whey; exactly resembling scalded curd, with its scalding liquor standing upon it. The curd as white almost as snow; the water pale and oily. Yesterday, the water emitted no smell: to-day, the

the curd which has formed itself into a compact mass at the bottom of the glass; a cake of perfect cheese-curd, is in a manner scentless and tasteless.

"Thus, from the whole, and from every part of this evidence, it appears, that the immediate cause of the pungency and rancidness of cheese is an essential oil, which spirit of wine dissolves; and which is rendered volatile in boiling water.

"The excellencies and defects of cheese being enumerated, and the probable cause of the principal defect pointed out, it will now be proper to view the following heads separately, examine still farther into this cause, and endeavour to point out some probable means of avoiding its evil effect: and, at the same time, to endeavour, by scattering a few rays of light on the general subject, to relieve it, in some small degree at least, from its present obscurity.

"It is a fact well established, that the season has great influence on the quality of cheese; especially on the defect more immediately under notice. In 1783, a dry hot summer, scarcely any dairy could make good cheese. In some dairies more than half the make was hollow; and even in the best dairy I had an opportunity of examining, numbers were eye: while in a common season, and more especially in a cool summer, the same dairy has scarcely a defective cheese.

"This corroborates the idea of an essential oil being the cause of the defect. It is annually proved in the practice of numbers, that plants in general afford a quantity of essential oil, proportioned to the warmth of the season they grow in. It is likewise known, in the dairy counties, that cheeses made from the grass of autumn seldom or ever heave. At that season the finer blade-grasses are chiefly produced. Few flowers, or aromatic plants, mix with them. Besides, the weather being generally cool, a less proportion of oil is probably raised at that season of the year.

"It has been observed, that the best cheese is made from the least productive soils: not, perhaps, fatter than cheese made from richer, more productive soils; but freer from the defect under notice. This is accounted for in the principle laid down: the unproductiveness of the inferior soils has been said (without any regard to this theory) to be owing to their coolness: another striking circumstance in favour of the principles offered.

"Another observable circumstance, with respect to soils, is that of their being injured by manuring: it being a fact sufficiently ascertained, in each district, that close, well-flavoured cheese cannot be made, or is with much uncertainty produced, from land that has been recently manured. But whether the manure, itself, be the immediate cause; or whether it only change the herbage, appears to be a moot point.

"Water is a subject to which no one seems to have paid the smallest attention. I have not been able to gather any information respecting it, which is interesting. Nevertheless, it is probable, that much may depend upon it. It seems reasonable that a plenty and purity of water should be conducive to the production of good cheese: it is probable that a deficiency of water may increase the proportion of acrimony in the milk.

"Each species of plants has its peculiar organization, which either enables it to make choice of its food, or gives it a faculty of changing, whatever it imbibes, to its own specific nature; or, which to me is more probable, each plant is possessed of these two powers jointly. It is evident, that the qualities of mild, sweet, bitter, acrid, and poisonous, are all of them produced by different plants growing in the same soil.

By analysis, their component particles are found to be extremely different in proportion, at least. Thus one plant (the fava) yields a quantity of fluid essential oil more than equal to one seventh of its own weight; while another (the rose) seldom perhaps affords the proportion of one to a thousand. Hence, on the theory offered, much, very much indeed, may depend on the specific quality of the herbage.

In North Wiltshire, an experienced and very intelligent dairy-woman observed, that when the crazy (the crow-foot) is in full blow, she finds her cheese particularly inclined to heave, while a dairy farmer of the highest class, in the same district, has observed, that when the creeping trefoil, white clover (*trifolium repens*) has been in full blow, and in particular abundance, he has heard the loudest complaints of the licentious disposition of the cheese.

It is not probable, that any one species of plants is the

sole cause of the disorder. Almost every cheese has its peculiar flavour, and its different degree of acrimony. Nothing is more likely to give that almost caustic quality, which some cheeses are possessed of, than the common and the bulbous crowfoots: not only their flowers, but their leaves, are singularly acrid. On the other hand, there are several circumstances which render it probable, that a redundancy of the creeping trefoil tends to aggravate the disorder. Dry seasons, by keeping the grass short, give it an opportunity of spreading. Manure is well known to encourage it; sometimes in a singular manner. Sheep-feeding pasture grounds produces a similar effect; partly owing, perhaps, to the blade grasses being kept short; and in part to the soil being meliorated by a fresh manure: and it has been observed that a suite of cow-grounds, which have been occasionally fed hard with sheep, are very difficult to make cheese from: while a few sheep among cows may, by picking out the clover, be serviceable to the dairy.

"Other plants, probably, have a bad effect; and to ascertain them is an object worthy of attention. It is probable, however, that the mischief is effected by some common article or articles of herbage; and not by a few weeds which can easily be extirpated: nevertheless, it would be useful to know, not only the herbs, but the parts of them, which cause the evil.

"The age of herbage may likewise influence its effect. It has been generally understood, that cheese of the first quality cannot be made from young leys: nothing but old turf being esteemed equal to its production. I have been informed, however, that there is, or was, an instance, in these districts, in which good cheese was made from fresh land; from land which was kept alternately in corn and grass. In my own opinion, more depends on the quality of the subsoil, and the species of herbage, than on its age: or, in other words, the effect appears to me to be produced by the species of herbage and the temperature it feeds in. I have traced the roots of old turf, in different parts of this district, to two or three feet deep. Here the plants, notwithstanding the subsoil may be absorbent, probably feed in a cool situation, undisturbed by the immediate influence of the sun, and on soils thus situated, much may depend on the age of the herbage: but it strikes me that young grass, of a proper species; may, upon cold land, produce good cheese, though it should feed near the surface. This, however, by the way.

"From the aggregate of the foregoing evidence we may infer, that the defects of porosity and hollowness are principally owing to the species of herbage: very much, however, depending on its state of growth; very much on the season; much on the nature of the subsoil; something on the age of the sward; and something perhaps on the soil. I wish, however, to have it understood that the inference here drawn is not considered as conclusive: all that appears to me is its probability. The theory of an art is seldom brought to light in a state of perfection. It generally requires to pass, progressively, the several stages of infancy, adolescence, and manhood; rising by slow steps to maturity.

"The present imperfection of the art stands confessed on all hands in management; and, even with the joint assistance of science, it may never be raised to perfection. Nevertheless, it is evidently capable of improvement, and of being raised nearer to perfection than it is at present. Different grounds (a term which aptly comprehends herbage, soil, and subsoil) may require different modes of management: but so it is in the raising of corn; dissimilar soils require dissimilar treatments: yet we see fine crops of wheat growing on almost every species of soil. Coagulation appears to be a much less fickle process of nature than fermentation: nevertheless we find the art of brewing (in the larger breweries) is raised to a degree of certainty.

"The milk, the coagulum, the coagulation, the curd, and the cheese, will each require to be separately examined.

"In the milk; three things are here wanted:

"A taste of the quality of milk;

"A mode of correcting an evil quality:

"A gauge to ascertain the exact quantity;

"That some milk is sufficiently pure, to require no correction, is evident, from cheese of the first quality being made from it, genuine, as it is drawn from the cow.

"In all human probability, however, the cause of the defect, more particularly under notice, is lodged in the milk; and a taste to discover it would be valuable.

"In the Vale of Berkeley, I was told, there are dairy-women

men who will judge, by the smell of the milk, whether the curd to be produced from it will, or will not, make a heaving cheese.

"This circumstance is highly probable. For, if the heaving be caused by an essential oil, the smell is the easiest, and, perhaps, the most certain test it can be brought to. The odour of plants (in general) lies wholly in their essential oils. Draw off this, they become scentless; the whole of their odour being found in the oil. The various essences of the shops are no other than the essential oils of the several plants, whose names they respectively bear. And it appears to me more than probable, that were the effluvia which rise from milk warm from the cow, to be concentrated; that is, collected into a narrower compass, thereby encreasing the flavor, the quality might be judged of with sufficient certainty. A simple apparatus might be rendered applicable to this purpose.

"A redundancy of odour being discovered, the means of doing it sufficiently away would be the great thing desirable. It is probable, that a degree of odour, a due portion of flavour in the milk, may be necessary to the production of well-flavored cheese.

"If rancidity be the effect to be guarded against; and if essential oil be the cause of rancidity; an evident, and easy mode of purification presents itself.

"It is well known, that all essential oils are of a volatile nature. The heat of boiling water will cause all of them to quit their native substances. Some will quit and fly off with a much lower heat. In the loose state, in which they lie in milk, they might, no doubt, be easily dissipated. Ventilation alone would probably go near to effect the desired purpose. A small addition of heat would, perhaps, render it fully adequate to the intention. By an increase of heat, the end might be obtained with a degree of certainty.

"Two inconveniences would attend this mode of correction. An increase of labour; and a loss of time. But theory suggests another simple apparatus, adapted to common use, and manageable by the most ignorant dairy-girl, which would render the extra labour and the loss of time inconsiderable, compared with the advantage to be obtained by the use of it.

"In this place, it will be proper to mention an attempt, which has been made, in this district, to correct the milk. But not, from what I can learn, with much success. Before I made the foregoing experiments, it struck me, that some chemical preparation might be hit upon for this purpose; and that which is, perhaps, most likely to effect it, has been used in this instance: namely, the vitriolic acid: or, as it is commonly called, the spirit, or the oil of vitriol.

"A dairy-woman, who tried it, put about a tea-cupful into seventy or eighty gallons of milk. But she found it interfere with the rennet, so as to disturb the coming. That is, being a strong acid, it brought on a premature coagulation. She, therefore, laid aside the use of it. Nevertheless she, and others, who have given it a fuller trial, are of opinion, that it helps to keep down the cheese.

"This circumstance, it is observable, still farther corroborates the theory offered; and in an interesting manner; as it is an evidence, that the heaving, the immediate effect, is caused by an essential oil; a considerable portion of which the stronger acids have a power of fixing in a resinous state. It is, therefore, highly probable that, by a sufficient quantity of concentrated acid, the cause might be sufficiently overcome. But supposing this mode of correction to be practicable, the practice could not be recommended.

"At present, the proportional quantity of curd to a given quantity of milk appears to be very uncertain. A dairy-woman seems to be under no certainty, until she has, as it were, measured it in the vats. Running the milk cool is thought to lessen the quantity of curd. The proportion is thought to be greater in autumn than in summer. Some cows are thought to afford more curd than others. This is an interesting subject, and requires to be strictly enquired into.

"To come at this proportion, the first thing is to ascertain the exact quantity of milk. A rod graduated to the given cowl (by an exact gallon measure) would give it at sight; without the trouble, or the danger, of calculation being incurred.

"Notwithstanding the stomach of the calf is the established coagulum of milk for cheese; it may, or may not, be the best, which nature affords for that purpose. Coagulation may be produced in a variety of ways, and the best

ought to be sought for. The great object seems to be to reduce the whey to the most aqueous state possible. Not only the quantity, but the richness, and even the dietetic quality of the curd is, perhaps, given by the coagulum. The theory of coagulation appears to be, at present, imperfectly known, or not in any degree understood; though, perhaps, a subject of some importance, in medicine, as well as in rural economics.

"A test of the strength of the coagulum used, and a measure to ascertain an exact quantity, are much wanted: in order that a given quantity of milk might have a due quantity of proof coagulum assigned it. This, with a little industry, might no doubt be accomplished: and being once fixed on mechanical principles, neither time nor labour will be lost by it.

"The thermometer is a certain guide as to the heat of the milk; as well as of the air, in which it is to be coagulated. Thus far we might, therefore, go, on mechanical principles; and regulate the time of coagulation, and the quality of the curd, with a degree of certainty: provided the quality of the air, in which the curd is generated, have no influence, by its action on the process of coagulation, on the quality of the curd.

"I have observed, in one or two instances, that in a close muggy air, the curd has appeared to come prematurely, and to be of an inferior quality. But even should this, on due enquiry, be found to be a real circumstance in the general law of coagulation, its evil effect might, perhaps, by due attention, be guarded against. If any particular species of air should be found to be conducive to good cheese; either during the coagulation, or while the manufacture is carried on; how easily might the required atmosphere be given, either to the containing vessel, or to the room in general!

"The method of regulating the heat of the milk may be a thing of some importance. Water may, or may not, be proper to this purpose.

"The due length of time in coagulating, requires, likewise, to be enquired into. Perhaps a rapid coagulation, not only renders the curd tough; but, by giving a greater quantity, injures its richness. Hence, on a lean soil, it may, perhaps, require to be carried on more deliberately, than on a rich one. It will, I am persuaded, be found, on due examination, that the quality of the curd is in great part given by the period of coagulation.

"The point of maturation wants to be ascertained. I know no guide to it, at present, which can be defined with sufficient accuracy. If the curd be broken prematurely, a portion of it may be lost: if it remains too long before it be broken, some worse consequence may follow. Hence, it appears to be only common prudence to keep the vessel closely covered during the coagulation, that the whole may reach the proper state of maturity at the same time.

"Curd may be called the state of manufacture. The first step towards perfection is to provide a suitable material; the next, to manufacture it in the most perfect manner.

"Separating the curd from the whey is a point of management, on which the richness of the cheese, perhaps, very much depends. The object to be aimed at, in this operation, is to draw off the whey as clear, as green, as may be. For this reason, it ought not to be suffered to remix with the curd, after it has once been dislodged from its cells: much less to have the curd broken small among it; thereby saturating it with the richer particles. An apparatus, sufficiently manageable in common use, and one which would, probably, save much labour and much time, might, I believe, be rendered equal to this intention. Should it be said, that what is lost to the cheese is saved in the whey, the reply is, that the injury does not proceed from the quantity lost; but from the quality of the entire cheese being lowered, by the loss of part of its most valuable particles. If an inferior kind of cheese be required, the milk ought to be reduced, previous to the coagulation. From the rich soils of these districts, cheese of a superior quality may be made; though the curd be impoverished in the operation of making it. But on leaner soils, not a particle of the natural richness of the milk should, in strictness, be suffered to escape among the whey.

"Scalding the curd is an operation, which requires to be examined into. It is peculiar to this quarter of the kingdom. It may or may not be necessary to the production of cheese of the first quality. It unavoidably carries off a portion

portion of the richer particles of the curd. Were it not for this inconvenience, it is probable, that the cause of heaving might be broken by breaking the curd small, and scalding highly, be dissipated in this operation. Even when the curd is cut into cubes, we find that high scalding has a probable good effect. Cutting the curd, instead of breaking it, certainly preserves the richness, but may prevent the free escape of the offensive matter. Nevertheless, in the instance of practice referred to, it seems to answer the purpose required by the excellent dairy-woman who uses it. It has, indeed, more ingenuity in it than all the other operations I have met with in the art.

"Another circumstance in the operation of scalding is noticeable. It seems to be indisputable, that the curd should be scalded evenly. But, by the present method in use, the same cowl of curd is scalded with various degrees of heat. That which the scalding liquor immediately falls upon, is subjected, perhaps, to 150° of heat; while that which is afterwards stirred up among the liquor has not, perhaps, more than 100° . This, and the practice of leaving the cowl uncovered, during the coagulation, may account for the otherwise, perhaps, inexplicable circumstance of one cheese of a good, and another of a bad quality, being made from the same cowl of curd: a circumstance which is mentioned with confidence in different districts. If the curd be scalded, it ought, in my idea, to be plunged wholly, and instantaneously, into the scalding liquor; and not the scalding liquor poured upon the curd, in the manner in which it is at present. Some prudent dairy-women, I have observed, lower the first dash of scalding liquor thrown in, and stir the curd up among this; before the rest be added. This lessens the evil very considerably, but may not altogether prevent it.

"Salting the curd is a matter entitled to attention. It strikes me, that much, if not the whole, of the superior pungency, which is mostly observable in the Berkely cheese, may be owing to the great quantity of salt used in that district: while the mildness of that of Wiltshire, and especially of the two-meal cheeses of the Upper Vale, may arise from the comparatively small quantity which is used in these. The quantity of salt used in the Lower Vale is, in the established practices of the two Vales, twice, or perhaps, near three times as much as in the Upper: and although, in Wiltshire, the quantity mixed with the curd be full as much as in the Vale of Berkeley, that rubbed on the surface is very considerably less. This is a point of management, which experiment would readily determine. Something too, may rest with the method of salting. Whether the whole should be rubbed on the surface; or whether it should be partly or wholly mixed with the curd; or communicated in the form of brine, is a subject worthy of enquiry.

"Correcting the curd by some chemical preparation, so as to prevent the cheese from rising, may be practicable; but it is probable, that although the rising were to be prevented, some part at least of the badness of flavour would remain, after this mode of correction; which, in theory, is much less eligible, than that of purifying the milk, previous to the coagulation.

"The shape of the vat is not unworthy of attention. It is observable, that cheeses shrink in width, but not perceptibly in thickness: thus, a cheese made in a vat fifteen inches and a half deep, does not, at three or four months old, measure more, perhaps, than fourteen inches in diameter; yet retains a thickness equal to the full depth of the vat. This seems to be accounted for in the species of compression to which cheeses are subjected. Curd being a substance of a tough cohesive texture, does not, like water, or other liquid, press upward, downward, sideway, every way, and equally in all directions; but, in a vat of the ordinary form, is pressed much more downward, than it is sideway; more flatway, than it is edgeway: hence, in drying, the cheeses shrink principally in width; and hence, all cheeses of the common form have a necessary propensity to cleave in the middle. For the edge, or outer rim, having a greater quantity of surface for the atmosphere to act upon, shrinks faster, or attempts to shrink faster than the central parts of the disk; which, of course, acquire a natural propensity to budge out, to allow for the contraction of the edge; while the edge acquires a similar inclination to crack, to give the requisite circumference. If, however, a cheese be of a close cohesive texture, the powers gained, by this inequality in drying, may not be sufficient to cause either of these effects. But, if it

happen to be of a loose crumbly texture; or, if the texture should be broken or opened by an internal rarefaction, it is left at liberty to act; and, in the latter case, is assisted by the internal expansion.

"The degree of propensity is in proportion to the diameter of the cheese. Therefore, in this point of view, broad vats are less eligible than narrow ones.

"There are, however, some strong reasons in favour of the present form of thin cheeses in these districts. If they were made narrower and of the same thickness, their number, and, of course, the labour and the requisite press room, would be greater. If their thickness were increased they would be more liable to rise, and would not be so soon ready for market, as they are at present: nor would they, perhaps, if made narrower, be so convenient to the dealers.

"To the consumer, however, the present form is extremely awkward, and the cause of unnecessary waste. It appears to me that, in regard to the convenience of the consumer, no cheese should be less than three or four inches thick; nor the diameter of cheeses of that thickness, more than ten or twelve inches.

"In North Wiltshire, we find the form of vats varying very much. The thin and the broad thick cheeses are still made in vats exactly of the Gloucestershire dimensions. But almost every dairy has vats of various forms and sizes; so that spare curd, a thing to be studiously avoided, is seldom heard of there.

"Vatting: With respect to the perfect closeness so much admired in the texture or substance of cheese, something may depend on the vatting; or rather, on the heat at which the curd goes into the press. If the common air, which is necessarily shut up, in greater or less quantity, with the curd, be, at the time of shutting up, in a state of rarefaction, it will, as it cools, condense; and, as it were, assist the press in giving the requisite compactness. Besides, curd, like wax, is softened by warmth; becomes pliable; and may be pressed into a closer, more uniform substance; than cold curd is capable of forming. The latter part of this position never struck me so forcibly, as in seeing the actual effect of heating curd very highly, in the instance of practice I saw in North Wiltshire.

"It is not an extraordinary circumstance for the cheeses to heave in the press: in which case, it seems, no weight is able to keep them down. They set men's laws at defiance. In this case, it is the practice of most dairywomen, I believe, to take it out; break it down small; and re-scald it. This, I understand, generally allays the commotion, so far as to prevent its rising in the press a second time.

"The weight of the press may be a thing of some importance, in the manufacturing of cheese. It seems to be a fact, sufficiently established, that net cheeses never heave; nor are found to be eyey; but are invariably close. I was assured, by an authority which I have no reason to doubt, that in Wiltshire, where (as has been already said) quantities of net cheeses are made for sale, it is no uncommon circumstance to form, out of the same cowl of curd, pressed cheeses which heave, and net cheeses which are perfectly close: it is farther remarked, in that observant district, that the heavier the press is, the greater propensity the cheeses have to heaving; and that filling the vats too full has a similar effect. These appear to me most interesting circumstances; and suggest a variety of theoretic ideas; which, however, it might be imprudent to risque on the present foundation.

"It may be unnecessary to observe, that an experimental enquiry into the art under consideration would be vague, without some method of identifying the subjects of experiment. Some permanent mark is requisite. Numbers are, perhaps, the best reference. In Norfolk, I made use of the numeral characters, cut out of plate iron. Common figures, of the same or other metal, would be still more simple. These lying upon the cheesing, while in the press, sink into the rind, and leave a lasting impression.

"The after-management of the cheese. Perhaps the principal improvement to be made in this stage of the art, is that of striking out some practical method of hastening the maturation of cheeses. Wine mixed with the curd brings on a rapid advance of ripeness. In Gloucestershire, I had an opportunity of observing the effect of three or four glasses of white wine thrown partially among the curd, during the operation of vatting. In a few months, the parts which had imbibed the wine, had passed the point of maturity, and were hastening down the stage of decay. Therefore, it is evident that, by composition, a species of ripeness

ness may be rapidly brought on; and the qualities of cheeses thus ripened, might, no doubt, be infinitely diversified. And, perhaps, by other means, the curd alone might be hastened to a more natural state of ripeness."

Mr. Marshall, in his Rural Economy of Yorkshire, says, "Skim-cheese (provincially, old-milk cheese) is the natural accompaniment of a butter dairy. In the richer parts of the Vale, towards the banks of the Rye, some new-milk cheeses are made: and of a quality nearly equal to those of Gloucestershire. But on the leaner parts of it, this species of cheese is seldom attempted."

"I have met with nothing striking in the manufacturing of skim-cheese to deserve notice; excepting what relates to the curd-mill; an utensil of the dairy which I never met with elsewhere, and which is new to this district."

"In making skim-cheese, the curd is broke up in the whey; the whey, when the curd has subsided, laded off; the remainder, with the curd, thrown into a coarse strainer; and having lain abroad in this (spread over a large tray, with a hole at the corner to let out the whey which drains off) until quite cool, the corners and loose part of the strainer are gathered together in the hand, and the curd squeezed as hard as the hands can press it. The curd in the strainer is then put into a vat, and set in the press for a few minutes to discharge the remaining whey more effectually. The whey having done running, the curd is taken out of the press, and re-broke as finely as possible, salted; and returned to the press."

CHEESE-LIP, a bag in which the dairy-women prepare and keep their rennet for making cheese. See **RUNNET**.

CHEESE-PRESS, a press used in dairies for squeezing the whey out of the cheese. We have given a drawing of the common cheese-press, on Plate VI. fig. 1. where A B is the press, C E, and F G, are levers moveable about the points D, E, F, G, by applying the hand at C; S is the stone or weight; and H the cheese to be pressed.

CHEESE-RENNET. See **YELLOW LADIES BED-STRAW**.

CHERRY-WINE, a very cooling and pleasant drink, made from the juice of cherries, properly fermented. The chief care necessary in making it, is to let the cherries hang upon the trees till they are thoroughly ripe, by which means their juice, which they yield in great abundance, will be the better perfected and enriched by the sun; to gather them in dry weather; press out their juice, and add a quantity of sugar proportioned to the strength you desire in the wine; for the more sugar there is added to the natural juice of the cherries, the stronger and richer the wine will prove, when of a proper age. When this is done, the whole must be regularly fermented, according to the method laid down under the article fermentation. See **FERMENTATION**.

CHEST, the breast, of that part of an animal's body which contains the heart, lungs, &c.

CHEST-FOUNDER, a distemper incident to horses, and occasioned by an improper treatment of an inflammation between the ribs. For if the inflammation be not dispersed in time, and the viscid blood and juices so attenuated by internal medicines, that a free circulation is obtained, such a stiffness and inactivity will remain on those parts as will not easily be removed; and this stiffness is generally called chest-founder.

The signs of this inflammation, are a stiffness of the body, shoulders, and fore-legs; attended sometimes with a short dry cough, &c. a shrinking when handled in those parts.

Bleeding, soft pectorals, attenuants, and gentle purges, are the internal remedies: and externally, the parts affected may be bathed with equal parts of spirit of sal ammoniac, and ointment of marshmallows, or oil of chamomile.

These outward inflammations frequently fall into the inside of the fore-leg, and sometimes near the shoulder; forming abscesses there, which terminate the disorder. *Bartlett's Farriery, p. 57.*

CHESNUT-TREE, the name of a tree, which well deserves the planter's care, affording excellent timber, and a very agreeable shade. It will grow to a very great size, and spread its branches finely on every side where it has room.

The leaves are large, and of a lucid green, and continue late in the autumn; nor are they so liable to be eaten by insects, as those of the oak; nor is there any better

food for deer, and many other animals, than the fruit of this tree.

Chesnut-trees are propagated by planting the nuts in February, in beds of fresh undunged earth. The best nuts for sowing, are such as are brought from Portugal and Spain, provided they are not kiln-dried, which is generally the case of those brought from abroad, to prevent their sprouting during their passage: if they cannot, therefore, be procured fresh from the tree, it will be much better to use those of the growth of England, which are full as good to sow for timber or beauty, as any of the foreign nuts, though their fruit is much smaller. The nuts should be preserved in sand, until the season for sowing, otherwise the mice and other vermin will soon destroy them. Before you set the nuts, it will be proper to put them into water, to try their goodness; which is known by their weight; such of them as swim upon the surface of the water should be rejected as good for nothing; but such as sink to the bottom, you may be sure are good.

In setting these nuts, the best way is to make a drill with a hoe, about four inches deep, in which you should place the nuts at about four inches distance, with their eye uppermost; then draw the earth over them with a rake, and make a second drill at about a foot distance from the former, proceeding as before, allowing three or four rows in a bed, with an alley between, three feet broad, in order to clear the beds, &c. When you have finished your plantation, you must be careful that it is not destroyed by mice, or other vermin: which is very often the case, if they are not prevented by traps, or other means.

In April these nuts will appear above ground; you must, therefore, observe to keep them clear from weeds, especially while young: in these beds they may remain for two years, when you should remove them into a nursery at a wider distance. The best season for transplanting these trees, is either in October, or the latter end of February; but October should be preferred. The distance these trees should have in the nursery, is three feet row from row, and one foot in the rows. If these trees have a downright tap-root, it should be cut off, especially if they are intended to be removed again; this will occasion their putting out lateral roots, and render them less subject to miscarry when they are removed for good.

The time generally allowed them in the nursery is three or four years, according to their growth; but the younger they are transplanted, the better they will succeed. Young trees of this sort are very apt to have crooked stems: but when they are transplanted out, and have room to grow, they will, as they increase in bulk, grow more upright, and their stems will become straight.

After they have remained three or four years in the nursery, they will be fit for transplanting where they are to remain: for the younger they are planted out the better they will succeed. But if they are propagated for timber, it is by much the better method to sow them in furrows, and let them remain unmoved: for these trees are apt to have a downright tap-root, which, being hurt by transplanting, often checks their upright growth, and causes them to shoot out into lateral branches.

If you design a large plantation of these trees for timber, after having two or three times ploughed the ground, the better to destroy the roots of weeds, you should make your furrows about six feet distance from one another; in which you should lay the nuts about ten inches apart, covering them with earth about two inches deep; and when they come up, you must carefully clear them from weeds. The distance allowed between each row is for the use of the horse-hoeing plough, which will dispatch a great deal of this work in a short time; but it should be performed with great care, so as not to injure the young plants; therefore the middle of the spaces only should be cleaned with this instrument, and a hand-hoe used to clean between the plants in the rows, and also on each side, where it will be unsafe for the plough to be drawn; and in hand-hoeing great care must be taken not to cut the tender rind of the plant. But for the two first years after sowing, it will be advisable to dig the ground each winter; because the plants will be too small to admit the hoeing-plough, and in summer to hand-hoe the ground.

When these have remained three or four years, you will, if the nuts have succeeded well, have many of these trees to remove; which should be done at the seasons before directed, leaving the trees at about three feet distance in the

the rows ; at which distance they may remain for three or four years more, when you should remove every other tree, to make room for the remaining, which will reduce the whole plantation to six feet square ; which will be sufficient for them, till they are large enough for poles, when you may fell every other tree, within a foot of the ground, in order to make stools for poles, which, in eight or ten years time, will be strong enough for making hoops, hop-poles, &c. for which purposes they are preferable to most other trees ; so that every tenth year here will be a fresh crop, which will pay the rent of the land, and all other incidental charges, and, at the same time, a full crop of growing timber left upon the ground.

Chestnut-trees were formerly much cultivated in England, and doubtless produced good profit to the owners ; for the wood of this tree is equal in value to the best oak, and, for many purposes, far better : particularly for making vessels to hold all kinds of liquor, it having the property, when once thoroughly seasoned, of maintaining its bulk constantly ; and is not, like other timber, apt to shrink or swell ; and hence all the large casks, tuns, &c. for wines in Italy, are made of this timber, as being preferred by the inhabitants to any other timber whatsoever. It is also very valuable for pipes to convey water under ground, as enduring longer than the elm, or any other wood. In Italy it is planted for coppice-wood, and is much cultivated in stools, to make stakes for supporting their vines, as it will endure seven years, which is near double the time any other stakes will do. *Miller's Gard. Dict.*

CHEWING BALLS, the name of a medicine adapted to restore a lost appetite, an infirmity which horses are often subject to, proceeding from a salt humour, and a bitter phlegm, which obstructs the passage of the throat, and makes them loath their food.

These balls are made in the following manner : Take a pound of assa-fœtida, as much liver of antimony ; half a pound of the wood of bay-tree ; an equal quantity of juniper-wood ; and two ounces of pellitory of Spain : pound all these ingredients apart into a gross powder, in order to which the woods must be previously well dried. Then put them all together into a mortar, and incorporate them with a sufficient quantity of good verjuice, well clarified, pouring it in by degrees, till the whole is reduced to an uniform mass. Make the whole into balls of an ounce and a half each, and dry them in the sun. Wrap one of these balls in a linen-cloth, and fastening a thread thereto, make the horse chew it for two hours in the morning, and he will eat as soon as you take off the bridle ; do the same at night, and continue this method till the horse recovers his appetite. When one ball is consumed, put in another.

These balls may be used on the road, as you travel, being fastened to the bit of the bridle.

CHICKLING-vetch, called by gardeners, the common everlasting pea, and by C. Bauhine, *lathyrus latifolius*, a perennial plant growing naturally in many parts of England.

A correspondent of the editors of the Museum Rusticum recommends this plant as well deserving cultivation for the food of cattle, as the root, which will grow in almost every soil, yields every year a great burden of excellent provender.

"I sowed, says this gentleman, three years ago, a rood of land, light, and but poor in quality, with this seed : the work was done early in the spring, the land being prepared as for barley.

"I sowed it not in the broad-cast way, as I should have found it much more difficult to keep down the weeds ; but I caused a slight furrow to be drawn the length of the land, with a light plough : and when the seed was thinly sprinkled, or rather dropped into this, another was drawn at a foot distance, in which the seed was dropped in the same manner.

"An interval, or fallow space, was then left at least two feet wide : and then two more rows of the vetches, till the whole land was sown. I must observe, that I covered the seed by means of a light harrow with wooden tines, drawn backward and forward across the land.

"When the plants came up, I had them well hoed to clear the ground of weeds ; and when they grew a little strong, they were set out with the hoe to about a foot distance in the rows, that they might have room to spread and branch.

"The first year they yielded no great quantity of fodder, but they have since made me ample amends.

"The second spring they came up very strong and vigorous, branching out much ; and when I turned a couple of horses in to feed, they were very fond of it, eating it very greedily, though they were taken out of a good natural upland pasture.

"The last summer the land was almost entirely covered, and it yielded a great deal of seed indeed ; for experiment sake, I caused a few roods to be mowed just before it flowered, and it made good hay, sweet, and without being sticky.

"I therefore think, from my little experience in the matter, I have some foundation for recommending this plant to the notice of the public. I could wish, indeed, I had been more accurate in my experiment ; but what is past cannot be recalled ; and some other person may, perhaps, hereafter, give the public more useful information on this head."

CHICKWEED, called by botanists *cucubalus*, flowers early in the spring, and, if it be suffered to grow, several times in the course of the year. The way to destroy it, is therefore to pluck it up from time to time, before it can shed its seed.

The berry-bearing sort, which grows with smooth erect stalks, globular empalements, and stamina longer than the petals, is the wild lychnis, or white behen of the shops. This is a very rambling weed, natural to most parts of England, and is frequently called spatling poppy. Its roots are perennial, and strike so deep into the earth, that they are not easily destroyed by the plough ; for which reason, bunches of this plant are too common among corn, in land which has not been perfectly well tilled. Summer fallows, and carefully harrowing out every part of the roots, which should then be burnt, will here prove the best and most effectual remedy.

CHICKWEED is also the name of an annual weed, called by botanists *alsine*. This weed, though it perishes every year, will soon become very troublesome, if suffered to stand till it sheds its seeds, which Mr. Lisle thinks it will do several times in the year ; for he observed, on the 23d of October, a great deal of this weed, the branches of which carried many buds of blossoms, many flowers full blown, and many pods with white seeds almost ripe : so that its increase may be the less guarded against by any sort of husbandry in the common way. The repeated hoeings in the new husbandry must here be of singular advantage ; and, at all events, particular care should be taken to prevent the seeding of this plant upon dung-hills, where it is too often suffered to grow unnoticed and undisturbed : for its seeds scattered there, and intermixed with the dung, will soon give birth to a multitude of weeds in the land upon which it is spread ; unless it be kept, as indeed all dung used for manure ought to be, till it is thoroughly rotted, and the seeds have lost their vegetative power.

CHICORUM IN FIBUS. See SUCCORY.

To CHISSUM, to put forth roots, to grow.

To CHITT, to sprout out, to grow.

CHITTED, sprouted, shot out, grown.

CHIZZLE, bran, the husky parts of ground work.

CHOCY, the same with chalky, resembling chalk, mixed with chalk, or of the nature of chalk.

CHOLIC. See GRIPES.

CHURN, the name of the vessel in which the cream is coagulated by agitation.

There are two sorts of churns, one called the common or Dutch churn, the other the barrel churn.

The common churn is represented on Plate VI. fig. 2, 3. where fig. 2. is the arbor or staff ; and fig. 3. the body of the churn. The lower end of the staff is placed in the body of the churn, and being raised with a pretty quick motion by the hand on the upper part of the staff, the cream in the body is agitated, and by that means coagulated into butter.

Fig. 4, 5, 6, 7, represents the several parts of the barrel-churn.

Fig. 4. is the arbor of the barrel-churn. Fig. 5. its bung, or cover. Fig. 6. the body of the churn ; and fig. 7. the stand on which it is placed. The arbor cannot be taken out of the body of the barrel-churn, without the help of the cooper ; but is here represented by itself, to shew the manner in which it is made. In fig. 6. the churn is represented with the arbor on it, but not placed on its stand, in order to shew the latter. When the utensil is to be used, the churn is placed upon its stand, the cream poured into it through the bung-hole, and the hole closed

with its bung. The arbor is then turned round pretty fast, by which the four leaves of the arbor agitate the cream, and coagulate it into butter. *See the articles DAIRY and BUTTER.*

CIBOULLES, a sort of small onions, propagated only by seeds, which, if sown in March, will be ripe in August; and these are reckoned the best for keeping; but they may be sown in almost every season. They differ from the onions, of which they are probably a degeneracy, in that they do not form bulbs at their roots, but shoot out several upright blades, and those which produce the greatest number of these, are reckoned the best.

Their culture is the same with that of onions, like which they must be thinned, and well weeded. They will increase greatly, even in very dry summers, if they have been transplanted into beds of good earth, and those beds are kept well watered. The reddest, hardest, and mildest, are the most esteemed.

CIDER, or CYDER. *See the article CYDER.*

CLASPERS, the threads or tendrils of creeping plants.

CLAVER, a word used in some counties of England for clover. *See CLOVER.*

CLAW, the foot of a beast or bird, armed with sharp nails.

CLAY, an unctuous and tenacious earth, justly accounted the stiffest of all soils.

Clays are of different sorts, and of as different colours. One kind of them is so obstinate, that scarce any thing will subdue it; and another so hungry, as not to be satiated without uncommon pains, because it absorbs whatever is applied, and turns it to as bad a clay as itself. Some clays are fatter than others, some more slippery; all of them tenacious of water on the surface, where it stagnates and chills the plants, without penetrating the soil; and in dry seasons they harden with the sun and wind, are very barren, and extremely untractable. The closeness of clay hinders plants from extending their roots to search for their necessary food, and prevents the entrance of water, which would help to convey it to them.

The more unctuous and fat clay frequently lies upon the other, and has often a bed of chalk beneath it: but neither is worth any thing till loosened, and fitted to admit the influence of the sun, air, frost, &c. The blue, white, and red clay, if strong, are all unkind: the stony and looser sort is sometimes tolerable; and the light brick earth does very well with most fruit-trees.

Clay, in general, of whatever kind it be, is of all earths the very worst for vegetation: yet even this, as well as any other untoward soil, may, with industry and proper correctives, be made to produce roots and plants which require the lightest and hollowest mould.

Among all the manures for clay, sea-sand claims the preference, founded upon experience, as best suited to break its too great cohesion. Dr. Cox has given us a very accurate account of the sea-sand used by the farmers of Cornwall, by which the lands are greatly benefited, and their crops largely increased. Doubtless the husbandmen of other parts of the kingdom, whose lands lie within a moderate distance of the sea, might find the same advantage from using the same manure, which many of them are too apt to overlook.

"The sea-sand made use of in the agriculture of Cornwall," says that ingenious gentleman, "lies commonly at or near the shore. To distinguish it from what is useless, it is proper to observe, that this sand is formed by the grating of stones, shells, &c. rolled and tumbled over by the wash of the sea. If the matter be shelly, as it is called, that is, the particles formed by the rubbing of stones only, it is of small value: but if it be tolerably shelly, it is the thing desired. Of this shelly sand there are three colours. About Plymouth, and the southern coast, it is blueish, or grey, like ashes, which I conceive to be from the breaking of muscles chiefly, and oyster-shells mixed with it. Westward, near the Land's-end, the sand is very white, and in Scilly glittering. This I think comes from the mouldering of moor-stones, or a kind of free-stone, mingled with the white shells of the scallop-fish. On the north-sea about Padstow, and eastward of Lundy, the sand is rich, of a reddish-brown colour tinged with yellow, and consists chiefly of the broken shells of cockles; which I guess to be of that colour there, from the wash of the Severn, which falls very dirty into the Severn-sea.

"Besides these differences in the colour of the sand, there is also another in the bigness of the grain. The

small is reckoned best for the tenant who takes to tillage only for four years; because it works soonest, and yields the most speedy return. The larger grain is thought to be more profitable for the landlord, because it abides longer in the ground, and makes the pasture afterwards the richer.

"In Falmouth Haven, near St. Mawe's Castle, there is a sort of sand, or rather coralline, that lies about a foot under the ooze; which ooze being removed, and the bed opened, this sand is taken up by a dredge, and is used about Truro, Probus, &c.

"West of the mount, in Portcuthnoe-cove, is a large shelly sand. In White-sand Bay, and about St. Ives, it is very white and small.

"About Minver, Perinsand, and Lelant, the sands are frequently blown up by the wind, and cover abundance of good land. Some houses and even churches have been buried in it; nor has any method hitherto discovered been able to prevent its devastation.

"Of all these sands, the best are accounted, as to colour, first the reddish, next the blue, then the white. As to kinds, the most shelly, and the coralline, are the best, especially if it be taken up from under the salt-water, either by dredges, or being left almost dry by the ebbing of the tide. The blown sand is accounted of no use: and, in general, if sand be only well drained of salt-water, so that it can be conveniently carried, it is better than that which has lain long drying in the sun and wind, which takes off much of its virtue.

"These useful sands are carried by lighters as far up into the country as the tides will serve for that purpose, and there they are cast on shore. From thence they are fetched, in some places, by wheel-carriages; but in most, by reason of the hilliness, narrowness, and badness of the ways, on horseback; one horse carrying about thirteen or fourteen gallons. One man drives seven or eight of these horses, tailed together, to the distance of nine or ten miles from the sand-place; and each horse-load comes to about eight-pence or nine-pence, in some places; though not so much in others: for where it is dredged out of the sea, it costs but twelve or thirteen shillings the lighter, containing six score horse-loads, at the landing-quay, or sand-place; and where it is loaded from the dry-beach, after the ebb, it is not above four shillings the lighter, exclusive of the land-carriage, which is computed at about thirty-two thousand pounds a year, in the whole of that country.

"When this sand is brought home, it is spread on the ground intended for wheat; or usually in the first crop of four, whatever be the grain. For after four crops, the Cornish farmers generally leave their land to pasture for six or seven years, before they till it again: and indeed the grass is so good, immediately after tillage, that they commonly mow it the first year, and which they call mowing of gratten.

"The Cornish acre contains eight-score yards, of eighteen feet to the yard. On one of these acres, if near the sand-place, good husbandmen bestow three hundred sacks, or horse-loads: if within the reach of three turns a-day, two hundred: if within two turns, one hundred and fifty: where only one turn can be made, eighty or an hundred; and so in proportion at greater distances, even to twenty or thirty sacks on an acre rather than none.

"The effect generally is, that where much sand is used, the seed is as much as the straw little. Land thus manured has produced barley, of which the ear has been as long as the stalk it grew on. But where less sand is used, there is but little, and that little hungry grain." *Phil. Transact.* N^o 113.

Where this excellent manure is found, it is taken up by a large bag of the strongest canvas, to the mouth of which is fixed an iron hoop, or frame, to keep it open, and sink it to the bottom of the sea, that it may take up the sand and coral, as it is dragged along by the bargemen. The Rev. Mr. Borlace says, that a barge-load, which is usually delivered for ten shillings, or less, if near the place of dredging, will dress an acre, provided the land be tolerably good.

Large quantities of this shelly sand lie neglected on most of the coasts of England. The benefits arising from it, particularly when laid on clayey grounds, are indeed somewhat slow, but they are very lasting. The improvement is not the first or second year; because this manure consists of hard bodies, such as the sand itself, shells, fragments of coral,

coral, and other calcareous substances, which require time to dissolve them, and which afterwards enrich the land for many years. The best is that which is mixed with coral, and other hard substances of that kind. It gives the heat of lime, and the fatness of oil, to the land it is laid upon. Being more solid than shells, it contains a greater quantity of fermenting particles in an equal bulk; nor does it dissolve into the ground so soon as shells, but decaying more gradually, continues longer to impart its warmth to the juices of the earth.

Similar to this is the practice in Ireland, in that part of the bay of Londonderry, called Loughfoil, towards the eastern side of which lie several banks, about the level of low water. They are formed of the shells of several sorts of sea-fish, particularly periwinkles, cockles, limpets, &c. The country people go thither with boats, and take loads of these shells, which they leave in heaps on the shore, till they are well drained, and thereby rendered lighter for farther carriage. They then carry them in boats as far as the river will allow, and afterwards in sacks on horses, six, seven, or more miles up in the country. They allow sometimes forty, but more commonly eighty barrels to an acre. These shells agree with boggy, heathy, clayey, wet, or stiff land, but not with sandy. They seem to give the land a sort of ferment, as yeast does to bread, opening and loosening the clods, and by that means making way for the roots to penetrate, and the moisture to enter into the fibres of the roots. This manure continues so long, that the archbishop of Dublin, from whom this was communicated to the Royal Society, could not find any person able to determine the time of its duration.

The reason of its long continuance seems to be, that the shells melt every year a little, till they are all spent, which requires a considerable time; whereas lime, &c. operates, in a manner, at once. But it is to be observed, that, in six or seven years, the ground becomes so mellow, that the corn which grows on it cannot support itself, and the land itself must be suffered to lie a year or two, that the ferment may be a little quieted, and the clods harden; after which it will bear as long again, and continue so to do, with the like intermission, for twenty or thirty years.

The good and lasting effects of shelly sand, for the improvement of clay, afford a strong presumption that there is an acid in the clay, which the shells absorb or correct: for when that acid is removed, the clay becomes more easily soluble, or miscible with water, or, as the farmers term it, is rendered mellow. This is contrary to the opinion of a very ingenious gentleman, Dr. Home, who because he could not separate an acid from clay, concluded that there was none in it. That the first object in the improvement of clay is the destroying of this acid, is pretty evident from the qualities of all the substances useful for this purpose; every one of them being of the calcareous kind. The tenacity of clay does not seem to be owing to the smallness and unctuous smoothness of its particles; for in this some marles exceed it, and yet are perfectly and easily soluble in water, probably because they are of a calcareous nature: and if clay be rendered in some degree calcareous, by the addition of alkaline or calcareous substances, so long as it continues in that state, it is said to be mellow; that is, it is soluble like marle, and continues fit for the production of plants, till the acid in the air either neutralizes the alkali, or so far impregnates the calcareous substances, that they can no longer attract the acid. If this be fact, as it seems to be, common sand can be of little use; because the clay will cling as close to a stone, or grain of sand, as it would to part of itself, if the stone, or sand does not so far change the body of the clay, as to take off its tenacity; and therefore Dr. Cox seems to be very right in saying, that the sand which is formed by the grating of stones only, is of little use as a manure. However, as some eminent writers on this subject strongly recommended sand in general, though they all agree in giving the preference to sea-sand, it may not be amiss to hear what they have said on the subject.

Columella, speaking in general terms, says, that his uncle used to carry sand on clay, and, on the contrary, bring clay on sandy grounds, with good success.

Mr. Worlidge says, that the best sand for fertility is that which is washed from hills or other sandy places by the violence of rain; and that sands which are dry have little fertility in them. *Systema Agriculturae*, p. 67.

Mr. Bradley, after dividing sand into two general sorts, as Dr. Lister does, viz. the soft, round grained sand, such as is found in bogs and hills; and the sharp or rag-

sand, as it is commonly called; taken from the bottom of rivers, the sides of high-ways, or the sea; advises laying even the former on heavy soils, especially if it happens to be mixed, as it sometimes is, with rotted vegetables or animal substances; to which he adds, that its efficacy will be increased by the addition of sand of a sharper nature, about a load of which last, if used alone, should be spread upon every rood of very stiff land; for a sufficient quantity of it must be allowed, or else the clay will soon overcome it. *Complete Body of Husbandry*, p. 84.

“The use of sand, says Mr. Miller, is to make the clayey earth fertile, and fit to feed vegetables, &c. for earth alone is apt to coalesce, and gather into a hard coherent mass, as is apparent in clay; and earth thus glued, as it were, together, is no way disposed to nourish vegetables: but if the sand, &c. that is, hard crystals, which are not dissolvable in water, and still retain their figure, be intermixed with such earth, they will keep its pores open, and the soil loose and incompact, by which means the juices will circulate, and plants are nourished thereby. By means of sand, the earth is rendered, in a manner, organical; pores and interstices being thereby maintained, somewhat analogous to vessels, by which the juices may be conveyed, prepared, digested, circulated, and at length excreted, and thrown off into the roots of plants.” *Miller's Gard. Dict.*

Small gretty gravel operates in nearly the same manner, as an opener of the earth, and is strongly recommended by Mr. Evelyn, Mr. Worlidge, Mr. Bradley, and Mr. King. Good crops have been produced by very stiff and sour land, after it has been manured with gravel, which, to fit it for this purpose, should be screened, or sifted, so as to leave among it as few stones as possible.

Shell-marle, or any marle, which makes a strong effervescence when an acid is dropped upon it, is a particularly good manure for clay; because dissolving easily in water, it gives a sufficiently free passage to this fluid, by which means the clay is kept dry even in winter: and if the soil be of a cold sour nature, the absorbent quality of the marle destroys that mineral acid, and keeps the ground warm.

The fossil-shells which has been found in some countries at a great distance from the sea, are a good manure, if they still retain their quality of shells: but besides their being generally petrified, they never are so serviceable as those which are taken from the sea-shore.

All animal and vegetable substances are likewise proper manures for clay. See the article MANURE.

The alkaline quality of the ashes of all vegetables, and the calcareous quality of coal-ashes, render them singularly beneficial to stiff and sour land, for which purpose they are successfully used in the neighbourhood of some great cities where coal is burnt for fuel. They open clayey grounds, and correct their bad qualities. The gardeners and farmers about London know their value, and make a very profitable use of them, particularly to bring into order those grounds which have been dug for brick-earth. After spreading these ashes upon the clay-bottom, they either sow horse-beans, or set the early Spanish, or, sometimes, the Windsor-bean, in those spots; or else they lay such lands down with rye-grass, which generally succeeds very well. Mr. Bradley, blaming the people of Staffordshire, and the counties adjoining, where there are coal-pits, for not improving their many heavy grounds around those pits, by manuring them with coal-ashes, which might easily be burned out of the waste-coal, says, “That wherever there are plenty of coal-pits, there can be no want of good profitable land.” On the same principle, we may account for the effects of the calcination of earth, commonly called, burn-baking, or Devonshiring. See the article BURN-BAKING.

Lime, as it is generally used, is not found to be of so great service in the improvement of clay, as a long established practice might give room to think, or its qualities reason to expect; because its particles are so extremely small, that when separated, or mixed with the clay, they soon become part of its body, and, being so much divided, are speedily saturated by the acid, either in the clay, or in the air: the best method therefore, of using lime as a manure for clay is, to spread the lime-stone unburnt; in which original state acids effervesce strongly with it, and therefore it will be likely most effectually to mellow the clay. It is likewise, in this its natural state, attended with the farther advantage of saving the expence of burning, and becomes a

very

very lasting manure; nay, probably a perpetual one, if the stones are broke into small pieces, which is the proper method of using it; as is practised at Hornton in Oxfordshire, where they manure their land with a sort of stone, common in those parts; and about Devonshire, where a kind of red rock, very tender, and easily broken into sand, is found to be of extraordinary service to clay, or other stiff soils: for any soft stone, broken small, will be of advantage to cold lands, if laid upon them. We find by Pliny, that lime was used as a manure by the ancient Britons, whose lands were thereby rendered extremely fertile.

Mr. Evelyn advises using lime a little slacked for cold wet grounds, and stiff clays; and observes, that it is apt to over-heat dry soils.

Chalk operates in nearly the same manner as lime: but, as Mr. Lisle justly remarks, it if be laid on clay, it will in time be lost, and the ground will return again to its former condition of clay; as we have already mentioned under the article chalk. See CHALK.

Soft pure clay contains a large proportion of very fine particles, more perhaps than any soil usually cultivated by farmers, as may be discovered by dissolving them in water, and after being well mixed, suffering them to subside, which they do in a longer or shorter time, in proportion to the fineness of their parts. In making this experiment it is found, that the finer parts of clay remain suspended in the water for many days, being nearly of the same specific gravity as the water. When they are subsided, and the water suffered to evaporate, the clayey particles unite again, and cohere as strongly as before. This strong cohesion of the parts of clay, is the cause that the roots of strong plants penetrate the clayey soils with difficulty, and that weak roots cannot penetrate such soils at all. Horse-beans for example, which have strong roots do, with some assistance of manures, make their way into strong clays, while the weak rooting carrot is entirely shut out, and starves in the soil that furnishes abundance of nourishment to beans. Clay planted with weak rooting plants appears to be a barren earth; but when clay is opened, and impregnated by the influences of the atmosphere, it becomes a rich pasture for plants: so that it may be said that land is more or less fertile in proportion to the quantity of clay it contains; or which is nearly the same, in proportion to the quantity of very fine parts in it.

As the separating or dividing the fine particles of clay, is the principal means of rendering it fertile, there are several mixtures or manures, adapted to break the strong cohesion of the clayey particles, and these act in different manners, but to all the purpose of disuniting the particles of the clay.

1. Dung, and other putrescent manures, are great enrichers of clay; they open the clay by fermentation, which is a very powerful agent; but the action of these manures is of short duration, and when the fermentation ceases, the clay returns again to its former state of cohesion.

2. Sand of various kinds, which though of so hard a quality as not to furnish any fertile matter to the clay, yet by insinuating into it, and dividing the fine parts of the clay, renders it susceptible of the riches contained in the air or atmosphere.

3. Chalk, which is a body consisting also of very fine parts; and these appear to have one quality in them, that adapts them in a particular manner to open, and keep open the particles of clay; for chalk is of a very dry nature, and the parts, when once separated, appear to have a repulsive quality, and do not, as clay, unite: again, in this seems to consist chiefly the great benefit of chalk, as a manure to clayey land. Chalk, by dividing and keeping open the fine parts of the clay, not only admits the fertilizing influences of the air to enter into it, but likewise makes way for the superfluous moisture of the clay to run off, which was the cause of that coldness in clayey land, which is unfavourable to vegetation: this is confirmed by experience: clays, when opened, become drier and warmer, and produce their crops earlier than they did before.

Other calcareous bodies have, in some degree, the same effects upon clays as chalk; and those kinds of marl that contain the greatest proportion of calcareous earth in them, are the most proper to be laid on clays.

Frost is a most powerful pulveriser of clays when they are dry: in order to receive the greatest benefit by frost, the clayey land should be ploughed up in autumn, or begin-

ning of winter; and not harrowed, but suffered to remain rough during the winter: in this state sand or chalk should be laid upon it. The frost will penetrate the clods exposed to it on all sides, and as soon as the frost breaks they will fall down fine by harrowing, which will mix the chalk with the soil; and if at the same time the land is dressed with dung, warm compost, or such other warm putrescent manure as can be spared, and harrowed in with the chalk, these will lay the foundation of a lasting improvement.

CLAYEY, mixed with clay, partaking of the nature of clay.

CLAY-LANDS, such as partake of the nature of clay.

See the article CLAY.

The natural produce of clay-lands, with regard to weeds, is goose-grass, or wild-tansy, large daisies, thistles, docks, May-weed, poppies, &c.

CLEARING, a term used in threshing corn, to signify a heap large enough to winnow.

CLEDGY, stiff, stubborn, hard, tenacious, mixed with clay.

CLETC, a brood, as of chickens, &c.

CLOD, a lump of earth or clay.

CLODDING-BEETLE, a large beetle used in some parts of England for breaking the clods. This operation may be much sooner performed, and at far less expence, by the spikey-roller. See the article SPIKEY-ROLLER.

CLOVER, the name of a well known plant, and of which there are a great variety of species; but only three of them are cultivated in the open fields for the food of cattle. viz. the red Dutch clover, the white Dutch clover; and the hop-clover.

The first sort is sufficiently known in England by the name of red clover, and therefore needs no description. It is called by Linnæus, *Trifolium caule erecto, foliis oblongo-ovatis integerrimis, spicis ovatis, clypeibus setaceis*.

Since red-clover has been cultivated in England, great improvements have been made in clay-lands, which before produced little except rye-grass, and other coarse bents; but, being sown with red-clover, have produced more than six times the quantity of fodder they formerly did: whereby the farmers have been enabled to feed a much greater stock of cattle, than they could do before, with the same extent of ground, which has, at the same time, enriched the soil, and prepared it for corn; and hence it is now common, where the land is kept in tillage, to lay down their ground with clover, after having had two crops of corn, whereby there is a constant rotation of wheat, barley, clover, or turnips, on the same land. The clover-seed is generally sown with the barley in the spring; and when the barley is taken off, the clover spreads and covers the ground; and this remains two years, after which the land is ploughed again for corn.

Clover is a biennial plant, whose roots decay after they have produced seeds; but by eating it down, or mowing it, when it begins to flower, it causes the roots to send out new shoots, whereby the plant is continued longer than it would naturally do. The common allowance of seed for an acre of ground is ten pounds. In the choice of the seed, that which is of a bright yellow colour, inclining to brown, should be preferred; and the pale coloured thin seed should be rejected. The clover-seed should be sown after the barley is harrowed in, otherwise it will be buried too deep; and after the seeds are sown, the ground should be rolled, which will press the seeds into the ground; but this should be done in dry weather, for moisture will often cause the seeds to burst; and when the ground is wet, the seeds will stick to the roller. The above is the method generally practised by most people, in sowing this seed with corn; but it will be much better if sown alone; for the corn prevents the growth of the plants till it is mowed and taken off the ground, so that one whole season is lost; and many times, if there be a great crop of corn upon the ground, it spoils the clover so that it is hardly worth standing; whereas, when it is sown without any other seed, the plants will come up more equal, and come on much faster than that which was sown the spring before under corn.

It is therefore advisable to sow the seed in August, when there is a prospect of rain soon after; for as the ground is, at that season, warm, so the first shower of rain will bring up the plants, and these will have time enough to get strength before winter: and if the clover be well rolled

rolled some time in October, when the ground is not too wet, it will press the ground close to the roots, and cause the plants to send out more shoots: the same should be repeated in March, which will be found very serviceable to the clover. The reason for preferring this season rather than the spring, for sowing the seeds, is, because the ground is cold and wet in spring, and if much rain falls after the seeds are sown, they will rot in the ground; and many times when the seed is sown late in the spring, if the season should prove dry, the seeds will not grow. The other season is therefore the surest, and consequently should be preferred.

The most usual time, however, of sowing the red or broad clover, is in the spring; for though it will come up well if sown in autumn, it is, while young, very liable to be killed by frost; and many crops of it that have come up finely in autumn, have been totally destroyed by the frost in winter; especially in strong moist soils, upon which it commonly produces the greatest crops, if sown in the spring.

About the middle of May this grass will be fit to cut, when the greatest care should be taken in the making it into hay; for it will require a great deal more labour and time to dry than common grass, and will shrink into less compass; but if it be not too rank, it will make extraordinary rich food for cattle. The time for cutting is, when it begins to flower; for if it stands much longer, the lower part of the stems, and the under leaves will begin to dry, whereby it will afford a less quantity of hay, and that not so well flavoured.

Some people cut three crops in one year of this grass, but the best way is to cut only one in the spring, and feed it the remaining part of the year, whereby the land will be enriched, and the grass will grow much stronger.

One acre of this plant will feed as many cattle as four or five acres of common grass; but great care should be taken of the cattle when they are first put into it, lest it fill them with wind and kill them, which is called their being hoven. See the article HOVEN.

In order to prevent this accident some turn them in for a few hours only at first, and so stint them as to quantity; and this by degrees, letting them at first feed one hour only in the middle of the day, when there is no moisture upon the grass, and so every day suffer them to remain a longer time, until they are fully seasoned to it: but great care should be taken never to turn them into this food in wet weather; or if they have for some time been accustomed to this food, it will be at least proper to turn them out at night in wet weather, and let them have hay, which will prevent the bad consequences of the green clover. Others give their cattle straw while they are feeding upon the grass, to prevent the ill effects of it; but this must not be given them in the field, because they will not eat it, where there is plenty of better food. There are others who sow rye-grass among their clover, which they let grow together, in order to prevent the ill consequences of the cattle feeding wholly on clover; but this is not a commendable method, because the rye-grass will greatly injure the clover in its growth, and the seeds will scatter, and fill the ground with bent.

When the seeds are intended to be saved, the first crop in the spring should be permitted to stand until the seeds are ripe, which may be known by the stalks and heads changing to a brown colour, when it should be cut in a dry time; and after being well dried, it may be housed till winter, when the seeds should be threshed out; but if the seeds are wanted for immediate sowing, it may be threshed before it be housed or flacked; but it must then be well dried in the field, otherwise the seeds will not quit their husks.

It has been a common complaint among the farmers, that they could not thresh out these seeds, without great labour and difficulty; but this is chiefly owing to their cutting their spring crop, when it begins to flower, and leaving the second crop for seed; which ripening so late in autumn, there is not heat enough to dry the husks sufficiently, whereby they are tough, and the seeds rendered difficult to get out. This complaint may therefore be entirely removed by leaving the first crop for seed, as above directed; and then the ground will be ready to plough and prepare for wheat the same year, which is another advantage.

When cattle are fed with this hay, the best way is to put it in racks, otherwise they will tread a great deal of it down with their feet. This feed is better for most other cattle than milch cows; so that these should have very little of it, lest it should prove hurtful to them; though it is not near so injurious to any sort of cattle when dry, as it is when green.

The second sort, namely, the white Dutch clover, grows naturally in most of the pastures in England; and is generally known among the country people by the name of white honey-suckle. Linnæus calls it *Trifolium capitulis umbellaribus leguminibus tetraspermis, caule repente*.

This is an abiding plant, whose branches trail upon the ground, and send out roots from every joint, so that it thickens and makes the closest sward of any of the sown grasses; and it is the sweetest feed for all sorts of cattle yet known: therefore when land is designed to be laid down for pasture, with intent to continue so; it should be sown with the seeds of this plant.

There is an advantage of pasturing white clover, which does not strike every farmer: each joint of them furnishes a fresh root, (and of course a fresh plant) whenever such joint comes in close contact with the soil; and consequently the more it is trodden, the thicker it will get upon the ground. Mr. Marshall recommends the cutting of clover in the beginning of June, before the middle; be there much or little; as cutting it while in full vegetation, no doubt, makes it branch: or; if thin, top it in May, and mow only once.

The usual allowance of this feed is eight pounds to one acre of land; but this should never be sown with corn, for if there is a crop of corn, the grass will be so weak under it; as to be scarce worth standing; but such is the covetousness of most farmers, that they will not be prevailed on to alter their old custom of laying down their grounds with a crop of corn, though they lose twice the value of their corn by the pooriness of the grass, which will never come to a good sward, and one whole season is also lost; for if this feed is sown in the spring without corn, there will be a crop of hay to mow by the middle, or latter end of July, and a much better after-feed for cattle the following autumn and winter, than the grass which is sown with corn will produce the second year. The seed of this sort may also be sown in autumn; in the manner before directed for the common red clover; and this autumnal sowing, if the seeds grow kindly, will afford a good early crop of hay the following spring; and if, after the hay is taken off the land, the ground be well rolled, it will cause the clover to mat close under the ground, and become a thick sward.

The seeds of this white Dutch clover is annually imported from Flanders, by way of Holland, whence it received the name of Dutch clover: not that it is more a native of that country than of this, for it is very common in moist pastures, in every county in England: but the seeds were never collected for sowing in this country till of late years; nor are there many persons here, even now, who save this seed; though it may be done if the same method as is practised for the red clover be taken with this sort: it should therefore be recommended to every farmer, who is desirous of improving his land, to sow carefully an acre or two of this white clover for seed, which will save him the expence of buying for some years, when the price is great; and there will be a sure market for any quantity he may have to spare.

The reader will find a farther account of this grass under the article PASTURE.

The third sort, namely hop-clover, called by some yellow meadow trefoil, and by botanists, *Trifolium spicis ovalibus imbricatis, vexillis deflexis persistentibus, calycibus nudis, caule erecto*, grows naturally among the grass in the upland pastures of this country; but the seeds are frequently sold in the shops, and are by many mixed with the other sorts of clover and grass-seeds, for laying down ground to pasture. This plant grows with upright branching stalks about a foot high, garnished with trifoliate leaves, whose lobes are oblong and heart-shaped, but reversed, the narrow point joining the foot-stalks. The flowers, which are yellow, grow from the wings of the stalk, upon long foot-stalks, collected into oval imbricated heads, having naked impalements lying over each other like scales, somewhat like the flowers of hops, from whence the plant had the name of hop-clover. But there are two sorts of this

clover, which grow naturally in England. The other is a much smaller plant than this, and generally known by the name of none-such, or yellow hop trefoil. See the article NONE-SUCH.

The hop-clover is strongly recommended by the following circumstances. 1. It not only grows, but flourishes on the most barren sands, and therefore must be a very proper grass to cultivate on such unfertile soils, where any other grass that is worth notice will not grow at all. 2. It is not apt to swell cattle as the red clover does. 3. In good ground it will continue long, and bear a very good feed or crop, as Mr. Tull, though prejudiced against clovers, confesses; and, by its flourishing both on sands and clay, which have not been ploughed for many years, it seems likely to continue long in any soil.

CLOUGH, a valley between two steep hills. It also signifies a cliff.

CLOUT, an iron plate on the axle-tree of a carriage.

CLUMP, a number of trees growing together without shape or order.

CLUNG, closed up, or stopped; spoken of hens when they do not lay. It is also applied to wood, or any other thing that is shrivelled, or shrunk up, when it is said to be clung.

CLUSTER, a bunch, a number of things of the same kind growing or joined together. Also a number of animals, or a body of people collected together.

M. de Chateauxvieux has made a very remarkable experiment on sowing corn in clusters, which must not be omitted here.

"It is of great consequence, says that ingenious and assiduous cultivator, to know which is the most profitable way of sowing beds with corn; I mean, that by which they will be stocked with a proper number of plants; for when too much seed is sown, the plants hurt one another; and when too little, the earth is not enabled to produce so much as it is capable of doing.

"The business therefore is to determine what number of plants would be most advantageous. Luckily the difference is wide enough between the too great, and the too small number; and the produce of the crop can only be diminished by an excess one way or the other.

"But whatever certainty we may acquire with respect to this interesting point, we cannot flatter ourselves that we shall be always able to keep it in our practice. The various accidents to which corn is liable, from the hour of its being sown till it is reaped, will always frustrate the methodical arrangement which we may have intended to give the plants.

"The difficulty of succeeding in this enquiry ought not however to discourage us; for it would be attended with such advantage, as would make very ample amends for all the labour bestowed upon it. Let us then have recourse to experiments. Those that are made with this view can never be quite useless. If they do not lead us to the very thing we are in search of, they may at least discover to others what may be of service.

"According to our principles, the distance between each plant ought to be equal throughout the whole length of the rows, that all of them may have an equal quantity of earth to draw their nourishment from.

"Several experiments have shewn, that six inches is not too great a distance for the plants to be at from one another. In this case it would be necessary to sow one grain of wheat at every six inches distance. According to this disposition, a field well prepared ought to produce the greatest crop. The plants will commonly branch out so as to have twenty, thirty, or forty stalks: I have had some with upwards of eighty. It is pity that this exact distribution of the seed cannot subsist long. An accident I lately met with soon convinced me that it was necessary to increase the quantity of seed, and that very considerably.

"This does not, however, yet hinder me from thinking, that if any easy method could be found to have a plant of wheat exactly at every six inches distance in the rows, it would be the best way of sowing lands. I have often considered how this could be reduced to practice, as well to satisfy my curiosity, as to enable me to proceed with more certainty in my operations. When a theory is known to be good, we are strongly encouraged to draw all possible advantages from it for the practical part; we proceed with confidence and pleasure.

"Experience having convinced me that it never would be possible to have a plant at every six inches in each row,

by sowing only a single grain of wheat at those distances, it naturally followed, that the way to have the ground better covered with plants was, to sow more grains. The next question was, how many grains should or ought to be sown in each place? Should it be two, three, or more? Experience only could answer this question. I therefore tried the following experiment. I sowed a different number of grains in clusters, six inches distant from each other, putting one grain in the first, two in the second, and so on to the sixth, which had six grains: then I began again, and went on as before, till the whole length of the row was sowed in this manner. The produce of each cluster was to shew me whether it would be best to double, triple, or quadruple the seed, which it was plain had been sown too thin, when a single grain was dropped at every six inches.

"The winter of 1753 was already far advanced when these thoughts first occurred to me. It was then too late to try this experiment with wheat; but that I might not lose a year, I did it in the spring with barley; not doubting but that corn, which is usually sown in March, might furnish me with some future hints for the culture of that which remains longer in the ground.

"Accordingly on the ninth of April 1754, I ordered another bed to be sowed with barley in my presence, and in the manner I have just related. I counted all the grains of each cluster myself. They were sown in three rows. I varied the experiment in the rows next the south, by sowing no clusters there of less than three, four, five, or six grains; which I continued the whole length of the row. At harvest, all the clusters in which several grains had been sowed, were so thick, that they touched one another.

"What is of most consequence to our culture is, to know the produce of each cluster. But it will be necessary previously to observe, that the clusters were sown in rows extending forty feet in length, and that the beds were five feet wide.

"Results:

The South row,
sowed with 6, 5, 4, and 3 grains,
produced 661, 624, 447, and 493 stalks.
In all 2225 stalks.

The Middle row,
sowed with 1, 2, 3, 4, 5, and 6 grains;
produce 48, 72, 147, 204, 219, and 417 stalks.
In all 1177 stalks.

The North row,
sowed with 6, 5, 4, 3, 2, and 1 grain,
produced 502, 372, 345, 276, 200, and 92 stalks.
In all 1787 stalks.

"Consequently the whole number of stalks in the three rows was 5189. They yielded seventeen pounds of grain, besides a very considerable quantity shed in cutting.

"On the footing of this crop, an arpent of thirty-seven square toises (equal to about one acre and three quarters of a rod English) would contain at least forty-four beds five feet wide, which was the breadth of the beds of which this experiment was made. The beds would be 222 feet long: the produce of one of them would be ninety-three pounds, eight ounces; and that of the forty-four, 4138 pounds, eight ounces; a very considerable crop, and which might be carried still further by other experiments of the same kind.

"The following observations deserve the reader's utmost attention. First, by this experiment, I have very nearly effected what I aimed at, viz. to have two or more plants grow so close together, as to seem but one; and that at six inches distance from each other. If the three rows had been joined together length-ways, they would have been 120 feet long, and ought to have contained 240 plants only: but the distances, which were marked by guess, not being exactly six inches each, ninety-six clusters were sown in each row, which made sixteen cluster over and above. By this means several of them were nearer than six inches to one another.

"Two hundred and eighty-eight clusters were sown, all of which produced plants, except twenty-five, which either did not sprout, or the plants perished. This deficiency is not very considerable; but we must observe, 1. That almost all the places where this happened had been sown with

with only one or two grains of corn. 2. That it was in the middle row that the greatest number of plants was wanting. 3. That the fourth row, in which the smallest quantity sown for any one tuft, was three grains, furnished and retained its full number of plants: and lastly, that almost all those which were next to the vacant spaces, were stronger than the rest, and thereby made amends for the loss of the others.

"Secondly, the whole number of the stalks amounted to 5189, which is after the rate of forty-three stalks and a quarter to a foot: but it is much more considerable in the fourth row, which having produced in all 2225 stalks, the proportion is fifty-five and a half to a foot. The cause of this difference is easily seen. The exposition of that row to the south being more favourable than that of the others, may have contributed thereto; but it was very plain that it was chiefly owing to none of the clusters in that row being sown with so few as one or two grains.

"Thirdly, we see that the increase of the stalks was, in general, in proportion to that of the seed; only the clusters that were sown in three grains in the fourth row, produced forty-six stalks more than those which were sown with four grains; but still the general result of the three rows was exactly in the same progression, as appears by the following recapitulation:

RECAPITULATION.

Stalks produced by	1 grain	-	-	-	140
	2 gr.	-	-	-	272
	3 gr.	-	-	-	916
	4 gr.	-	-	-	996
	5 gr.	-	-	-	1215
	6 gr.	-	-	-	1650

Total 5189

"Fourthly, the ears were nearly equal, at least in two thirds of the length of the rows: the other third surpassed the rest very considerably.

"Fifthly, the difference between the produce of the clusters sowed with one, and with six grains, is extremely great. The former produced but 140 stalks, the other multiplied to 1650. It is true the number of the clusters of six grains is greatest, which is some small diminution of this difference.

"Sixthly, I observed several stalks from which others had shot out, all as strong, and as long, as those from which they derived their origin. They proceeded from the first joint above the surface of the earth, generally at the height of three, four, or five inches, and were two, three, and sometimes four in number. I never perceived this kind of multiplication before; but had till then always observed it to be at the neck, or point of separation between the roots which descend, and the stalks which ascend, that the stalks branched out.

"Seventhly, I suspected, in the summer, what was the cause of the great vigour of the plants of this experiment; but I saw it much plainer after harvest: for, upon pulling up some of the tufts of stubble, I found their roots innumerable. This fact is strictly true. I could not count them upon any one plant that had more than fifteen or twenty stalks. These roots were in such bundles, and so confusedly interwoven one with another, that after counting several hundreds of them, I was forced to give up the task. Their length and thickness was answerable to their number.

"I must now remind the reader of what I said before, that the several accidents which I met with in my first experiments, shewed me it was necessary to increase the quantity of the seed. I did so, by small degrees, from year to year. It is equally important for the success of the New Husbandry, not to run into another extreme, by loading the earth with more plants than it can nourish: the crop would be considerably diminished thereby.

"It appears from this experiment, that the plants of the clusters that were sowed with six grains did not hurt one another: on the contrary, their being sown in that manner proved an advantage, since they produced much more than the others; whence it follows, that we may, without danger, extend the quantity of seed beyond the limits of the New Husbandry. Its principles are not the less true; but they leave the farmer at liberty to use his own prudence in the application of them, according to the nature of the soil.

"Those principles, which suppose that every plant is to subsist till harvest, reduce the seed to a very small quantity: but numbers of accidents destroy many of them. Our reason ought therefore to tell us, that without deviating too much from the principles we adopt, we may, and should, judiciously stock our land with a sufficient number of plants, in order to guard against unavoidable accidents.

"Still I may be asked, what is the sufficient quantity? I answer, that our experiment shews, that sowing six grains together in a cluster, at the distance of six inches from each other, all the length of the rows, will not be found too thick. By following this rule we may be almost certain that the whole ground will be stocked with a proper number of plants. This ought, however, to be looked upon only as a general proposition, which it will be often proper to deviate from in the circumstances we are going to mention.

"When the sowing season is favourable.

"When the land is well prepared.

"In countries where the winter is seldom severe.

"When the land is but little liable to insects.

"When the land is not in danger of being hurt by too much drought, or too much wet.

"And lastly,

"When the land is good, and very fertile.

"In all these and such like cases, less seed should be sowed; and, in the contrary cases, more. Prudence, and a careful study of the nature of the soil, ought to be our guides. Two or three years experience will be sufficient to shew us the practice that will be best to follow.

"It will be right to repeat our last-mentioned experiment, and even to vary it. In all probability it will afford us still greater lights. It will be right, for example, to sow the clusters with a great number of grains, beginning with six, the produce of which is known, and going on to seven, eight, or even more, always in clusters, till we come to a number of which the crop ceases to yield an equal profit. By this means the two extremes may be known, either of too much, or too little seed; and the just proportion will then be easily determined.

"Some farther alterations may likewise be made in this experiment. For example, I placed the grains in the earth so that they touched one another; they may be placed at some little distance, and ranged in a kind of circle of about three inches diameter. It is reasonable to think, that the plants may then make a greater progress, as they will not at all have one common center: some of them will be nearer the ploughed alley; their roots will reach it more easily than before, and will multiply there, which may render the plants more vigorous." *Dubamel's Culture des Terres, tom IV.*

CLUSTER-GRAPE, the small black grape, generally called the currant.

COAL, the common fossile fuel.

COAL-ASHES. See the article *Coal-Ashes*.

COAL-BALLS, a composition of culm, or the dust and refuse of pit-coal, mixed up with mud, clay, &c. burnt as fuel.

About Bristol, Brislington, and other places in the west of England, they commonly make coal-balls of their culm, or small refuse-coal, which would not otherwise be saleable.

The method of making these balls is, to take a certain quantity of the culm, and an equal quantity of sleet, or mud left by the tide on the sea-shore: these ingredients are first mixed grossly with shovels, and then blended more perfectly with the hand: after which they are moulded into balls about six inches diameter.

These balls may either be burnt immediately as soon as they are made, or laid up and kept as long as the owner pleases, without suffering the least damage.

The inhabitants of Croken-pill, near Ring-Road, about seven miles below Bristol, are supposed to make them in the greatest perfection. They seldom use any other fuel, and find it answers extremely well, being much cheaper than coal, making as good a fire, and lasting longer. They make it a rule to work as much culm into the sleet with their hands, when they mould the balls, as they possibly can, without making them crumbly.

These balls have not been used above thirty or forty years in the above parts; but are now greatly preferred, though they can have coals laid in at three-pence half-penny the bushel.

In Wales, where these coal-balls are also made, they use clay instead of the sleet, allowing two parts of culm to

One of clay, adding to the heap a sufficient quantity of water, which they temper with it, in the same manner as if they were making mortar with lime and sand. And after the culm and clay have been sufficiently mixed and tempered together, they form the whole into balls, in the manner above related.

The balls made with clay are not so pleasant a fuel as those made about Bristol with fleech, because the clay is apt to emit a stinking smoke, especially if the balls are burnt before they are dry: but notwithstanding this inconvenience, which the lower sort of people little regard, they afford the poor a good and cheap fuel.

It is surprising that some work of this kind is not undertaken in the neighbourhood of London, as it would greatly tend to lessen the enormous expence to which the poor of the metropolis are every winter subject, for fuel; and could not fail of rewarding the undertaker for his trouble. Culm might be imported into the Thames very cheap, and nothing could be more suitable than the river mud to mix with it, in order to form the balls; it would, probably, do better than the fleech, being of a richer, and more combustible nature.

COAL-SOOT, the soot collected in chimnies, &c. where coals are burnt. A correspondent of the editors of the *Museum Rusticum* has obliged the world with some useful observations on coal-soot as a manure. He observes, that many farmers in some countries are at a loss to find a proper dressing for their meadows; and to such he recommends the use of coal-soot as highly profitable and advantageous; its effects will be very visible for upwards of three years, during which time no other manure need be laid on the land.

"Coal-soot, says he, is of a very warm refreshing nature: it cherishes, and gives nourishment to the grass; it kills the noxious insects that infest the crop, and protects it from the effects of frosts, snows, and chilling rains; and, what is still of greater consequence, it will kill the moss that often abounds in four meadows.

"I must not however fail noticing, that soot will not have these good effects if the meadow-land should be so damp as to require draining: in this case cuts must be made across it, in proper directions, previous to the laying on the coal-soot, which would otherwise be of little service.

"All rank weeds should be carefully grubbed up from among the grass, and that before they have perfected their seeds; without which precaution, in point of time, the work would be to do over again.

"The general quantity I lay on an acre of meadow-land is twenty-five loose bushels: more I find to be rather prejudicial, and less does not answer all the purposes we are to expect from this excellent manure.

"The best time for applying this dressing, I take to be the beginning of the spring: about February is the time I generally lay it on; the gentle rains which then for the most part ensue, wash it into the land, and the following crop is greatly benefited by it. This is very soon visible from the fine deep verdure which the grass assumes.

"Some of my meadow-land is particularly subject to be damaged by frosts, snows, &c. on this I generally lay the proper quantity of soot in the beginning of November; and sometimes, if the winter is likely to be severe, I venture to allow thirty bushels to an acre, which in other cases I never do.

"Having myself found great benefit by using this coal-soot as a manure for meadows, I am willing my brother farmers should know it; that they may have it in their power to adopt the practice, if they approve of it.

"It will be well worth their while, provided they can have it at a reasonable rate, which they may, if they do not live more than twenty miles from London, by land-carriage, and wherever there is a communication by water, though at almost ever so great a distance.

"Other great towns also, where sea or pit-coal is burnt, may supply the farmers with it; but this misfortune is, that where it is in the greatest plenty, they least know the use of it.

"Great care however should be taken to get it genuine and good, the merchant chimney-sweepers, frequently to increase the bulk, mixing the fine sifted coal-ashes with it: this is a great fraud, but may easily enough, with proper care and circumspection, be discovered; for the ashes make the soot gritty, and increase its weight in a very sensible degree.

"Before I conclude, I must give my brother farmers a caution; which is, that they never lay the soot on their land in windy weather, as not only great part of it will be lost and wasted, but the remainder will be so unequally disposed, as to do rather more harm than good. *Museum Rusticum*, vol. I. p. 218.

Coal-soot is also an excellent dressing for green wheat in February; it should be sown by hand, in quantity sufficient to blacken the ground. This is frequently practised in Leicestershire, and many other countries. It is of a warm nature, and therefore does most good on cold, moist, clayey soils.

COB, a wicker basket to carry on the arm. Hence a feed-cob, or feed-lip, is a basket for sowing.

COCCIFEROUS Plants, such as bear-berries.

COCK, the male of the hen; also the male of any small birds.

COCKEREL, a young cock.

COCKLE, the same with darnel-grass. See DARNEL-GRASS.

CODLING, a well known species of apple. See the article APPLE.

COFFIN, that part of the horn or hoof of a horse which appears when he has his foot set on the ground.

COFFIN-BONE, that bone which lies within a horse's hoof as in a coffin.

This bone is round upwards, where it receives the little pastern, but grows broader and thinner towards its bottom; it is of a porous open texture, like a piece of loaf-sugar, and is easily pierced, and often wounded when horses happen to take up nails or other sharp bodies in the streets or roads: accidents to which they are often liable, and are more easily cured than they would have been had the bone been hard and solid.

COFFIN-JOINT, that where the lesser pastern joins the foot.

When the coffin-joint is strained, a horse often continues a long time lame, without the owner's discovering where the lameness lies; because a horse does not, at first, favour it much on the bending of the foot, only in planting his foot upon the ground: but in time, there will grow such a stiffness in that joint, that he will only touch the ground with his toe, and it will be impossible to play the joint with one's hand. The only method of removing this stiffness is blistering and firing, which generally succeeds, unless the stiffness and contraction has been of long standing. *Gibson's Farriery*, vol. II. p. 372.

COKE, pit-coal, or sea coal, charred. It is made by burning pit-coal in ovens constructed for that purpose, and extinguishing the fire in the same manner as is done for charcoal.

COLD, the name of a disease to which animals of almost every kind, particularly horses, are very subject.

Colds are caused by an obstruction of perspiration: that is, the pores, or outlets of the skin, are so far shut up, that the steams of perspirable matter are checked so, that they cannot pass off in their usual manner. The consequence of this is, they recoil on the blood, vitiate its equality, over-fill the vessels, and affect the head, the glands or kernels of the neck and throat, the lungs, and other principal parts.

It would be endless to enumerate the various causes of colds; the most usual are, riding horses till they are hot, and suffering them to stand in that condition, where the air is cold and piercing; removing a horse from a hot stable to a cold one, and too suddenly changing his cloathing; hence it is that horses catch severe colds after they come out of dealers hands; and by not being carefully rubbed down, when they come in hot, off journeys.

The signs of a horse's catching cold, are a cough, heaviness, and dulness, which affect him more or less in proportion to the severity of it; the eyes are sometimes moist and watery, and the kernels about the ears, and under the jaws swell, the nose gleans, and he rattles in his breathing; and when the cold is violent, the horse will be feverish, his flanks work, and he will both loath his hot-meat and refuse his water. When these last symptoms are attended with a slimy mouth, ears and feet cold, and a great inward soreness, there is danger of a bad fever.

But when the horse coughs strong, snorts after it, is but little off his stomach, pricks up his ears, and moves briskly

briskly in his stall, dungs and stales freely, his skin feels kindly, and his coat does not stare, he is in no danger, and there will be no occasion for medicines of any kind; but, you should bleed him about two quarts, keep him warm, and give him feeds of scalded bran, with as much warm water as he will drink, in order to dilute his blood.

If the disorder should increase, the horse feel hot, and refuse his meat, bleed him, if a strong one, two quarts more; and if you are not satisfied, without giving medicines, avoid, as you would poison, a farrier's drench; which is generally composed of some hot nauseous powders, given in a quantity of ale: which too often increases the fever, by over-heating the blood, and palls the horse's stomach by its loathsomeness. And instead of it, infuse two ounces of anniseeds, with a dram of saffron, in a pint and a half of boiling-water; pour off the clear, and dissolve in it four ounces of honey; to which may be added four spoonfuls of salad oil: this drink may be given every night; or one of the following balls, provided there is no fever; in which case, it always will be more eligible to give two or three ounces of nitre, or sal prunella, every day in his feeds, or water, till it is removed; but should the horse be inclined to costiveness, remember that his body should be kept open by emollient clysters, or cream of tartar dissolved in his water, to the quantity of three or four ounces a day.

Take of the fresh powders of anniseed, elicampne, carraway, liquorice, turmeric, and flour of brimstone, each three ounces; juice of liquorice four ounces, dissolved in a sufficient quantity of mountain; saffron powdered half an ounce, salad-oil and honey each half a pound, oil of anniseed one ounce; mixed together with wheat-flour enough to make them into a paste.

Or, Take the following from Dr. Brachen:

Take anniseed, carraway-seed, and greater cardamoms, finely powdered, of each one ounce, flour of brimstone two ounces, turmeric in fine powder one ounce and a half, saffron two drams, Spanish juice dissolved in water, two ounces, oil of anniseed half an ounce, liquorice-powder one ounce and a half, wheat-flour, a sufficient quantity, to make into a stiff paste, by beating all the ingredients well in a mortar.

These balls consist of warm opening ingredients; and, given in small quantities, about the size of a pullet's egg, will encourage a free perspiration; but, in case of a fever, should be cautiously continued. They are much more efficacious, and in all cases superior to the farrier's drenches, if dissolved in a pint of warm ale.

This simple method, with good nursing and hot mashes, warm-water and cloathing, especially about the head and throat, which promotes the running at the nostrils, will answer in most sudden colds; and when the horse feeds heartily, and snorts after coughing, moderate exercise every day will hasten his recovery.

The scalded bran should be put hot into the manger, for the steams conduce not a little to promote a running at the nose, which is often very plentiful, and greatly forwards the cure. His manger should be kept clean, by filling it with straw; his hay well shook and sprinkled with water, and given in small quantities: for his breathing, at this time, taints the hay, and then he will not touch it.

To a horse loaded with flesh, a rowel may sometimes be necessary, as may also a gentle purge or two, to some, when the distemper is gone off. *Bartlet's Farriery*, p. 26.

COLD-CHARGE, the name of a medicine much used by farriers for curing strains, &c. It consists of vinegar, bole, and the whites of eggs, mixed together to the consistence of a poultice, and spread over the part hurt.

COLE, or **RARE**, the name of a plant greatly cultivated, both on account of its seed, being that from whence the rape-oil is drawn, and also for feeding cattle. The botanists call it *napus sylvestris*, or wild mallow.

The marquis de Turbilli, who has done more service to agriculture than any other foreign writer, has lately published a Memoire on the culture of cole-seed, as practised by the Flemish farmers, to whom we are indebted for many valuable improvements in husbandry.

In the piece above-mentioned, the marquis observes,

that all sorts of cole-seed are cultivated in the same manner; and that all grow more or less towards their natural perfection, yield more or less seed, and this seed is of a better or worse quality, according to the nature of the soil on which the cole-seed is sown, the good or bad husbandry bestowed on it, the favourableness of the season, and the manner in which it escapes other accidents to which it is subject.

Cole-seed, he says, thrives best in deep kindly soils; but with plenty of manure, and deep ploughing, it will grow any where. He adds, that he has seen it yield good crops on a dry chalky soil, on which street dirt had been previously laid.

We must observe, that this is a very useful piece of knowledge to propagate, as we never yet heard of any farmer in England, who ventured to sow it on such a soil. This should be attended to by the Bedfordshire farmers about Dunstable, &c.

Our noble husbandman next remarks, that in Flanders, cole-seed is sown and transplanted like cabbages: they give two ploughings to the land before winter; and it is not of much consequence what crop the land was last under.

In the month of May another deep ploughing is given; the land is harrowed two or three times, and then rolled, in order to make it fine. Towards the eighteenth or twenty-fourth of July, it is again ploughed, harrowed, and rolled till it is reduced to as fine a tilth as possible: the seed is then sown, being scattered by the three fingers: the land is lightly harrowed, and afterwards rolled.

The marquis says, that twenty-four pounds of seed will sow three acres, and the plants of these three acres will fill twelve others. Cole-seed is transplanted after any crop whatever.

The land intended to receive the cole-seed plants should be twice ploughed as soon as the crop is carried off. About ten or fifteen days afterwards it is to be once or twice harrowed, and towards the end of September it should have a very deep ploughing. In this last ploughing there should be an open furrow or trench every five bouts. If the field does not lie level, it should be ploughed obliquely, so that there may be an easy fall for the water.

The best and most promising plants being taken up, and tied in bunches, are carried to the field where they are to be transplanted, by the time the last ploughing is completed, and the workmen are ready for them.

There will always remain a number of plants in the land where they were sown: these are generally fed off with cattle; for the farmers never let them stand to ripen their seeds, unless they intend to manure the land for the succeeding crop.

The season in Flanders for transplanting cole seed is the beginning of October. The plants are placed in rows across the furrows. The rows are one foot asunder, and the plants in the rows about six inches distance one from the other. The manner in which this work is done is as follows. A certain number of men advance in a parallel line, each having a dibble, or spade-handle, with two large iron points to it, six inches asunder: they drive this instrument into the ground; the women and children follow, who put a plant into every hole, and settle it at the same time; which is easy enough to do, and it saves some expence.

Then all the cole-seed is planted; if the land to which it was removed was not dunged before it was ploughed, it must be sown with pigeons dung reduced to powder: this, of all other manures whatever, has the most immediate and proper effect on the vegetation of this plant; sixty bushels are enough for two acres.

When this is done, the loose earth in the trenches, or open furrows, is to be thrown with a shovel amongst the plants in the rows. Early in the spring, a spit of earth out of the trenches is, in like manner, to be cast amongst the plants of cole-seed in the rows. This slight tillage gives vigour to the crop, chokes the weeds, and keeps the soil loose.

The rows of cole-seed form a number of beds, and when it thrives well, the trenches are entirely covered, and the whole resembles a thick copse.

Here the marquis observes that cole-seed thrives perfectly well in new-inclosed lands.

The seed is fit to gather about the beginning of July.

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When

When it turns yellow, it is reaped like corn, and laid in pretty large gavels on the beds, where it remains three or four days; it is then carried in cloths, in order to prevent any of the seed from being lost, for it is very ready to drop.

In one, or several parts of the field, in proportion to its extent, and to the quantity of cole-seed there is, the crop is formed into several stacks. The Flemish farmers never thatch these stacks; they know so well how to make them, that the rain does them no damage. The cole-seed heats in the mow, by that means yielding more oil than it would have done, if it had not been stacked.

In the month of September they make a kind of floor in a field, whereon they thresh and dress their cole-seed. If a farmer should incline to thresh his cole-seed without stacking, it will be necessary for him to leave the gavels longer exposed to the air on the beds. Cole-seed may be cut at any time of the day, provided it does not shed; if it does, it should only be cut mornings and evenings. As a whole field does not all ripen at the same time, it should be cut in different portions; being laid in gavels, or heaps, the changes of weather will not affect it. It may safely be stacked three or four hours after rain, provided it has previously been some time in gavels, and is judged sufficiently dry.

In order to clean the seed, parchment sieves are used, if there is any wind stirring; but if it be calm, they use wind-fans.

Cole-seed should not be sown on the same land above once in five or six years.

In the neighbourhood of Clermont, in Beauvoisis, the marquis tells us, that they let the cole-seed ripen in the field where it was first sown; but if they considered that cole-seed is not fond of moisture, that it sends forth large roots into the earth, and grows to a great height, with numerous wide extended branches, they would be sensible that the land, being covered with too many plants, must be impoverished; and that plants, which stand so close together, cannot attain their full size: thus, in this way, the land is impoverished, the weeds are left to perfect and shed their seeds in it, and not only the crop of cole-seed is very indifferent, but also the crops which succeed it. In order to restore such land to a good condition, it should be well manured and fallowed.

Cole-seed extracts such a quantity of salts from the earth, that the Flemish farmers transplant it, as well to divide betwixt two pieces of land the losses in point of quality it occasions to the soil, as to procure better crops. For both these reasons, they also sometimes transplant their cole-seed on land newly broke up.

In the country of Amiens they transplant their cole-seed after the plough in close furrows: this method is better than that above-mentioned; but it is greatly inferior to the Flemish method; for the rows are disordered, and the plants crushed by the horses feet; and having, besides, no fresh earth laid on them, they cannot grow to such fine plants; and, on the other hand, the earth, which is not kept stirring, cannot receive any considerable benefit from the influences of the air.

The marquis observes, that there is, however, a case in which this method must be resorted to; which is, when the plants are grown so tall, and have such long roots, that proper holes cannot well be made for them with a dibble, they should be laid in the furrows after the plough, and open furrows, or trenches, should be left at the distances already mentioned; but the earth from these trenches is with greater difficulty thrown on the beds, because the cole-seed, in this method, is planted lengthwise, whereas in the other method of transplanting, the plants cross the beds.

In this essay the marquis de Turbilli relates a very curious fact, which we shall insert in his own words.

"In the year 1755, I saw in the neighbourhood of Guise, in France, some cole-seed transplanted into a field, containing about eighteen acres, which had always borne fine corn, but had no great depth of soil.

"At the depth of seven or eight inches from the surface lay a bed of red clay, which the farmers are so much afraid of mixing with their good earth. This land was first well dunged, and when the cole-seed was transplanted, the red earth out of the trenches was thrown on the beds.

"All the inhabitants of the country flocked to see this work executed, which was under the direction of a Flemish

farmer. They pretended that he spoiled the land, and that no corn would grow on it afterwards.

"However, during the course of the winter, and red clay became mellow; the rains which washed the dung, ran into the trenches, carrying with it a sediment, and a portion of salts improving the earth that was in the ensuing spring to be thrown on the beds amongst the rows of cole-seed, which came on amazingly.

"At the harvesting of the next crop, the inhabitants did not fail of coming to see what sort of corn succeeded the cole-seed; and being perfectly well convinced that it was much finer than the land was accustomed to bear, they laid aside their prejudices, and adopted the planting of cole-seed. In the year 1761, there was in that single quarter above one hundred acres of transplanting cole-seed."

Must we not, on such good authority, allow that the notion of the under-turf earth being poisonous is ideal? If indiscreetly laid over the surface of the land when it either is, or is to be sown, under certain crops, it may be prejudicial, and so may the best practices in husbandry, if injudiciously followed.

A correspondent of the editors of the *Museum Rusticum* has given us the following method of cultivating cole-seed in Essex. He begins with observing, that the great consumption of rape-oil in that country in manufactures, together with the natural richness of their land, induces them often to sow the cole-seed or rape-seed, which thrives there extremely well.

"In moist soils, continues he, we sow it on four-bout lands, the large furrows between the ridges serving to drain off the water.

"We do not trust to the richness of our land alone, for we almost always lay on a considerable quantity of manure; being of opinion that land cannot be in too good heart for this plant, which requires a great deal of nourishment, having a very luxuriant growth, and draining the land much: for this reason, it is in vain to attempt sowing it on poor, hungry, dry soils, on which it will never thrive, nor turn to profit.

"Land cannot be too mellow, nor too much pulverized, for the cole-seed plant; for it not only requires a rich soil, but also the land must be in excellent tilth: we allow land, on which it is to be sown, sometimes three or four ploughings, according to the nature of the soil: if stiff, it requires more tillage; if a loose, rich, crumbly loam, less ploughing will do.

"In July we harrow the field over, and afterwards sow on it half a peck of seed to the acre broad-cast. As soon as the plant gets out of its seed-leaf, I hoe it as I do my turneps, thinking this a better way than to let it grow rambling without after-culture, as some of my neighbours do.

"This crop is, without care, very apt to be destroyed by slugs, whilst the leaf is young and tender; but to prevent this, I always strew over the young plants a mixture of slaked lime, and wood-ashes; about ten bushels of slaked lime, and fifteen of the ashes, will be quite sufficient for an acre: this is the quantity I use.

"I find great benefit from this practice, as it not only burns up the slug, and destroys many pernicious insects, but also greatly helps to forward the crop, inasmuch that it gets to a strong head before winter, and yields me a plenty of fodder for my cows, sheep, &c.

"A part of my ground will sometimes unaccountably fail: that is, the seeds will not come up; but as the cole-seed plant bears transplanting extremely well, I make my men remove some of the plants, where they stand too thick, to supply the deficiencies: these are sure to take, especially if rain ensues: if it does not, I cause them to be watered, which is soon done, as they seldom fail in great quantities.

"The cole-seed plant is so hardy, that it bears without injury, the frosts of our severest winters; but the north-easterly winds, if very cold and piercing, will sometimes greatly injure a crop, and there is no guarding against these.

"We sometimes in this county sow cole-seed merely for the sake of the winter feed it affords our cattle; in which case we plough it up early in the spring, and are almost sure of a good crop of sound barley. This is not generally practised, because it requires great care to clear the land of the cole-seed plant, which would otherwise grow up with the barley, and injure it; I, how-

ever

ever, and some others, have often practised it to advantage.

"One thing I must observe, before I conclude, which is, that cattle must be fed with this plant with great care, or it will have fatal effects: it is best to give them with it, at times, sweet dry hay: this corrects the superabundant moisture of the plants, and serves to dry up the uncorrected and raw juices that would otherwise mix with the mass of blood in the cattle: suckling ewes may feed on it heartily, however, with very little danger; and in fact, experience will soon direct the young farmer in the management of his cattle in this respect.

"We reap, for the most part, our crops of cole-seed; and as it is very apt to shed, we prepare frames lined with threshing-cloths, each drawn by one horse, to receive the heads of the plants as fast as they are cut off.

"When this crop is properly managed, nothing pays better." *Museum Rusticum*, vol. I. p. 237.

Another correspondent of the editors of the above work, gives the following method of cultivating cole-seed in the fen countries.

He observes, that they make use of no muck or compost, but have recourse to the method of burn-baking, which we have already described under that article. See BURN-BAKING.

As soon as the land is burnt, and the ashes spread, it is immediately ploughed, and the seed is sown as soon as possible.

"The quantity we sow, continues he, on an acre is about half a peck, or rather less: it would be proper to draw a light hurdle, stuck with thorn spray, over it, by way of prevention against the fowls. We plough the land about ten paces wide, that the furrows may carry the water off, where the land lies on a little descent.

"There is one thing to be observed in the ploughing, if the square of the piece will admit of it: you should plough for burning from east to west, and when you plough for sowing, then plough north and south, for these reasons: first the land will break better for being cross-ploughed: and then the land, when sown, will lie as it were full face to the sun; but this cannot always be done.

"As soon as the cole-seed begins to sprout, it is often all destroyed with what we call a black fly; an insect so small, and being black, the same colour of the land, that it is almost impossible to see it, otherwise than as you walk among the seed, if you look steadily, you will perceive something hop or fly off, like the hopping of a flea: I have often endeavoured to discover what sort of fly this is, but never could find one, though they will find the seed immediately on its first sprouting.

"It has many more enemies as it advances in its growth; the next is what we call the black canker; it is a small black worm, about a quarter of an inch long, or rather more: this takes possession when it is about the size of a small cabbage-plant, but windy and rainy weather are great helps to the destroying that insect.

"There is yet another enemy, but he appears in a different dress: this is the green caterpillar, more than an inch long, but does not appear till about the latter end of September, and very often destroys a great deal of it; but the frosty mornings generally dispatch him.

"I have now gone through the various steps of the culture of cole-seed to this particular period, with a supposition, that we have escaped all those dangers. I will now give you a short sketch how we proceed when we are attacked with those enemies above-mentioned.

"If the small fly eat the first sprout, it is usual to sow the land again: but I would advise the farmer before he sows, to harrow the land with a light harrow with wooden teeth; for if the harrow be heavy, it will tear up the furrows: my design in this is to raise a fresh mould, by which means the seed will strike much sooner than if nothing was done to it.

"As to the black canker, the only method I can advise is, to let two men take a waggon rope, each take one end, and draw it over the plant about twice in a place, by which means the canker will be beaten off the plant on to the ground, which seldom rises again.

"As to the green caterpillar, the same expedient, I believe, would be of service to that; but as I have said before, we are chiefly relieved from it by frosty mornings."

The writer then proceeds to give his readers an account

of the uses the cole-seed is put to in the fen countries, when the plant is arrived to its utmost perfection.

"We eat off, says he, with sheep that are about half or three parts fat to make them fit for the butcher; for cole-seed is the most fattening food for sheep that is known in this part of the world, greatly exceeding turneps, as a sheep will thrive more at cole-seed in one month, than it will at turneps in two.

"The usual time of putting them into the feed is about Michaelmas: however that depends upon the farmer's own convenience; but if the sheep are poorer than as above described, they must be put in sooner. We generally manage so as to have the feed eaten off by about Old Candlemas, for this reason, if the land be stout and good, there is a chance for the seed to stand for a crop.

"If the farmer finds the seed good enough to stand for a crop, I would advise him, if the stumps or stalks be left high, as where the cole-seed is strong and good is mostly three or four inches off the ground; otherwise he will find his crop will receive great damage by the stumps being left very shagged and torn, which lets in the wet, and rots a-bundance of them; and even those that do grow have not the vigour as those have that are mowed; for the former is as it were, spread to the snow and rain, while the latter is wholly secured from them both, and will support the sprouts, that shoot out at the sides with strength and vigour.

"Cole-seed is a plant that will shed or shale its seed very greatly, if it is not reaped in proper time; from which great losses have been known, where the farmer has thoughtlessly let it stand too long before he begins to reap.

"If the season has been kind, that the crop comes on all together, though we often see the contrary, the farmer is, in either of these cases as soon as he perceives any part of it turn brownish, to begin to cut, notwithstanding the generality of the seed will be green; but if you let the whole stand till the last becomes brown, like the first, the first part will be entirely lost.

"But it will perhaps be said, should not the latter part be as ripe as the first? My reply is, as cole-seed is a small seed, and the stalks on which it grows are very large, the stalk will feed that part that is green, after it is reaped, so as that of the latter will be nearly equal to the first: by which means both are saved.

"There is a particular method of laying it on the ground, when reaped, different from all other corps; for instance, suppose the people reaping a field from north to south, every two men should lay in their reaps, with the heads of the seed to each other, but not to touch, the heads and the ends of the stalk lying east and west. We shall now proceed to the threshing.

"The distance of time between reaping and threshing depends so entirely upon the weather, that it is impossible to give particular directions in that matter, otherwise than than when the seed has lain till the stalk or straw is dead, and turned white, and the seed some of it being rubbed out of the coss or pod, appears black and plump, and does readily come out, then is the time to begin to thresh.

"Though the bottom of the reaps will be a little greenish, they must be not turned to weather the under side; if you do, it will brush out a great deal of the top side: and if the weather should prove wet in the time it is threshing, even in that case it must be turned, but raised up gently and laid lightly on the stubs, in that situation they will dry apace.

"It is always threshed in the field, upon a cloth, about twenty yards long, and eighteen yards wide. To describe each person's employment, I think, it is not to be done, so that a person that never saw it can have an idea of it; but as it is, I think, if every person concerned in a cole-seed sale, for that is the name we give the cloth and people when at work, be clever in their places, it is a curious piece of mechanism, if I may be allowed this expression, where men and women are made use of instead of wheels and pulleys.

"The number of people employed at a cole-seed sale are, generally, about twenty: seven gatherers; these are women, great boys, and girls: I have said seven; but where the crop is thin it requires more, sometimes eight or ten, or more: but where the crop is thick, a less number may do; these people gather the reaps up with a sickle, for, as their arms cannot reach round the reaps, they would squeeze it together and brush a deal of seed out, if they had no sickle, they

they put it into a sheet called a bearing sheet, of which there are two belonging to every fale: it is about ten feet long, and about seven feet wide, and has loops on each side, through which a light pole is put, and is carried, when filled, by two men to the cloth: these are called the bearers.

"When the seed is laid on the cloth, there is a man called the layer-on: he with a sickle lays it on a row, across the cloth, for the threshers, which are four, two on each side of the row of seed. While the threshers are threshing the first row or floor, the layer-on lays on another row at a proper distance from the other: when they have threshed the second once over, they turn to the first, and thresh it all a second time: they have then done their parts: there are two men called shakers off, that immediately follow the threshers: the first of them throws the cole-seed straw up; the other strikes it as it rises, which helps to knock out what seed may be left: these two men with wooden forks for that purpose, convey the straw off the cloth, over the bolster, to a person that takes it away: he is called the sack-straw.

"After the shakers off, come two persons, one of them a woman: they take off the cosses or pods, and short broken straws, with rakes made for that purpose: these are called the before and behind cavers. The behind caver must be a person of strength and activity, in order to do his work as it ought to be done; for upon him the saving and throwing away of a good deal of the seed depends; so that he should be a nimble brisk fellow, and careful too, or he is by no means fit for that place.

"If there be a good crop, and the plants yield well, the weather bright, and the seed thresh easy, thirty combs, or one hundred and twenty bushels, may be threshed in the day; but sometimes no more than ten or twelve combs.

"Early the next morning the four threshers throw the seed upon the cloth, when the farmer comes with sacks and a waggon, and takes it away, so that the cloth is cleared and ready against the people come to work." *Museum Rusticum*, vol. I. p. 418. and vol. II. p. 79.

If this plant be sown for the food of cattle, they will be large enough for feeding by the middle of November, when if there be a scarcity of other fodder, this may be eat; but if there be not an immediate want of food, it had better be kept as a reserve for hard weather, or spring feed, when there may be a scarcity of other green food. If the heads of these plants are cut off, they will shoot again early in the spring, and produce a good second crop in April, which may be either used for cattle or suffered to run to seed. It is so hardy as not to be destroyed by frost, and therefore of great use in hard, severe winters, for feeding of ewes: for when the ground is so hard frozen that turnips cannot be taken up, these plants may be eat for a constant supply. Mr. Miller says he has found, in several places where he has sowed this seed, that one acre of land planted with cole will produce nearly as much food as two acres of turnips; that this will afford late food after the turnips are run to seed: and that if the plants are permitted to stand for seed, one acre will produce as much as, at a moderate computation, will sell for five pounds, clear of charges.

Partridges, pheasants, turkeys, and most other fowls, are so fond of these plants, that if there be any of them in the neighbourhood of the field where they are cultivated, they will flock thither, and lie constantly among them.

The cakes of cole-seed, which remain after the oil is extracted, are exceeding good for cattle, and will very soon fatten them. They are indeed apt to render the fat of such beasts yellow and rank; but this may be easily removed by feeding them with dry fodder a fortnight or three weeks before they are killed.

"Cole-seed, says Mr. Young, wherever I have remarked the cultivation, has been sown for a crop of seed, as well as food of cattle, but often fed off with sheep, and afterwards reaped for the seed. It is usually sown in the manner of turnips; but I never knew any hoed, even by those farmers that are nicest with the latter crop. It was this circumstance that first induced me to cultivate cole-seed, to discover if I could gain better crops than common, (for sheep) by means of a better than common culture.

The soil of the first experiment, made on half an acre, is a loose woodcock brick earth, and under that a white clay; the field hangs a little to the north. This was ploughed six times, and had four harrowings, sowed broad, and twice hand-hoed. The season was very unfavourable being so very dry, that almost all the turnips in the country were thereby destroyed. Half this experiment ground was hand-hoed in the manner as for turneps, the other half had nothing

done to it. The whole was fed off by sheep. The result was, a loss on the part hand-hoed, of 11. 7s. 7d. per acre. and on the part not hoed, of 18s. 3d. per acre.

"This proves sufficiently the great benefit of hoeing, besides cleansing the land, which is yet more. But I should remark, that the hoeing, if it was a general practice, would be done much cheaper. Labourers always impose when their work is uncommon.

Experiment 2d. made upon a field of four acres, hanging to the north; the soil a strong clay. This land had six ploughings, two harrowings, and two water-furrowings; was sown broad cast, July 1st, and the seed harrowed-in. The excessive drought prevented the crop from rising as it ought to have done, but yet the plants were more numerous than in some turnip fields adjoining. I was induced therefore, as the land had been well prepared, to let it stand. January 24th, I turned into it fifty sheep and three two year old heifers; it kept them just three weeks. The keeping of the sheep being reckoned at 4d. per week, and of the young cattle at 1s. 3d. per week, the value of the produce was 3l. 1s. 3d. but the expence computed, there was a loss upon this crop 1l. 5s. 7d. $\frac{2}{3}$ per acre.

"The greatness of this loss is certainly much owing to the dryness of the season; but such mischances are never to occasion a neglect of trials that are subject to them: all vegetables are liable to such evils, and if one species withstands the enemy better, upon the average of a long period, than another, it is an advantage that ought by no means to be overlooked: experiments registered only in favourable years, are useless, because unfair.

"The sheep and young cattle both affected this food much; but the latter not so soon as the sheep.

Experiment 3d. Half an acre in two divisions, 1776. The soil and exposure the same as in the last experiment. — First division one rood, five ploughings, three harrowings; sown broad-cast the second week in June. — The plants extremely favourable — July 9th, hand-hoed the first time; and again the 24th. The effect of these hoeings was striking — The other rood sowed at the same time, broad-cast, and not hoed. — September 9th, viewed this experiment; the hoed part is as thick as the other, and much more luxuriant, but very few weeds; the other full of them.

March 17th, hurdled the divisions, and fed them off with 60 sheep: the unhoed half lasted them six days. They were turned into the other, which kept them just eight days. N.B. They were taken out of nights and lodged in a small pasture near the field.

	l.	s.	d.
The profit of the rood hoed, after deducting			
all expences	1	19	5
Ditto of the rood unhoed ditto	1	9	11
— Superiority of the hoed per acre	0	9	6

The sheep are very fond of this crop, which agrees perfectly well with them, and the young lambs thrive very much.

Experiment 4th. Half an acre in four divisions, 1766. This piece in the same field as the last experiment. The soil and exposure the same.

Ploughed the whole six times, and harrowed three times, the last ploughing the 27th of June, and by this ploughing struck it into four parts, and sowed,

No. 1. Harrowed-in the seed for broad-cast, for the common management.

2. Harrowed-in the seed broad-cast, designed for hand-hoeing.

3. Thrown on to 5 feet ridges, and drilled a double row on one foot asunder each.

4. Left flat, and drilled in equally distant rows, two feet asunder.

July 15th, hand-hoed No. 2, 3, 4, and hand-hoed the same again, August 6th, — July 21st, horse-hoed No. 3, by turning a furrow from the plants. The 23d, hand-hoed it again, setting the plants out eighteen inches from each other in the rows. August the 12th, horse-hoed No. 3 again throwing the mould to the plants. The 22d, another horse-hoeing, reversing the last. September 2d, another, throwing the earth back to the plants.

The end of March, I moved No. 1. first, and spread the crop upon a piece of dry grass ground, and then turned 15 hogs, about three parts grown, into the field. They took at once to the cole-seed, and fed very heartily upon it.

it. They were kept to it, and it lasted them three days.

No. 2. lasted them seven days.

No. 3. lasted them two days.

No. 4. lasted them five days.

The hogs thrive very well on this food, and none of it was wasted.

The expences of these products being deducted, it appears that they were all unprofitable, in the proportions following :

	l.	s.	d.
No. 1. The broad cast unhoed, loss per acre	1	12	8
2. The broad cast hoed ditto	1	5	10
3. The horse-hoed ditto	2	11	8
4. The drilled in equidistant rows; ditto	1	14	2

From this view the comparative advantages (or rather disadvantages) are pretty clearly seen.

The ill success of this experiment, is to be attributed to more causes than one. The poverty of the crops in point of quantity; and the vegetable not being of that substantial nature which goes far in feeding of the cattle. And yet I think three-pence a week (the price charged in the estimate) a fair price for hogs, that rise when full grown, to about ten stone (14 lb.)—From viewing the field, I should have thought the hoed broad cast crop would have turned out better; but it never carried near so good an appearance as experiment No. 3. But whatever idea is formed of cole-seed in general from this trial, the comparative part of it is very decisive. Drilling is evidently an improper method to cultivate it; and horse-hoeing excessively unprofitable, the expences being very great, and far worse than no purpose. The beauty and luxuriance of the plants in these rows were great, but the superior quality of the others, much more than balanced this circumstance."

We may remark upon these four experiments, that computing the quantity of the crops from the number of cattle fed upon each, is not so accurate and satisfactory, as by weighing the produce of each; and the reason of the drilled equidistant rows, falling short of the broad cast hoed, would have been more apparent, had the distance of the plants in these rows been mentioned. It would seem that the plants stood too thin in the rows: for it is certain from repeated experiments made upon wheat, and other plants of a lesser growth than cole-seed, that drilling them in two rows, at two feet asunder, constantly improves the crops beyond the broad cast sowing, provided the drilled plants are properly hand-hoed.

The very small produce of the horse-hoed crop, is still more extraordinary, as it is allowed by all experienced cultivators, that horse-hoeing improves plants of every kind more than any method of culture hitherto known: for which reason they are allowed more room than in any other way. There is however a medium to be observed; they may be planted too thin for profit, even for horse-hoeing, which seems to have been the case here. For these horse-hoed plants, were upon five feet ridges, two rows upon each ridge, at a foot distance, and the plants were set out to the distance of eighteen inches plant from plant in the rows. By this disposition, every plant occupied a space of a foot and a half square; a space not indeed too great for these plants, where the land is good and well horse-hoed; as appears from an experiment made by Mr. Donellan near Dublin, related in a letter from him to Mr. Wynne Baker, November 8, 1765.

"In a very hard winter, says Mr. Donellan, I observed in my garden, a plant in full verdure above the snow, when turnips were buried a good depth below it. On enquiry I found it was rape (I believe the English call it cole) I tried cows and sheep with it, and found they devoured it with greater eagerness than I had ever seen them eat any other plant. This determined me to try it, and it was answered beyond my expectations, for cows and sheep, especially ewes.

"I have cultivated it ever since, as the best plant for winter and spring pasture, that had at that time come to my knowledge.

I sow the seed about the beginning of July, on good garden ground in drills, and transplant it upon ridges, thrown up from a good fallow at three feet distance the rows, and the plants in the rows about eight inches distance (which I believe is too near) in August, to chuse, when the ground is moist with rain. If it has a favourable season, about Christmas it will be about two feet high; but in March, when the seed branches have shot, near four feet high.

I weighed a middling plant in March 1753, it weighed eight pounds. In 1754, a middling plant weighed ten pounds.

"My butter from the time the cows began to get the rape, was of a rich yellow colour, and had a particular sweetness. And the ewes and lambs were in high order—It must be given to cows with caution, as it will hove them like clover, if given in too great quantities.

"A man will plant eight yards of a ridge in seven minutes. This is all I can recollect in relation to this valuable plant; which for quality, quantity, and lasting, excels all that I have experienced or observed."

Computing from the smallest of the plants that Mr. Donellan weighed, eight pounds, his crop was 73 tons; and 600 weight upon an English acre, which is without doubt a great crop. Mr. Donellan does not mention in what manner he cultivated these plants, but it seems by the disposition of the plants, and his culture of other crops, which he does mention, that these were horse-hoed. His method of planting, adapted them better for the horse-hoeing culture, than in the above experiments where two rows were planted upon five feet ridges: single rows being always more improved by horse-hoeing than double rows; of plants that grow large enough to admit of that manner of planting. We shall next proceed to Mr. Young's last experiment upon this plant; the products of which were weighed.

"Experiment No 5. Upon half an acre in three divisions, 1767. The soil, exposure, &c. the same as in the preceding experiment.

"This piece had seven ploughings, and five harrowings; struck into three parts, and sowed them the 29th of May; viz.

No. 1. With cole-seed broad cast:

No. 2. With turnips broad cast.

No. 3. Was planted with cabbages; the Battersea fort; in rows four feet asunder, and three feet in the rows; the plants of which had been raised in the garden.

"June 15th all three were hand-hoed. The 27th, horse-hoed the cabbages, and hand-hoed the turnips, and cole-seed again. July 18, the second horse-hoeing, the 28th, the third. August 4th, hand-hoed them again. The 6th, the fourth horse-hoeing. All three crops flourished exceedingly: October 5th, cut them all, and weighed the produce:

	Tons	Cwt.	lb.
No. 1. weighed 17 cwt. or per acre	5	0	0
No. 2. weighed 3 tons, 13 cwt. or per acre.	21	18	0
No. 3. weighed 4 tons, 13 cwt.	27	18	0

"They were then given upon a bare grass field, to two large oxen, and two dry cows.

	l.	s.	d.
No. 1. Lasted them two days, which, at 5 shillings a week for the two oxen, and 3s. 6d. for the two cows, comes to 2s. 6d. or per acre:		15	0
No. 2. Lasted them a week, which, at the above prices, comes to 8s. 6d. or per acre	2	11	0
No. 3. Lasted them just a week and a half, which at the above prices, comes to 11. 1s. 3d. or per acre:	6	7	6

From a comparison of these products, with the stated expences of raising them, there appears to be on

No. 1. A loss of 2l. 3s. 9. per acre; and on

No. 2. A loss of 10s. 9d. per acre:

No. 3. A profit of 2l 5s. per acre:

"Cole-seed makes a very indifferent appearance here. The cabbages did not near equal some other crops I have had at various times, but they are much superior to the other vegetables.—All three crops would have improved, had they stood longer (although they were sown very early) but the comparison remains the same. The cabbages, however, would have decayed sooner than either of the others.

"Corollaries to be drawn from these Experiments:

1. Cole-seed is a nourishing and wholesome food for oxen, cows, sheep, and hogs.

2. The quantity of its produce, under the preceding management,

hagement, is inconsiderable, and not upon an average sufficient to answer the expences of culture.

3. The best culture is that of sowing broad-cast and hand-hoeing, as in the turnip husbandry; without hoeing it is much worse, and drilled and horse-hoed naught.

4. Turnips are much superior in quantity and value of produce.

5. Cabbages are greatly superior to it.

Cole-seed, as Mr. Young justly remarks, makes a very indifferent appearance here; and it seems indeed extraordinary, that a plant, which will rise to the weight of eight or ten pounds, should produce no more, by what he reckons the best culture for it, sown broad-cast and hand-hoed, than 5 tons upon an acre: yet as one plant only, weighing 10 pounds, upon a yard square, the produce of an acre amounts to 21 tons, 12 cwt. We have seen that Mr. Donellan's was much greater than this; and if we should suppose that he made a mistake, and that the plants he weighed were larger than the average of his plants, it is not probable that they were twice the weight of the average: yet even upon that supposition, his crop was about 30 tons per acre, and Mr. Young's best crops but 5 tons per acre: a very surprising and unaccountable difference, especially when we consider that the crops were both of them weighed at the same period of their growth, both in the month of March.

This essay on the culture of cole-seed is concluded with the following remarks:

"Cole-seed is one of the most profitable common crops known in England, but not for feeding cattle; nor should I have conceived that any persons could have thought of comparing it with turnips in that light. The profit of the crop is the seed, which amounts to five times the value of any food for cattle that will ever be gained from it.

"I have made enquiries in many parts of the kingdom concerning the culture, and I find that the great object is every where the seed; that in most parts they have no idea of feeding it at all; and that in others, where it is practised, they do it merely upon the same principle that wheat crops are fed off. The farmers are distressed for green food, and they turn their flocks into their wheat and coal-feed, (in many places absolutely against their own judgment, relative to the crop alone) not because such crops were sown for the purpose, but their yielding food when the flock starves.

"Some very sensible farmers, long practised in the culture of cole-seed, with whom I have conversed on the subject, have assured me, that if it is fed when the food is wanted, that is, after turnips are done, the crop of seed is vastly damaged by it, to a much greater amount than the value of sheep fed.

"Some of them have told me, that they have fed off crops earlier, and they think the seed not the worse: but this they mention as a doubt.

"But if the plant be applied to the same use as turnips, and used at the same time, it is agreed throughout the kingdom, that the culture is worthless, not producing near the quantity of food with that crop, nor paying in any respect so well.

"Respecting the culture of cole-seed merely for food, in April and May, that is to succeed turnips, there is one strong reason against it, which is, its not producing a great weight of food per acre. I know, both from my own and other's experience, that the weight of food is trivial, compared to that of turnips and cabbages, &c. I will venture to say not an eighth part, consequently much land must be appropriated to this use, and after the season in question, what quantity of barley or oats will be gained? The sowing will be in May, now it matters nothing to enquire into culture, or any other circumstances; it is clear enough that the spring corn crop is ruined by late sowing. Hence arises the necessity of the spring food yielding a great quantity on a small space of land, that the farmer may experience this evil only in a small degree. Cabbages, which yield as much food on one acre, as ever cole-seed will on six, appear to come infinitely nearer the wished-for mark." *Young's Essay on the Culture of Cole-seed, including Experiments.*

COLE-Cale, or *Keal*, signifies pottage in the northern parts of England and Scotland.

COLEWORT, or *Dorsetshire Kale*, is a species of cabbage, formerly much cultivated in gardens, but at present little known, cabbage plants being substituted in its room. It is however a very useful plant for feeding milch-cattle in the spring, when there is a scarcity of herbage; for it is so hardy that no frost will kill it.

The best method of cultivating this plant in the fields is, to sow the seeds about the beginning of July, choosing a moist season, which will bring up the plants in about ten or fourteen days: the quantity of seed for an acre of land is nine pounds. When the plants have got five or six leaves, they should be hoed in the same manner as turnips, cutting down all the weeds from among the plants, and also thinning the plants where they are too thick; but they should be kept thicker than turnips, because they are in more danger of being destroyed by the fly: this work should be performed in dry weather, that the weeds may be killed. About six weeks after, the plants should have a second hoeing, which, if carefully performed in dry weather, will entirely destroy the weeds, and make the ground clean, so that they will require no farther culture. In the spring they may either be drawn up, and carried out to feed the cattle, or the beasts may be turned into the field to feed upon them as they stand; but the former method should be preferred, because there will then be little waste; whereas, when the cattle are turned in among the plants, they will tread down and destroy more than they eat, especially when they are not fenced off by hurdles. *Miller's Gard. Dict.*

COLLAR, the part of the harness that goes round a horse's neck.

Mr. Marshall, in his Minutes of Agriculture, says that after trying different experiments in various shapes; and finding that those formed with hair and tallow prevented a tender-shouldered horse from galling, but were tedious, expensive and complex; he therefore contrived one made with a wooden bolster; and instead of the bottom piece substituted an iron spring bow; and instead of spring pins had catches. The idea of a wooden collar arose, he says, from this observation, when a horse galls, it generally proceeds from some knot or lump in the stuffing. He prefers straw ones, for be the straw collars ever so hard, if they are smooth they seldom gall. The same wooden collars with great success, Mr. Marshall used for oxen, conforming to the construction of the shoulders of an ox, which generally are very much concave not convex. On experience, he strongly recommends the nine-pin collars as preferable to the bolstered ones for an ox, as they have this material advantage; whether the ox draws on a straight line or turns on a curve, they are equally easy on the shoulder. This is not so perceptible at plough, where it is straight forward, as at cart; when they draw at the turnings and where they obviously draw against the outer edge of the bolster. The nine-pin collars take less wood, are easier made, are stronger, and more tightly, and they fit a hollow shoulder as well as a full shoulder.

COLLAR of Brawn, is the quantity of brawn bound up in one parcel.

COLLATERAL Bee-Boxes. See the article **BEE**.

COLLEY Sheep, such sheep as have black faces and legs. The wool of these sheep is very harsh, with hairs, and not so white as that of other sheep.

COLLIFLOWER. See the article **CAULIFLOWER**.

COLONY, a number of people drawn from the mother country, to inhabit a distant place. And hence the ingenious Mr. White has applied the word to a stock of bees. See **BEE**.

COLT, a foal, or young horse.

Foals are separated from their dams after five, six, or at farthest seven months; experience having shewn, that such as are suffered to suck ten or eleven months, though usually larger and fuller of flesh, are not equal, in other respects, to those that are taken away sooner. After living six or seven months on milk, they are habituated to a more solid nourishment, having bran giving them twice a day, with a small quantity of hay, which is increased as they advance in age, and in this manner they are kept in the stable as long as they express any desire of returning to their dams; but when this uneasiness is over, they are turned into the fields, taking care never to do it fasting. An hour before they are turned to grass, a feed of bran and some water should be given them; nor should they be exposed to either severe cold or rain: in this manner the first winter must be passed. In May following they must not only be turned into the fields every day, but may lie in the open air till the end of October, taking care not to let them feed on the after-math; for by accustoming themselves to this remarkably delicate and succulent grass, they would contract a dislike to hay, which, together with bran mixed with barley and oats ground, should be their principal food during

during the second winter. In this manner they are to be kept till their fourth year, spending the days only in the pastures, during the winter; but both day and night in the summer. When they reach that age, they are to be taken from the pastures, and fed with dry meat; but in this change of food some precautions are requisite; as during the first week to feed them only with straw, and give them proper medicines against worms, which often trouble them from bad digestions and too rank grass.

At weaning young colts they should be kept in a clean stable, not over warm, which would render them tender, and too sensible of the impressions of the air. They must frequently have fresh litter, and be rubbed often with straw; but not tied or curried till they are three, or at least two years and a half old; for the roughness of this friction would give them pain, and their skin being too tender to endure it, instead of thriving, they would fall away. The rack and manger should not be too high, lest the necessity of lifting up their heads to reach their food should occasion them to carry their heads in that manner, which would spoil their chests. When they are a year, or a year and a half old, the hair on their tails should be cut, as the succeeding growth will be stronger and thicker than the former. When they are two years old, they should be separated, and the stone colts kept with the horses, and the fillies with the mares, otherwise the former would fruitlessly weaken themselves with the latter. At the age of three years, or three and a half, they should be broke, and rendered docile. In order to this, a light easy saddle should be put on their backs, and continue there three or four hours every day. They should also be used to receive the bit of a small bridle into their mouths, and suffer their feet to be taken up, and some strokes given on the sole, as if shoeing them. If they are designed for draught horses, a harness should be put on their bodies, and afterwards a snaffle bridle should be added. They should then be trotted on level ground, but without a rider, the person only holding the reins, and either the saddle or harness on their backs: and when the saddle-horse easily turns, and freely comes up to him that holds the rein, he should mount on his back, and dismount again immediately, without riding him, till he is four years old, as before that time the weight would be too much for him: but at four years old he may be ridden, and trotted at small intervals. *Buffon's Histoire Naturelle, tom. IV.*

COLT-EVIL, a distemper to which young horses are subject, consisting of a swelling in the sheath, occasioned by their having full liberty with the mares before they are able to cover them.

This disease may easily be removed at the beginning, by the use of warm fomentations, made of emollient herbs, &c. but if the swelling be hard and inflamed, bleeding and purging are both necessary; and it may also be proper to tie his yard up to his belly, making a hole for his water to pass free. *Gibson's Farriery, vol. II. page 168.*

COLTS-FOOT, *sole-foot, horse-hoof, or bull-foot*, the name of a very common weed, whose scaly stalks arise in February, bearing one yellow compound flower, which is succeeded by a hairy white down. The leaves come out later. They are shaped somewhat like a horse's hoof, and are downy underneath.

This weed, which delights to grow by the side of rivers, increases so fast by its seeds and rambling roots, every piece of which last will produce a new plant, though they have been broken by the plough, that it cannot be extirpated without much difficulty, and a considerable time. Carefully pulling up the roots every time the earth is stirred, or the least vestige of the plant appears, and preventing its running to seed, are the most effectual means of destroying it in arable land: and this is best accomplished by the horse-hoeing husbandry; but totally to extirpate it, the ground must be laid down long to grass. One of Mr. Lisle's neighbours almost destroyed it by two successive crops of vetches; and he himself is clearly of opinion, that it may be killed by letting the land lie a sufficient time under clover or rye grass; because, says he, the roots of the natural grass matting more and more every year, will in five or six years, so bind the surface of the ground, that the colts-foot will not be able to pierce through it, and will therefore die for want of air. He ploughed up broad clover in the beginning of July, and turned up the roots of colts-foot, in which he observed, between earth and air many little buds, shot forth, of the bigness of the midsummer buds in fruit-trees, probably to be the leaves or flowers of the next year; and at the depth of five, six, and even se-

ven inches; he remarked here and there a shoot of a callous body; like the root itself, from one to four inches long; perhaps destined to be future roots: he experienced that a winter's fallow will not destroy these roots, and that they cannot resist the effect of summer fallows, in which they are turned up; and exposed dry to the sun. It is therefore necessary to pick them as clean as possible, and burn them: for it is not to be supposed, that all the roots which are turned up in a summer fallow will wither of themselves: on the contrary, such of the buds at the joints of these as are buried under ground; will shoot out again if much rain falls, or the season be wet.

COMB, a measure of corn, consisting of four Winchester bushels; but in the fen country the comb generally consists of four bushels, and each bushel of eight gallons and a quart.

COMMON, an open piece of ground used equally by many persons.

The marquis of Turbilly has treated the subject of breaking up commons and waste grounds in so masterly a manner, that it will be necessary to give the substance of what he has advanced on this interesting subject, nearly in his own words.

"Upon the death of my father, says the marquis, which happened in the year 1737, I inherited the lands of Anjou, of which I am now going to speak. They lie contiguous, and form a pretty considerable extent.

"Hills and vales render the country uneven in many places; though in others, there are spacious plains, with several brooks, and a small river. The soil is of three kinds, bad, middling, and good: but this last is least frequent. Most of the lands being of a middling quality, are fertilized only by dint of care and manure: wheat grows on one spot, mellein on another, rye on a third; and sometimes it is necessary to sow these three different sorts of grain in the same field; so much does the soil vary: but, in general, we sow more ground with rye, than with any other corn. Buckwheat, barley, oats, hemp, flax, and other equally useful productions, are likewise cultivated in these parts. The vine prospers here very well, especially on the sunny side of banks and higher grounds: our wine, both red and white, is good; our fruit trees thrive well; and so does the white mulberry, of which I made large plantations some years ago. The oak, the elm, the beech, and other forest trees, grow extremely well in these lands. Such is the soil of this district: the climate is mild and temperate, as is the rest of Anjou.

"Three sides of this estate border upon immense tracts of uncultivated heaths, which spread through the greatest part of the province, and belong, some of them to the king, and others to different lords, ecclesiastical and temporal. However, the situation of my house, and of the chief village, is advantageous, being nearly in the center of the whole, and within about six miles of three pretty towns.

"Such was my estate when I took possession of it: not a quarter part of the land was cultivated, and even that very badly: the rest was either abandoned by the husbandmen, or had not been cultivated at all. Most of the meadows along the brooks and rivulets were become marshes, productive of scarce any thing but rushes. The vineyards were ruined, and the woods destroyed. A third part of the farms belonging to the principal parish where my seat is, were un-tenanted, for want of farmers to rent them. The inhabitants of this place were very poor, and did not, in general, raise corn enough of any kind to subsist them half the year: nay, such was their indolence, that they chose rather to stroll about and beg during the other half, than be at the pains of bestowing proper culture upon their land, which, with that culture, would have maintained them decently.

"This deplorable condition of my estate, which I have here represented fairly, without exaggerating any one particular, determined me, early in life, to read attentively all the most approved writers upon agriculture, and to observe carefully every improvement I met with in my travels. Even the campaigns in which I served did not interrupt these inquiries; for agriculture and arms never were by any means incompatible. Under these circumstances, I resolved to execute upon my own property, designs, which my knowledge of the place, concern for the unhappy situation of its inhabitants, and regret to see what small returns were made by so large an extent of ground, naturally suggested.

"I plainly foresaw that this undertaking must be a work of

of time; neither my fortune, nor the number of hands I could procure in the country, allowing me to go beyond the clearing and improving of a certain space every year. Some gentlemen of knowledge, judgment, and public spirit, to whom I communicated my thoughts, approved of them, commended my design, and exhorted me strongly to carry it into execution; representing, besides the advantage which would necessarily accrue to me, the general benefit which such an example might be of to my country, filled as it is with numerous tracts of uncultivated land. This last reflection animated me more and more.

"My first care was, to endeavour to extirpate the spirit of indolence, and consequent love of begging, which prevailed among my peasants in general. To this end, I gave public notice of my intended improvements, with a declaration, that I would constantly employ every man, woman, or child above eight years of age, who might not have business of their own to do, on condition of their leaving off begging. At the same time I ordered an account to be taken of such as were not able to work. These I afterwards examined more particularly myself, and found among them several who, though they were not fit for hard labour, were capable of doing many useful things, in which I accordingly employed them. By this means, my list of really helpless people was reduced to a small number, which I provided for, till their relations should be able to keep them by means of what they earned from me. A few, and only a few, of these poor objects, who either had no relations, or such as in truth could not help them, became a dead charge; though this soon lessened, and is now inconsiderable.

"An innumerable multitude of rabbits infested my land. Against these I declared open war; being determined absolutely to destroy them. This has already been several years a-doing, and is not yet entirely completed. Some of them still remain, sheltered in their burrows at the foot of rising grounds, and others make incursions from the neighbouring woods and warrens. However, they do me no great mischief now; and even then I drove them from the place where I wanted to work.

"In the month of June 1737, I begun my improvements with clearing some of the land near my house. This ground was so poor that no farmer would even attempt to make any thing of it, served only to feed a few stunted cows, and was over-run with briars, thistles, and broom, which, being cut up, and laid in heaps, from space to space, were burnt upon the spot, and yielded a considerable quantity of ashes. These were then spread, and immediately turned in by a single ploughing, lest their virtue should exhale. During the summer, this land was ploughed several times, different ways, in order to loosen it, and endeavour to destroy the weeds. I had bought for this purpose oxen, which are generally used for ploughing in Anjou: but my horses helped them, especially for harrowing. Here my poor peasants, men, women, and children, were employed to break the clods and pick off the stones; and as I had more dung than my arable lands required, I ordered about half the quantity that is generally used in other places, to be laid upon this ground, which was afterwards sowed at the usual time. This first trial succeeded, and the crop was very good; though most of my neighbours were of opinion that all my labour would be lost.

"In 1738, I undertook another piece of ground, adjoining to the former, and of the same kind. I began in March, proceeded as before, dunged it, and had equal success. The second crop of the former spot is still more plentiful. This summer I gave a thorough fallow to ten acres which had long been under corn, and sowed part of them with hemp and flax, for a purpose which will be mentioned hereafter. I likewise recruited my vineyard, and drained my meadows. Numbers of day-labourers were employed in cleansing the rivulets and brooks which run through them. In the winter of this year an accident happened, which had like to have overset my whole undertaking. The oxen which I used for ploughing, and which were grown lean, it was supposed through labour and fatigue, were on a sudden covered with vermin, which eat into their flesh: several remedies were applied, but in vain, the vermin re-appearing in a few days. We knew not to what cause to ascribe this disorder, which was destroying animals without whose assistance I could not proceed: besides which, the loss would, in itself, have been considerable. They had hitherto been fed with hay only; though

the custom of the country was to mix it with an equal quantity of wheat-straw. As I had not yet a sufficiency of this last, I bought some, gave it to them mixed with hay, and allowed them oats from time to time when they had been hard worked. This mended them a little: but they did not recover entirely, or get rid of their vermin, till they fed on green grass and lay out of doors.

"I begun this year to make new roads and causeys across my meadows, marshes, and rising grounds, for the easier conveyance to and from my fields; the old ways being often impassable in many places. This has been a very long and expensive work; nor is it yet quite finished. I also bought at this time a number of sheep, which have since increased considerably; for, notwithstanding the great extent of this uncultivated land, where many of them might easily have been fed, none were ever kept upon it before. The people of the country thought they could not thrive there, on account of the marshes, and of a plant called white root, very prejudicial to them, found in several parts of the lay-grounds and commons. Most of these weeds were pulled up at a small expence; and the sheep, who were fond of this herb, eat up the rest, which was so little that it could not do them much hurt, though some of them were sick with it. The constant feeding of the sheep, and their dung, afterwards completed the destruction of this noxious plant, and brought up good grass in its stead. This shews how farmers may often get rid of any such bad weed.

"In 1739, I took the next contiguous land, going round my mansion: a method which I have always followed; so that my improvements have been, from year to year, more and more distant from my place of residence. The soil I now fell upon was tough, strong, and only thin grass grew upon it, with here and there a few brambles and other wild productions, which were soon cut up. This ground was broken up only with the plough: some dung was laid upon it, and I sowed it directly with winter oats, which succeeded very well. My improvements of the two last years yielded plentiful crops, not only of corn, but also of hemp and flax. These last were dressed and given to the women and girls to spin; paying them different prices, according to the fineness of the thread. They applied themselves to their work, and by degrees became perfect in it. By this means I accomplished my design of finding employment for these women and girls all the year round, and afforded them the means of procuring an honest livelihood, as well as to those whom age or infirmities rendered incapable of working abroad.

"The business of the field was always preferred in the seasons proper for it, and when the weather permitted; keeping in my eye Cato's advice, never to work within doors, while there is any thing to be done without, nor to do that in fair weather, which may be done in wet. I have continued this spinning ever since; and have allotted for the growth of hemp and flax particular spots, which I have inclosed with hedges and ditches, and kept in good heart and with fine tilth. They have yielded plentiful annual crops without being rested; only dunging them every other year; for hemp does not impoverish the ground when it is properly cultivated. My vines, meadows, and ways were not neglected.

"In the beginning of this winter I gave my oxen hay mixed with an equal quantity of rye-straw, not having wheat-straw enough to answer that purpose. This succeeded to my wish. My oxen continued in perfect health, free from the vermin I mentioned before, and in better plight than those in the neighbourhood, which were fed with hay and wheat-straw. I have continued to give them this food as long as they lie within doors, and find it answer extremely well. During this time they have no corn, even though they work; and I do not find that this suppression of their otherwise usual allowance of oats, renders them at all less hearty and vigorous. This quality of the rye-straw may be of great advantage in countries where oxen are used for ploughing.

"In the year 1740, I was obliged to make a considerable addition to my number of servants, and stock of cattle of all sorts in proportion to the increased extent of my improvements. It may perhaps be thought, that so many servants would eat me out of house and home. This I had guarded against from the beginning. All those employed in my husbandry lived by themselves, in some of the out-houses, where they had their own kitchen, and a certain stated allowance

lowance, suited to their usual manner of life ; so that they had no sort of connections with the others, whose more immediate business it was to attend me.

" The land which I improved this year was covered with heath, broom, and furze, which had grown very thick and high. In the spring, when the weather was dry, I set fire to this surface, after taking the due precautions to hinder the flames from spreading too far. The whole burnt very well, and I was in hopes of being able to plough up this ground without paring off the turf, as I had done with my other land the year before. This would have been a considerable saving ; especially as the ashes were ready spread. But I should have considered that different lands require different treatment. Ploughs stronger than usual, were made on purpose for this work ; but the roots of the furze and broom, which had resisted the fire, broke them ; and though I doubled the number of my cattle for draught, several of the oxen were ruined by this hard work, in which I persisted with too much obstinacy. In vain did I plough it over and over, and break every clod both before and after sowing it ; the broom and furze were not destroyed, but made new shoots every where : the land continued unkindly and sour, and the oats which I sowed in it yielded scarce any crop ; in short, repeated ploughings and dunging were necessary during three years, before it could be brought to a good tilth, or those noxious plants be quite extirpated. I came badly off in this experiment : but my former improvements, which I had continued to manure and sow, luckily produced an abundant crop : that of the last year yielded a good quantity of wheat, which kept up my establishment, though it did not compensate for the loss I now sustained. However, this disappointment did not discourage me. It raised the laugh of the whole country at my expence ; especially of those who had foretold from the beginning, that I should not succeed. I gave them the hearing, and only resolved not to fall a second time into the same error.

" This year I established a nursery of fruit-trees, and also of forest trees from other countries. This nursery which succeeded very well, was of great advantage to me afterwards, to fill up the different plantations which I made as my improvements extended. I likewise repaired my woods, which had formerly been destroyed by cattle and deer. I surrounded them with ditches planted with hedges, in order to bring them into regular yearly cuttings ; to which end I grubbed up such trees as were stunted in their growth, and filled every empty space, either with young plants, or the seeds of others, according to the nature of the ground. By continuing to do this every year, my woods are now in excellent order, and afford regular cuttings, at a small expence of keeping the fences in repair.

" In 1741, I had the same kind of land to deal with as the year before ; but took care not to commit the same fault. Each day's cutting of the heath, broom, &c. was burnt, with proper precautions, as the workmen advanced, and the whole surface was dug by hand as it was cleared. By this means, the ashes of these plants preserved their fertilizing quality, and their roots were pulled up. Women and children took the earth from off these roots, and turned them, whilst they were drying in the hot weather. These were also laid in heaps from space to space, and burnt upon the spot, where they yielded some ashes, which were spread, and immediately buried with one turn of the plough.

" During the summer, this ground was ploughed several times ; each time in a direction different from the former. My cattle were but little fatigued with this work : the heath, broom, &c. was almost entirely destroyed, and the sourness of the land was in a great measure cured. I had then begun to make composts, which were mixed with the dung of the stall and stable, and proved of singular benefit. With their help, I was enabled to manure my newly broken up-land sufficiently ; that is to say, to lay upon it half the quantity that is generally used of dung for the common run of lands. I sowed this piece with rye, which yielded a plentiful crop. The crops from my former improvements, which I continued to sow without resting them, were likewise very good this year, excepting that of the last, which was also under rye, and yielded but a middling produce. My vineyards were now brought into as good order as any in the province ; and I continued draining my meadows, and making roads and causeys.

" The war then calling me into Bohemia and Bavaria, I

forefaw that I should be absent some time, and consequently not able to spend part of the year in the country, as I had used to do ; to give directions to my people, and see my orders executed. Under these circumstances, that my improvements might not stop, I gave the direction of the whole to an intelligent servant, who had lived with me a long while, and was married to an excellent housewife : and to interest him the more in the future success of my undertaking, I agreed to allow him half of the profits of every kind : subjecting him to this only restriction, that he should not impoverish the ground by too many crops. In this state things went on till the end of the year 1748.

" In the mean time new pieces of land were broken up every year ; but not so extensive as the former ; the expence of my campaigns not permitting me to lay out upon them so much money as before. I even straitened myself, not to interrupt the progress of my improvements : which, in general, succeeded very well. I also revived an old method of breaking up land, by cutting off the surface with a paring mattock, and then burning it. See the article BURN-BAKING.

" During the whole of this time, I was but two years together without visiting my estate, where my presence was then very necessary. In all the other years, I gladly accepted the leave which was given me to see how my works went on ; though I sometimes did not stay above a fortnight among them. However, this was enough to give an eye to every thing that was doing ; which is of great consequence in undertakings of this kind.

" Peace being restored, I resumed the personal guidance of my affairs in the beginning of the year 1749, and placed my old servant in a farm which I had to let, where his profits sat him down at his ease. Though he was extremely faithful, and my improvements were carried on very well, yet I found that, for want of due care and attention at certain times, the crops were not equal to what they had been under my immediate direction : a circumstance which plainly shews, that a work like this never thrives so well as in the hands of the owner himself.

" I now resolved to pursue my improvements as before the war, that is to say, to break up larger tracts of ground every year, than had been done of late. Most of my yet uncultivated lands were, and had been from time immemorial, thick covered with high broom, heath, fern, &c. and experience had taught me that these were not to be broken up with the plough alone.

" Of all the methods which I tried, none seemed to me, as I said before, so good as the paring-mattock and burning. I therefore fixed upon this, and, in consequence, sent for the workmen I had formerly employed in trials of this kind : but their number not sufficing for the extent of ground which I proposed to break up this year, I sent for others from a distance, and was weak enough to let these last persuade me to contract with them at a set price, for paring the whole surface. I agreed to give them even more than they ought to have had for doing the work ever so well ; for I was not yet thoroughly acquainted with the nature of this business. They began it in March ; and to earn their money the more easily, or rather to rob me, only skimmed off the mere surface, without hardly touching the roots of the plants, which they should have cut off. When this work was done, as they called it, for the burning part did not belong to them, they immediately came to me, and asked for their money, which I simply gave them, not suspecting the cheat, but only thinking they had earned it very soon. When the turf of their cutting was dry, I ordered it to be laid in heaps, and burnt. The small quantities of ashes which it yielded, made me suspect the roguery : but when I found that the roots in the earth broke some of my ploughs, in cutting only a single furrow to cover the seed, and that there was no clearing it of clods, I was thoroughly convinced that I had been the dupe of these people, and that this paring would be of little service. The wheat sowed in this ground rose indeed pretty well, and looked tolerably during part of the winter ; but not being able afterwards to strike through the crust formed by the remaining matted roots of the plants, most of it died, and the little that remained scarcely returned the seed : nor could this land be recovered till the next year, even by ploughing, breaking the clods, and dunging.

" The bad success of this experiment, upon which a great deal of money had been thrown away, tried my patience, but did not discourage me. My neighbours

began anew to exclaim against my projects, as they called them; and numbers of those people who are determined at all events to oppose every novelty, be it right or wrong, were pleased to vent their sarcasms at my expence: I let them talk on. The roguery of the people who had last pared my ground did not hinder me from still thinking that this was the best way of breaking up new land, especially heaths; and the event has shewed that I was right. This check, which was the last which I received, made me resolve to take my measures better for the future.

"The rest of my improvements yielded very good crops this year, during which I continued to mend my roads and meadows. These long winded works, for which only a certain space of time, and a certain sum of money, could be allotted every year, have been continued ever since, and indeed are not yet finished. I likewise bought this year several hives of bees; though I had some before. These useful creatures have multiplied exceedingly; especially in a little garden, where my chief apiary is, situated between meadows and heaths, of the flowers of which they are remarkably fond. Though these industrious insects thrive perfectly all over the country I am speaking of, yet the inhabitants of these parts not only have not a tenth of the number they might keep, but ignorantly follow the old barbarous custom of destroying the bees, when they want their honey, instead of only taking part. See the article BEE.

"I did not agree by the piece for breaking up the land I intended to improve in the year 1750, lest I should be again deceived; but hired proper labourers by the day. They began their work in March, and finished it about the middle of June; cutting all the way deep enough to go under the crust, or net-work, formed by the roots beneath the surface; for I took particular care to see that this was done. When the turf thus pared, to the thickness of about four inches, was dried, piled up, and burnt in heaps from space to space upon this ground, it yielded a considerable quantity of ashes, which enriched the soil for a long time. Wheat was then sowed, and the plough easily turned up the furrow which covered the seed. Women and children easily broke the clods of this ground, which was thereby at once brought into good order; the roots of all the wild plants having been effectually cut through, and their seeds destroyed by the fire. My wheat, by this means un-incumbered with noxious productions of any kind, flourished well, and yielded an excellent crop; as also did such other parts of my land as were under corn. The success of this year revived my hopes. I now perfected my method of making artificial dung, which, as I have already observed, proved of infinite service; and, for manuring my more distant lands, I built upon them perpetual kilns, which have always supplied me with a sufficient quantity of ashes.

"This year I began to plant white mulberries, in order to feed silk-worms, and make the inhabitants acquainted with the management of them. I have since continued to make plantations of this kind every year, and find them answer perfectly well, especially in light soils. Several of them are an useful embellishment to proper parts of my improved lands, and I have alleys of them, which, though not suffered to run up high, form a very pleasing prospect.

"In 1751, I again succeeded perfectly well in my new method of paring and burning. All my cultivated lands now yielded very good crops: and that in particular which I had broke up last year, and since dunged properly, that is to say, with half the quantity commonly used upon ground in general, produced more than any other equal space had yet done. From this time I continued to dung all my grounds which were broken up in this manner, every alternate year.

"My improvements were now become so extensive, that I was again obliged to increase the number of my servants, and of my ploughing cattle. The same thing happened more than once after this; but I shall not mention it any more. My cattle too, of different kinds, had multiplied so much, that I had no longer room for them in the old farm yard, or buildings belonging to it, but plainly saw, that if my improvements were enlarged every year in the manner they had hitherto been, I should soon want more yards and more buildings, to keep them in. I accordingly marked out proper places for this purpose, and drew plans for more spacious buildings.

"As the cattle in this country are small, I bought some of a larger size in Poitou (from whence we generally have our working beasts,) and particularly a fine bull, to try if I could mend our breed, and thereby have of my own oxen strong enough for the plough; by which means I should save the expence of buying them elsewhere. I have not yet succeeded in this, so far as I could wish; probably because my pasture is not yet good enough. However, my bullocks, proceeding from this race, are much stronger and bigger than those I had before, though not large enough to be yoked to the beam, but only before or with others.

"The ground which I broke up in 1752, was pared and burnt in the same manner as that of last year, and produced an equally good crop. My other corn lands did the same; and I have since continued, and still continue, at the time of my writing this, to break up a parcel of heath, or other waste-ground, every year. The success has answered; so that my improved lands now yield me every kind of corn which this country produces. Turkey-wheat, buck-wheat, and millet, have done extremely well in some parts of them; and so have flax, hemp, and other productions suited to the different qualities of the soil. In some places I have sowed, at different times, several sorts of trees, such as the oak, the beech, the chesnut, the fir, and others, all of which thrive wonderfully. I have likewise planted new vineyards, and find them answer perfectly well. All these trials convince me more, and more, that the very best way of preparing land, is by burning it, as I have already said more than once. Those who were formerly the readiest to blame my undertakings, now see their error, and commend them.

"During this same year 1752, as well as in the course of the following, I drained several marshes, and improved other pieces of uncultivated ground, which not being of the heath kind, or proper for paring, were broken up, and fitted for their respective crops, whether of corn, or of other plants, as is more fully related in the second part of this account. I likewise sowed in these, as I had done before in other places, trees of every kind, some of which have succeeded, and others failed, according to the soil, and the manner of preparing it. This also will be more fully noticed hereafter, when I shall speak particularly of the different methods of raising trees from their seeds: and of the means of obviating the three chief difficulties which must of necessity be guarded against or removed, before one could properly set about breaking up any sort of ground; these are, water, stones, and large roots; each of which I have found it necessary to get rid of, before I could rightly begin any of my improvements.

"I endeavoured this year to make some progress towards perfecting my instruments of husbandry; my new buildings went on according to the plan I had laid down, and were extended from time to time, in proportion as the products of my enlarged improvements and the increase of my stock of cattle, required more room. I likewise tried to mend the breed of horses in this country, where their chief fault is, that they are too small.

"My sheep were also too small a size, and yielded but little wool, which indeed is the case throughout this province. I therefore got from Lower Poitou, in the year 1753, two fine rams, of the large kind, called Flemish, by which means my lambs are much stronger than any other in these parts. Several of the males are almost as large as their fires, and I have given some of them to my neighbours for rams. They have produced a bastard breed, which increases apace, and, though not so large as the Flemish, yields more and better wool than our former breed. I got rid of all my old sheep by degrees, and have now a well-sized stock; nor do I doubt but that if I could conveniently have purchased a whole flock of these large sheep, their breed might have been preserved without degenerating, and increased so as to supply the place of our present inferior species: for our uncultivated lands would feed a much greater number of sheep than we even attempt to raise.

"In 1755, I discovered lime-stone upon my own land. This proved a considerable saving; for I had hitherto been obliged to fetch my lime from a distance of near twelve miles. This stone, if properly searched for, may often be found in places where it is not suspected to lie. It is easily known, by putting a piece of it into the fire, till it be calcined, and then dissolving it in water. This discovery, in consequence of which I built a proper kiln, has enabled me

to carry on my buildings with less expence than before; and is of signal service in affording an excellent manure for my land.

" I began this year to give premiums for agriculture to the inhabitants of my estate. They were instituted the year before; and I had long used my best endeavours to inculcate a general love of industry, and a relish for improvements. My success had induced several others, both landlords and farmers; to follow my example, as well in amending their already cultivated lands, as in the breaking up of new grounds. I assisted them in their undertakings, giving instructions to some, lending seeds to others, and money and tools to such as were honest, and wanted them. The better to encourage them all, I had given rewards every year to those who distinguished themselves most, and allowed my tenants sixteen shillings for every acre of new ground broken up by them: a regulation which still subsists.

" To fix these people in the industrious disposition to which I at length had brought them, no method seemed to me more proper than to take them on the weak side of almost all mankind, interest and vanity. Accordingly, I notified in the month of January 1754, that I would distribute every year, beginning on the next ensuing festival of the Assumption, two premiums for agriculture; one, to the person who should raise the finest crop of wheat, and the other to him who should have the best field of rye. Each of these premiums consists in a sum of money, not inconsiderable for the country where it is given, and a silver medal, engraved for the purpose, of the size and value of a crown piece. These were, I believe, the first premiums ever proposed in France for this most useful object: though many have been given for much less interesting concerns. On one side of this medal is a sheaf of corn, with two sickles, a scythe, and a flail; over which are the words, *Premium for Agriculture*, and underneath the date. On the other side are my arms, with this inscription round them; *To excite to industry the inhabitants of*, &c. I would not put the goddess Ceres of the ancients, or any emblematical figure upon this medal, because, in the first place, the ignorant peasants would not have understood its meaning, and in the next, some of them might perhaps, hereafter, take it for the representation of a saint, and honour it as such; by which means, what I intend only for an object of utility, would become a source of superstition or idolatry.

" A candidate for these premiums must have at least two acres of land sowed with either wheat or rye: they are given to the finest crop as it stands to avoid all tricks; and if two crops are deemed equally good, the worst soil has the preference. When both the crops and the soils are alike, the largest extent of ground is entitled to the reward. The inhabitants of the place, in general, meet at the parish church on the day appointed; and, after divine service, choose from among themselves five who are not candidates, to inspect all the fields of corn, and mark those which they think the finest. On the next Sunday or holiday, they make their report to the same assembly. If any one complains that his corn has been unjustly passed over un-noticed, proper persons are immediately sent, to examine whether the complaint be just. The assembly then appoint the same five as before, or others if they please, to go and inspect again, with the utmost care, the fields which they had marked, and to judge which two of them, one of wheat, and the other of rye, best deserve the premiums. On the next Sunday or holiday they declare their opinions to a general assembly of the parishioners, as before; and, if no objection be made by any of those whose corn has been marked, this assembly adjudges the premiums accordingly: but if any one of them appeals, other proper judges are immediately chosen, and directed to inspect the spot. On the next Sunday or holiday, till which the decision of the premium is, in this case, of course put off; these last examiners make their report, and the matter is then determined. All the people thus sent by the assembly, are paid at my expence. In consequence of the decision of the inhabitants, the premiums are delivered publicly on the feast of the Assumption, after the service at church is over. Those who win them, wear the medal, for a year only, fastened with a green ribbon to a button-hole of their coat, and have, likewise for that time, a distinguished seat in the parish church. These marks of distinction cease at the end of the year, when others succeed to them;

but the medal remains the property of the person to whom it was adjudged. He may dispose of it as he pleases; yet, though he is no longer allowed to wear it on the outside of his cloaths, there has not been a single instance of any one's selling his medal. They all keep it as a badge of honour.

" These rewards have been productive of so much good, and have raised so extraordinary an emulation among my tenants, that I cannot but advise every gentleman to practise the same method upon his estate. I intend to institute some others, for different productions; and as I am far from having a sufficient number of people to manage all my lands, if the whole of them was under culture, I have long thought of giving gratuities to such as shall have a child within the first year of their marriage, to continue this allowance to them so long as they shall have a child from year to year, and to allot a pretty considerable sum for the family which shall have most children. Some may, perhaps, think these encouragements for propagating the human species odd, and even superfluous: but they will be of a different opinion when informed, as they may be by the ministers of most country parishes, that many peasants are unwilling to get children, or at least do not choose to have more than a very small number, when they might have a numerous offspring. If my abilities were equal to my will, I should already have formed all these useful establishments. It is generally allowed, and experience has particularly demonstrated it upon my estate, that an increase of culture produces an increase of inhabitants; and that wherever there is room for two, with the means of subsisting them, a marriage will ensue: but at the same time that this means of increasing population is encouraged by a more extensive culture of the earth, I see no reason why proper methods should not be used to induce men likewise to concur in the same laudable end.

" Ever since the year 1756, I have continued all my undertakings, and with the same success as before. Those who saw the condition of my estate when I first came to it, in the year 1737, now scarcely know again a single spot of it; so much is the face of the country changed. My mansion-house, which was formerly surrounded with dreary wastes, vast commons, and unbounded heaths, now stands in the middle of well cultivated fields: my improvements are become considerable both for extent and value: producing all sorts of grain, and natural as well as artificial grasses. I have dispersed in them all kinds of fruit-trees, and divided them into fields of proper sizes, separated by good ditches planted with quick hedges. Alleys of limes, poplars, white mulberries, chestnuts, and various other trees, besides being a considerable embellishment to the whole, afford convenient passes from one field to another, yield food to cattle, and are sown from time to time. I turn every thing to profit; even my driest soils. Many of my marshes are drained, and yield good crops. All my meadows by reason of their great extent, are not yet brought to the state in which I wish to see them; though a great part of them now produces excellent hay. I have mowed some of them twice a year, and hope by and by to do the same to others; for I intend to water them all, by making dams and sluices in the brooks and rivulet which pass through them.

" My vineyards are in good order; and my woods, which are now in regular cuttings, thrive perfectly. Some of these, which I have raised from the seed, have grown so prodigiously, that a stranger would think them much older than they really are. I have made some large reservoirs of water, and several ponds, entirely new, besides repairing the old ones. All these have succeeded, and yield good fish. A quarry of mill-stones, formerly abandoned, now turns to good account, and I have discovered several quarries of free-stone.

" I have been obliged to make several bridges over the brooks and rivulets which divide my meadows and marshy grounds, and have carried my roads as far as my improvements extend. Some of these roads lie over hills, which could not be avoided; though others have been cut through, at a great expence. Most of my out-houses, which are pretty spacious for all my cattle and all the produce of my land, with proper buildings for poultry, barns, granaries, &c. are finished; and I have built farm-houses with the stones which it was necessary to take off the lands, in different parts of my improvements, and settled in them young men, who are now married, and have children. Though

Though my barns are very large, and not few in number, I have the pleasure to find that they would not contain all my last year's crop of corn: a satisfaction which I hope to enjoy still more amply in the next and following years.

"Thus my estate, which formerly yielded scarce any thing, now affords every necessary for food and raiment. When there I can, truly speaking, keep a very good table, and be decently clothed, with only the produce of my own improvements. I have no occasion to buy any thing except salt, sugar, and spices. My farmers have followed my example, so far as their means, and the helps that I have given them, have permitted.

"These improvements have, undoubtedly, cost me a great deal of money; but my income from them will soon be proportionably increased; besides which, it is proper to observe, that few lands will require so great an expence to break them up, as mine have done; owing to the uncommon stubbornness, inequality, and unkindness of the soil: nor will it often be necessary to cut through hills in order to make roads, to lay causeys over quaking bogs, or to erect so many new buildings: though, if even all these difficulties should occur, I would still advise gentlemen to undertake the improvement. If they follow the directions here given, and profit by my errors, so as not to commit the like, I can assure them of success, at a much less expence than it has cost me, who have thoroughly paid for my apprenticeship. I can also promise, that they will lay their money out at better interest, and on better security, in this, than in any other way, besides which, they will have the heart-felt satisfaction of contributing to the prosperity of their country, to the increase of population, and to the enriching of others, at the same time that they enrich themselves.

"I have already said, that when I began my improvements, two and twenty years ago, a third part of the farms in my parish were untenanted, for want of farmers who would rent them; that most of the inhabitants of my estate were very poor, and did not, in general, reap corn enough to support them half the year; that they were grown so indolent, that rather than cultivate their ground, which would have afforded them a maintenance, they chose to beg, like vagrants in the neighbouring districts. Now their situation is very different, and they are no longer in that deplorable condition. They are become industrious, live by their labour, and beg no longer: they would even be at their ease (a happiness which I shall do my utmost to procure them), were it not for obstacles beyond my power to remedy. The parish now reaps more corn than it consumes; so that the farmer here is enabled to sell at the very markets where he used to buy. All my farms are tenanted; not a house on my estate is empty, and if I build a new one it is immediately filled: in short, the number of inhabitants in this parish, for I have an exact list of all of them, is double what it was in 1737. Such is the history of my improvements, and such are the effects with which they have been attended." *Memoir sur les Defrichemens, par. II.*

Burn-beating, or burn-baking, has been long practised in some parts of England; but in many others, is totally exploded, as destructive to the land, which it certainly is, as commonly managed, for it has been customary to burn-bake chiefly downs, and other such land of a very thin staple, from whence the fire carries off so great a part of the soil, that such burn-baked land is afterwards reputed to be quite barren, and of no use. And for this reason, the owners required great fines, for granting liberty to burn them; which the tenants willingly paid, because they got a great deal of money by it; for the burning, which is not very expensive, forces the land so much, that they were sure to obtain several great crops from it, and they continued to crop the land, with robbing crops of wheat and other corn, till the land was quite impoverished, and would at last yield none sufficient to pay the small expence of cultivation; for it has been long remarked of most farmers, that they are so prejudiced in favour of tillage crops, without allowing the land proper change of crops, rest, or manure, that they continue plowing every year till the land is quite impoverished; as in the present case of burn-baking, liming, &c. The very ingenious M. de Turbilli, pursued a quite different method: he took only a few crops after his burn-baking, and as soon as he perceived any abatement in the fertility of his land, he applied proper dressings of manure, which restored it, and to this judicious practice his great success is to be ascribed. If the

owners of land would oblige their tenants to pursue the same method, instead of prohibiting entirely their burn-beating, it might in time become a general system in husbandry, very much to their own and tenants advantage, and to the great benefit of the public.

The difficulty which this gentleman found in sowing the proper quantity of seed upon his newly burn-baked lands, may be entirely removed by sowing them with a drill-plough, which can be managed with great ease in such a light soil, and where is no obstruction from either stones or roots. The occupier, in this case, would be under no apprehension of damage to his crop from weeds, which deters them from allowing the rows of corn a proper distance in other lands; and if the rows are sown at such a distance, as to admit a small plough to come between them; or if only eighteen or twenty inches distant, a hoe, with several tines in it, would cultivate the intermediate spaces to great advantage, and at the same time would so much break the clods, and pulverize the soil, that it would be much enriched by it, and save great part of the expence of the tillage for the next crop. The spikey roller would also be very serviceable, to break the clods and half-burnt turfs, before the land is sown, much more expeditiously, and at a less expence than beating and breaking them by hand.

"The marquis observes, that, as to the little freeholders and farmers, who have but a few acres, and after having grubbed, cleared, and burned them, in the manner above-mentioned, labour them by the strength of their arms, with the pick-ax, shovel, spade, or other instrument, and wish to sow in one of the above recited methods; they must take care to mix the ashes well with the soil, and to carry off all the stones and roots. These are they who will in proportion reap the most corn the first year, as digging stirs the ground much better than ploughing. Were it possible to cultivate all thus with the spade, it would produce a great deal more."

This is undoubtedly a just observation, and the reason of the spade tillage being superior is, that the spade breaks the soil most, into the smallest parts, and also goes deeper in it than the plough does in the first culture. Every means therefore of pulverizing the soil, and deeper than is commonly done at first in burn-baked lands, should be adopted. The spikey roller will be very serviceable here: for the earth having been dried by the fire, this roller will make the surface very fine; and so it will the soil below, by ploughing it up, and drawing the roller two or three times over it, especially if the land is harrowed between the rollings, to bring up the clods; or if that is not sufficient, by alternate ploughing and rolling. In this manner this dry soil may be broke, even more effectually than by digging with the spade, and at a much smaller expence.

COMPOST, an useful sort of manure, consisting of earth, dung, lime, clay, &c. according to the nature of the soil, well mixed and rotted together, till it forms one united mass. See **DUNG-HILLS**.

CONE-WHEAT, a species of wheat, called in some parts of Somersetshire, blue ball. Some of the ears of this wheat have awns, and others none. See **Plate IV.** fig. V.

CONIFEROUS, an epithet applied to such trees as bear cones, as the fir, pine, cedar, &c.

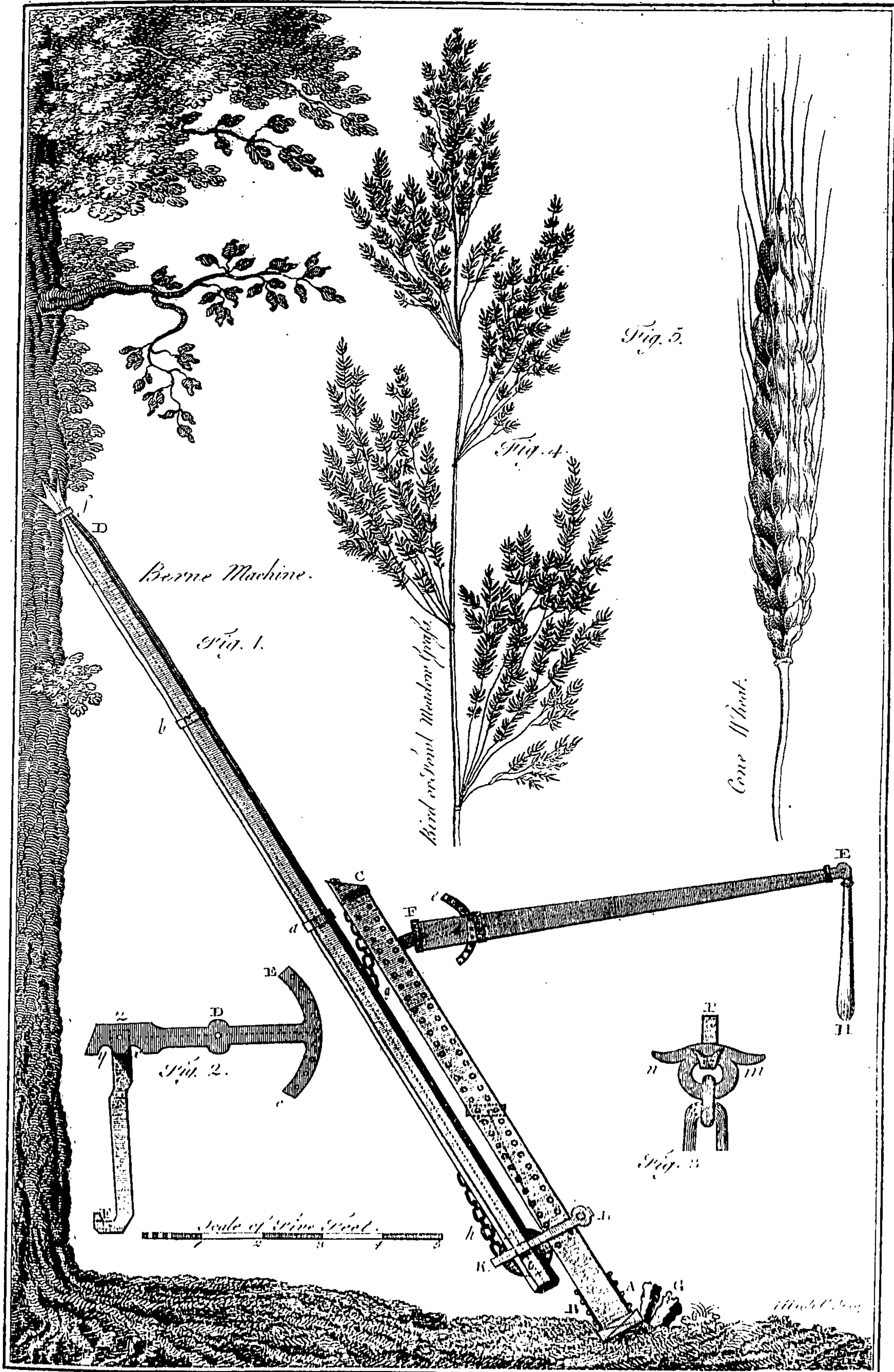
CONSOUND, the same with bugle. See the article **BUGLE**.

CONSUMPTION, a disease incident to horses, consisting in a waste of muscular flesh, attended with a slow fever.

When a consumption proceeds from a defect in a horse's lungs, or any principal bowel, the eyes look dull; the ears and feet are mostly hot; he coughs sharply by fits; sneezes much, and frequently groans with it; his flanks have a quick motion; he gleans often at the nose, and sometimes throws out a yellowish curdled matter, and he has little appetite to hay, but will eat corn, after which he generally grows hot.

As to the cure, one of the principal things is bleeding in small quantities, a pint, or pint and half, for some horses is sufficient, which should be repeated as often as the breath is more than ordinarily oppressed. Pectorals may be given to palliate present emergent symptoms; but as dissections have discovered both the glands of the lungs, and mesentery to be swelled, and often indurated, the whole stress lies on mercurial purges, and the following ponderous alteratives, given intermediately.

Take native cinnabar, or cinnabar of antimony, one pound,



pound, powdered very fine, and add the same quantity of gum-guacum and nitre: give the horse an ounce of this powder twice a day, wetting his feeds.

The spring grass is often extremely serviceable, but the salt-marshes are to be preferred, and even to be more depended on than medicines; for great alterations are thereby made in the blood and juices, and no small benefit arises from open air, and proper exercise.

But it may be worth observing, that a horse frequently relapses after appearances of amendment; when a yellowish gleet, or curdled matter, runs from his nose, and he grows emaciated, is much addicted to sweat, heaves much with a reduplicated motion, and has a short rattling cough; under these circumstances there can be little hopes of his recovery, or any future service from him, consequently to save farther expences, the best way would be to dispatch him as an incurable. *Bartlet's Harriery*, p. 76.

CONVOLVULUS, the same with bind-weed. See the article BIND-WEED.

COOM, the foot that gathers over the mouth of an oven; also a composition of tar and grease, with which the axle-trees and boxes of the wheels of carriages are daubed or smeared over, in order to lessen the friction.

COOP, a tumbrel or cart enclosed with boards, to carry dung, sand, grains, &c. which would otherwise fall out.

COOP likewise signifies a pen, or enclosed place, where lambs, poultry, &c. are shut up in order to be fed.

COPPICE, low woods, cut at stated times for poles, fuel, &c.

"If you are to plant a coppice, says the ingenious Mr. Lisle, it is a good way to set your plants in trenches, as one raises quickset hedges, and not to sow seeds, for they are tedious in coming forward, and will tire one's patience in weeding them. I would not set above four plants in twelve feet square, and at regular distances, so that the benefit of ploughing might not be lost; and then at six or seven year's growth I would plash, by laying the whole shoot, end and all, under the earth in the trenches, which would not therefore be choaked, but shoot forth innumerable issues: this, by great experience, oak, ash, hazle, and withy, will do.

"In our parks we never set less than an hundred plants in a double chased lugg; and if the earth turned up such rubbish and stony stuff that the edge of earth on which they are to plant, is too narrow for a double chase, then they always set eighty plants on a single chase in a lugg.

"I observe the sedgy grass comes not up in felled coppices the first summer; consequently the young shoots have a year's start of that grass; the next summer the sedgy grass comes up, and grows ankle high, equal with the two year's shoots: but what harm can it then do to the wood? The third year the sedgy grass dies, and you see no more of it. I speak this, in answer to the countryman's objection, who pleads for putting some sort of cattle into coppices to keep down the sedge, which he pretends otherwise will choak and damage the plants. I have experienced this to my cost.

"It was May the sixth, in the year 1701, that I bought some yearlings; and asked the farmer, if I might not put them in the coppice till midsummer: the farmer said, not yet, by any means, for fear they should be oakered, that is, lest they should bite off the oak-bud before it came into leaf, which might bake in their maws and kill them; but after the oak-bud was in leaf, it would be safe enough. The higher coppices are fit for yearlings, and the coppices of the last year's growth for hog-sheep in winter. My shepherd said, what the farmer observed as to the oak-bud was true; but he thought that the year was so backward, that they were not yet come out, and so there could be no danger at present. Farmer Elton said, his father had lost abundance of yearlings by the oak-bud, by putting them into the coppices while that was out. I have since experienced and remarked the same.

"It is a common saying, that calves will not crop in woods: but I put six calves in my woods, in November, which very much crompt the yearling shoots. All husbandmen I told of it very much wondered at it; but the reason to me was clear, viz. on first putting them in there came three or four days hard frost, with a shallow snow, and a rime that laid on the bennetty grass, so that they could not

come at the ground, but only met with briar leaves, of which, though I had plenty, they were but thin diet to depend on altogether; yet together with other pickings, would have been a noble maintenance for them, if they could have come at the rowet: this straightness of fodder brought them to the necessity of cropping the young shoots, which they afterwards continued to do, having got the habit of it, and finding, when the weather came severe, the shoots to be toothsome, though the rowet in the coppices would have been sufficient.

"For a general rule, newly weaned calves are less hurtful to newly cut spring-woods than any other cattle, especially if there be abundance of grass; and some say, colts of a year old will do no harm: but the calves must be permitted to stay a while longer, and surely the later you permit beasts to graze the better.

"Letting coppice-wood grow to sixteen or seventeen years growth is of great service to young heirs, because by so many years growth their backs are case-hardened, and able to withstand the cold, when the coppice is cut, and they must stand naked; whereas, when coppices are cut at ten and eleven years growth, the barks of the young heirs are so tender, that they are starved with cold air and winds. Ivy itself, says Evelyn, the destruction of many a fair tree, if very old, and taken off, does frequently kill the trees by a too sudden exposure to the unaccustomed cold.

"When coppice-wood is of fourteen or fifteen years growth, it will yield a better price in proportion than young wood, because it will be applicable to more uses, and particularly in the cooper's business; for he will use the withy and some of the ash for hoops and wine hogsheds; another part of the ash may serve for prong-staves, rake-staves, and rath-pins for waggons, and the rest may be parcelled out for hurdle and flake-rods.

"Oak stems of fourteen years growth are, in my woods, which in a great measure consist of them, as high as the ash or withy, and measure more in the diameter; for oaken stems are stronger at root, and will hold growing longer than ash, withy, or hazle. When hazle grows spriggy in the body, and shoots forth from the sides of the back, it is a sign that it has given out, and done growing at the top.

"Coppice-wood, in hedging and hurdling, wears much better and longer if cut between Michaelmas and Christmas, but sells best in faggots, if cut between Christmas and Lady-day, because it shrinks less, and is much swelled, and looks best to the buyer. The method at Crux-Easton, and the hill country adjacent, is only to oblige the buyers to rid the coppice by Midsummer; they think the coppices are not harmed, if rid by the time the Midsummer-shoots spring up, but they had not rid this year, 1697, by the latter end of July.

"It is observed, that coppice wood, cut for hedging at the latter end of winter, will not endure so long by a year as that which is cut at the beginning of winter; which, as I believe, may not only be, because the wood late cut, is cut after the sap has risen, or attenuated by the sun, but also oftentimes because it is not cut long enough before such rarefaction is made; for, if a tree, or a cyon cut to be grafted, as Quinteney affirms, will endure many weeks of the winter out of the ground, or without being grafted, and, when spring shall come, it will by virtue of the sap inherit in it, when attenuated put forth buds for some time, till it dries away; so it follows, that the sap inherent always in the stem of the wood, if not cut so early as to have long time to dry, may be put into motion at spring, so as to effect the abovementioned inconvenience; therefore I hold hedging-wood and fire-faggots should be cut in October.

"It is a common practice of husbandmen to fell their hedge-rows, and small brakes within the grounds, those years they sow the grounds with wheat; but such persons ought well to consider, first, whether such land, after the wheat is off, will not bear a rowet too long for sheep to eat, and, if so, great cattle must be put in to eat up the long rowet, and the sooner the better for their tooth; and then attendance must be given by a cow-keeper by day, before the harvest is in, and consequently the wages dearer, and when you may have many other offices to employ such a person in: therefore, in such case, my advice is to let the hedge rows stand till after the wheat crop be got in, when great cattle may be suffered to feed down the rowet without prejudice to the hedge-rows, and at that time of the

year such grafs is wanted by night ; and during the future three crops, it is to be supposed the rowet will not be so large, but sheep may overcome it, nor will they very much prejudice the young wood." *Lisle's Husbandry, vol. II. p. 245.*

In raising coppices, great care ought to be taken that the wood they are to be composed of be such as is proper for the soil you raise them on, and that it be proper for the uses you design to sell it for, which you must be regulated in by the vent you have ; and let the profits resulting from your under-wood regulate the thickness of your standards ; for in proportion as they are thicker or thinner, they will do more or less injury to your under-wood. You should likewise consider at what growth you can sell your under-wood ; only remember that the older and taller your under-wood is, the better it is both for fuel and for what standards you leave, because they will be taller and straiter, by being forced up by the wood that grows about them ; though a deep soil contributes much to their springing. It is also necessary, about the time of your felling, to lay out your several falls, that you may have an annual succession, to yield a yearly profit. But though the seldom felling of coppices yields the more and better wood ; yet the frequent cutting of it makes it thicken, and gives room for the seedlings to come up. If many trees grow in the coppice that is to be cut down, fell both them and the under-wood together, cutting off the stubs as near the ground as convenient, and those of the under-wood a-slope and smooth, and not above half a foot from the ground ; and stock up the roots of the timber-trees, if they send forth no shoots, in order to make room for seedlings and young roots to grow.

The under-wood may be cut from the beginning of October to the latter end of February ; but February is the best month to cut wood in, where you have but a small quantity to fell, that you may do it before the spring comes on too much : take great care to prevent the car- ters from brushing against the young standards, and let all your wood be carried out by Midsummer, and made up by the end of April at the farthest ; for if the rows and brush lie longer unbound or unmade up, it will spoil many of the young shoots and seedlings. If the winter before you fell, you enclose it so as to keep all cattle out of it, your care and trouble will be well recompensed.

Your elder under-wood may be grazed about July, or in winter ; but, for a general rule, newly weaned calves are the least prejudicial to new cut wood, where there is abundance of grafs ; and some say colts of a year old ; but then they must be drove out by the beginning of May at farthest. However, if nothing at all be suffered to come in, it will be better. In this every man's experience must direct him.

If your woods happen to be cropt by cattle, it will be better to cut them down, and they will then make fresh shoots ; whereas what has been bit by the cattle, will be otherwise stunted for several years before it will take to its growth. *Mortimer's Husbandry, vol. II. p. 69.*

CORD of Wood, a certain quantity of wood for fuel, properly stacked up ; so called because it was formerly measured with a cord. The dimensions of a statute cord of wood are eight feet long, four feet high, and four feet broad.

CORE, a disorder incident to sheep, occasioned by worms in their liver, resembling a plaice, or flounder.

A sheep, if chiefly feed with hay, will live a year after being affected with this distemper, by which time he will

have a water-bladder as large as an egg, under his throat ; at the same time his eyes, mouth, and gums, will be white.

If any sheep in a flock core during the winter, it will be easily seen at shearing-time ; for such sheep will be poorer than the rest ; their wool also will run into threads, twisting together at the ends, and look somewhat like teats. The last particular is not however a certain sign of a sheep's being cored ; for sometimes the wool of very sound sheep will be apt to run together into threads ; and the finer the wool the more apt it is to twist together in that manner. There is no method of curing this distemper hitherto known. *Lisle's Husbandry, vol. II. p. 207.*

CORIANDER, the name of a plant formerly much cultivated in England ; but at present little of it is sown.

The seeds should be sowed in autumn on rich land ; and when the plants are come up, they should be hoed out to about four inches distance, every way, clearing them from weeds. By the above management, the plants will grow strong, and produce a greater quantity of good seed. *Miller's Gard. Dict.*

CORN, a general name for grain that grows in ears, not in pods, as wheat, barley, &c.

If corn be lodged, it may be cut before it is quite ripe ; and if blighted, it cannot be cut too soon. But if neither of these accidents happen, both wheat and barley should be suffered to stand till full ripe. The grain will also grow plumper by being left a while in the field after cutting, to take the dew ; but the straw will be injured by it ; nor must it by any means be laid up damp in the mow, lest it heat, and become what is called mow-burnt ; and perhaps take fire. A great number of weeds will produce the same effect, if the corn be housed before their stalks are sufficiently withered.

A correspondent of the authors of the *Museum Rusticum* tells us, that in the year 1763, he had twenty acres of barley, which was rather weedy at harvest ; on which account he was desirous of giving it as much field room as he could conveniently ; but the weather promising to be very wet, he was obliged to cart his barley, which he put into the bay of a large barn.

Whilst this work was going forward, he was called away, and in his absence his son got a horse upon the mow to tread it ; by which means, the weeds, not being thoroughly dry, caused the barley to heat to so violent a degree that he was very apprehensive of its firing.

" My men, adds he, were in a violent hurry to get it out of the barn ; but this I would by no means consent to. I however ordered one of them to get upon the mow with a cutting knife, and cut in it a round hole like a well. He began the work ; but in about five minutes, being almost overcome by the heat, I sent another to relieve him ; and thus they worked spell and spell, till they got to the bottom.

" This round hole saved my barley, and perhaps my barn too ; for it formed as it were, a chimney or flue to carry off the heat." *Museum Rusticum, vol. III. p. 365.*

For the method of preserving corn after it is threshed, see the article **GRANARY**. And for preserving it in the straw, see **REEK**.

Mr. Young, in the fourth volume of his *Annals*, gives the general average price of corn for fourteen years and his observations on the subject.

		Wheat.	Rye.	Barley.	Oats.	Beans.
1771,	—	5 10 $\frac{1}{2}$	4 3 $\frac{1}{2}$	3 2 $\frac{1}{2}$	2 1	3 6 $\frac{1}{2}$
1772,	—	6 4	4 7	3 2	2 0 $\frac{1}{2}$	3 9
1773,	—	6 4 $\frac{1}{2}$	4 2	3 6 $\frac{1}{2}$	2 1 $\frac{1}{2}$	4 1 $\frac{1}{2}$
1774,	—	6 7	4 3 $\frac{1}{2}$	3 6 $\frac{1}{2}$	2 2 $\frac{1}{2}$	3 10 $\frac{1}{2}$
1775,	—	6 0 $\frac{1}{2}$	4 1 $\frac{1}{2}$	3 3	2 0 $\frac{1}{2}$	3 7
1776,	—	4 9 $\frac{1}{2}$	3 4 $\frac{1}{2}$	2 6 $\frac{1}{2}$	1 10 $\frac{1}{2}$	3 3 $\frac{1}{2}$
1777,	—	5 8 $\frac{1}{2}$	3 6	2 6 $\frac{1}{2}$	1 11 $\frac{1}{2}$	3 6 $\frac{1}{2}$
1778,	—	5 3	3 6 $\frac{1}{2}$	2 10	1 10 $\frac{1}{2}$	3 5 $\frac{1}{2}$
1779,	—	4 2 $\frac{1}{2}$	2 11	2 5 $\frac{1}{2}$	1 9	3 0 $\frac{1}{2}$
1780,	—	4 5	2 9 $\frac{1}{2}$	2 1 $\frac{1}{2}$	1 7 $\frac{1}{2}$	2 9 $\frac{1}{2}$
1781,	—	5 7	3 4 $\frac{1}{2}$	2 1 $\frac{1}{2}$	1 8 $\frac{1}{2}$	2 10 $\frac{1}{2}$
1782,	—	5 11 $\frac{1}{2}$	3 7 $\frac{1}{2}$	2 9 $\frac{1}{2}$	1 10 $\frac{1}{2}$	3 3
General						
average of	12 years,	5 6	3 7 $\frac{1}{2}$	2 9 $\frac{1}{2}$	1 11	3 4 $\frac{1}{2}$
1783,	—	6 7	4 5 $\frac{1}{2}$	3 9 $\frac{1}{2}$	2 5 $\frac{1}{2}$	4 1 $\frac{1}{2}$
1784,	—	6 1	4 0	3 6	2 3	4 0

In the years 1772, 1773, and 1774, the complaints which resounded through the kingdom upon the high price of corn, are in every one's recollection: committees of the house of commons sat repeatedly to enquire into the cause, and the press swarmed with publications, the authors of which attributed the high prices by turns to almost every circumstance of the internal policy and state of the kingdom. No use would result for mentioning the trifling and inadequate causes to which the effect was referred; the circumstances which a few authors of note pitched upon were, large farms, and inclosures, the increasing predominacy of which were considered as great evils, and particularly bearing upon the point in question.

Endeavours were made to refute those ideas, and to prove, that ten years of peace, in which every branch of national industry had been carried to an uncommon height, having introduced a flood of wealth, were amply sufficient to account for the high price, not of corn only, but of every commodity in the nation, the rate of which could be affected by the quantity of circulating specie.

The table which we insert yields as strong a confirmation of the former reasoning as the power of events could give. Large farms have continued to the present moment, and inclosures gone on as rapidly as ever, yet we see the prices of every sort of corn sinking in 1779 and 1780, as low as they had been high before. And it is fresh in every one's recollection, that all the products of the earth were almost equally low, and the farmers in a more melancholy situation than they had been in for half a century before. Such a contrast of prices in so short a period cut up by the roots, and did away for ever all the arguments that had attributed the high prices to great farms or inclosures, or the conversion of arable to grass, or to any of the numerous causes that have been so anxiously sought for. But we may observe, that this was not the case with the cause to which had been attributed those high prices, viz. to circulating wealth from national prosperity: for no sooner had the American war come into full operation, and had diffused throughout the kingdom its baneful influences; such as an impeded and languid circulation; a reduced consumption; a comparative stagnation in trade and manufactures; with a consequent poverty in all ranks of people, but the prices of corn and other commodities sunk proportionably, without having a shadow of reference to the size of farms, or number of inclosures. But farther; the experiment became double, for after that point of depression suffered by the national industry in consequence of the war, fixed at 1779; the prices arose with the returning prosperity of the kingdom, until they got up to their full standards, and perhaps above it. This great variation of prices, in so short a period as twelve years, ought, by every unprejudiced man, to be received as a double proof, first, that the size of farms and inclosures have had nothing at all to do in the question; and, second, that the cause must be looked for alone in the prosperity, wealth, circulation, and consumption of the kingdom.

It is true, there are many persons who incline to think that the principal variations in price are owing to the difference of seasons; some years being very favourable to the growth of corn, and others much the contrary; and we find annexed to Mr. Whitbread's manuscript, some remarks on the season for each of these twelve years, an abstract of which is here given:

- 1771, Preceded by a severe winter.
- 1772, A very wet harvest.
- 1773, Great rains and floods in May.
- 1774, A wet harvest.
- 1775, A very dry time from March to Midsummer.
- 1776, A severe frost from January 7th, to February 1st, with an unusual fall of snow; fine season following.
- 1777, August and September the finest ever remembered, and the whole season generally good.
- 1778, The summer remarkably dry, and a fine harvest.
- 1779, A general good season.
- 1780, Cold and wet winter, backward spring, and dry summer.
- 1781, Winter open and dry; a growing summer; mild.
- N. B. The three last years dry upon the whole, and corn plentiful.
- 1782, The wettest, coldest, and backwardest spring ever known; great floods; wet and cold summer, with floods in August; mildew, and very little corn ripened or got in well. The greatest crop of grass ever remembered, but the hay spoiled.

1783, Winter favourable, spring fine, and the summer hot and burning.

1784, The last week in December, a frost set in, which lasted with snow till the 21st of February. In March deep snows and frosts; and the backwardest spring ever known; wet harvest.

Many circumstances could be added to this detail if essential. In Suffolk the mildew, in the years 1780, 1781, and 1782, destroyed and damaged more wheat than any other distemper has done in half a century. 1783, was free from it. 1784 has it, but in a much less degree. The phlogisticated state of the atmosphere in 1783, from which foreign philosophers deduced immense crops, passed away without producing them. There are three seasons critical with wheat: in winter frosts, too much wet and severe cutting winds kill it; this is to be totally avoided by sowing early in September. In the spring, when the first set of roots die, and are succeeded by a second system of fibres, at which period the blade turns yellow; then hand-hoeing and top-dressing takes effect. The last is at flowering-time; refreshing moderate rains just when it is beginning, and fine, dry, warm weather while it lasts, are conducive to a great crop: as to the harvest, it shares the fate of all other crops, the better the weather, the better got. But at this season rains have not half the ill effect of wheat properly shocked as on that in the common method. Three sheaves beneath, and one longer above, and bound nearer the butt, inverted over the others.

We are strongly inclined to think that though the season has a most powerful influence upon any given field, farm, soil, or district, so as to make the difference of a great crop or a very poor one; yet when we consider the kingdom at large, I believe the influence is not great. In very northerly climates, where a harvest is sometimes utterly lost, this reasoning would not hold good; but that is never the case in England. We are to remember, that the wet years which damage the clay lands, make the fortune of sand farmers, and we are also to have in mind, that the improvements of draining and laying the land round and dry, which it is to be hoped spread daily through the kingdom, are constantly lessening the greatest evils of wet soils; we are also to recollect, that though dry years, in general, suit clay countries, yet there must at certain seasons be a great deal of rain to enable the farmer to cultivate them at all; clays, for every thing but wheat, have been observed to bear a drought worse even than some sandy soils. Thus it is not very easy to describe or point out the season that shall be attended with the greatest crop in England. But there is another consideration which seems to throw the matter of season much more out of the question than these observations, and that is, not the prices of corn only, but of all other products. If bad seasons occasioned the high prices of corn in 1772, 3, 4, why did those seasons make every sort of cattle as dear as corn? the dearness ran through every article that can be named. On the contrary, if good seasons in 1779 and 1780 (and by good is generally understood dry) brought down corn to a price that starved the farmers; how came all sorts of cattle, fat and lean, to be at as depressed a rate as corn? A dry season can work no such effects as lowering prices of oxen and sheep cent. per cent. Again, for as we before observed, the experiment is double, when bad seasons returning in 1782 and 1783, (though, by the way, 1783 was one of the driest years that have been known in England for a century, and consequently ought to have been attended according to the reasoning we combat with a low price) how come cattle, fat and lean of every sort and kind, and all the products of the earth in general, to rise with corn in the manner we have seen, and at this moment experience? To say that a scarcity of bread creates a greater consumption of other food, is giving no satisfactory reply. The fact is true with but a very few commodities: wheat being excessively dear, will drive the poor to barley, or rye bread, or to potatoes; but not to beef or mutton, much less to horses or lean sheep: and the high price of malt may drive them to gin, possibly to water, but it will not make them the greater consumers of lean pigs.

The circumstance, therefore, which influences these prices, must be sought for, not in seasons whose effects would necessarily be local and partial, but in some more general cause that operates equally over the whole kingdom; this cause we find in the wealth and circulation of the people. It agrees with political data that enables us to reason upon it; the vibrations are correspondent; and those effects, which we have experienced, ought to flow from the causes that

that are open to every eye, and the events that have happened in every one's recollection.

The price upon the general average of 5s. 6d. a bushel for wheat during these 12 years, is something above what would have paid the farmers well 20 years ago, when 5s. was a fair price, and sufficient to give encouragement. We are inclined to think, and I trust, without any undue predilection for the farmer, that the price ought now to be 6s. which we do not think, upon the whole, better for him at present than 5s. was twenty years ago; owing to the rise of poor rates.

The average price of wheat in France, during these twelve years, was from 24 to 25 livres the *sceptier* of 240 lb. but as the mean weight of a Winchester bushel of wheat in England does not amount to 60, we may deduct one tenth upon the account, and then the French price reduced to English, will be 4s. 10½d. per bushel. The price in France, August 1784, was 27½ livres, or 5s. 5¼d. per bushel. The London price in that month was 5s. 10d.

The London prices during this period have been,

Years.	Wheat.	Rye.	Barley.	Oats.	Beans.
1771,	5 4	4 0	3 0	2 2	3 2
1772,	6 3	4 3	3 1	2 1	3 5
1773,	6 4	3 7	3 3	2 2	3 6
1774,	5 11	3 2	3 2	2 2	3 4
1775,	5 8	3 3	3 0	2 0	3 2
1776,	4 7	3 0	2 4	2 0	3 1
1777,	5 5	2 11	2 5	1 11	3 4
1778,	4 11	2 10	2 7	1 11	3 0
1779,	4 2	2 5	2 5	1 10	2 5
1780,	4 7	2 3	2 2	1 9	2 3
1781,	5 6	2 8	2 0	1 9	2 5
1782,	5 9	2 9	2 7	2 1	2 9
Average	5 4½	3 1	2 8	1 11½	2 11½

If we compare these prices with the general averages of the whole kingdom, we shall see a remarkable fact that they are lowest where the demand is greatest. This is the case with wheat, rye, barley, and beans. Oats are an exception, owing, doubtless, to the capital being supplied more from abroad with that grain than any other. This cheapness, where there is a great demand, is perfectly consistent with the principles of commerce, and ought to be a strong conviction on the mind of those ministers and statesmen in other countries, who lay restrictions on the corn trade, fearing the want of so necessary a commodity: they should from hence be convinced, that a great demand is the surest means, while trade is free, of securing a supply; and that they have nothing to do but to give permanency to freedom, in order to ensure a perpetual supply. Much, however, in this case depends on London being a sea port, for inland countries cannot receive their corn from a distance, without charges that add greatly to its price. Powerful as the principle is, it cannot overcome such circumstances as the seat of manufactures being in a country of mines and pasturage, which is the case of several of our western counties. To draw out many of these comparisons in tables would be tedious, but if the reader compares the prices of Norfolk, Suffolk, Essex, Kent, and Sussex; with Derby, Lancaster, Worcester, Westmoreland, Monmouth, Somerset, and Devon, he will find that the contrast is very considerable. In fact, many of the western counties receive their corn at all times from Lynn, Yarmouth, and other ports on the eastern coast, which must necessarily add to the price, when there is not only a long sea voyage, but a transport also on canals or rivers.

We may also observe, upon the London prices compared with those of the kingdom at large, that they are more equal. The variation between the highest and the lowest is less; and those both exceed the medium in a less degree. This greater steadiness of one city over a whole kingdom is remarkable, for it might be thought, that the overplus of some markets answering the deficiencies of others, might on the average of so many, induce a more exact level; but the contrary is the case, and owing to the operations of demand meeting an unobstructed supply.

As a contrast of price, let us insert those of Lancaster and Sussex.

Years.	Lancaster.	Sussex.
1771,	— 6 5	— 5 0
1772,	— 6 9	— 5 10

Years.	Lancaster.	Sussex.
1773,	— 6 8	— 6 1
1774,	— 6 10	— 5 9
1775,	— 6 1	— 5 7
1776,	— 5 6	— 4 5
1777,	— 5 11	— 5 2
1778,	— 5 11	— 4 7
1779,	— 5 1	— 3 9
1780,	— 5 1	— 4 5
1781,	— 5 9	— 5 8
1782,	— 6 4	— 5 9
Average,	— 6 0½	— 5 2

This is the greatest contrast in the whole kingdom.

The quarterly prices of the twelve years, being reduced to average, will be as under.

	Wheat.	Rye.	Barley.	Oats.	Beans.
From Christmas to Lady-Day,	5 5½	3 6½	2 9½	1 10	3 4½
From Lady-Day to Midsummer,	5 7½	3 9½	2 10	1 11½	3 5
From Midsum. to Michael,	5 9½	3 9½	2 10½	2 0½	2 5½
From Michael to Christmas.	5 5½	3 7½	2 10	2 5	3 5½

Some of the most important circumstances that can direct the conduct of a farmer, are to be deducted from this little table. It shews how exceedingly erroneous it is in any man to thresh his corn at unseasonable times with a view to a better price. Nothing more common than to see half fed cattle, and crops half starved for want of dung, while a great portion of the straw of a farm is almost lost by being threshed when the cattle cannot eat it. Nothing can be clearer than the mistake of such a conduct. Here is a gradual and regular rise during three quarters of the year; but it is by no means answerable to any inconvenience in point of consuming the straw. By keeping his wheat till after Midsummer, a farmer gains only 3½d. a bushel upon an average of 12 years. The difference of a summer and winter price of threshing deducted from this, what is there remaining to make amends for the almost total loss of the straw? It may be answered, that the farmer sells his straw: so much the worse; for the near neighbourhood of great cities alone excepted, that is an execrable losing custom, which tends only to impoverish a farm, and if keeping corn till the cattle will not eat the straw is done on that account, two mischiefs arise instead of one, but never will apologize for each other. But another consideration, and a most powerful one, is the damage done by vermin: rats and mice in many situations devour quantities of corn; but very small depredations indeed will be sufficient totally to wipe out this trifling rise of price.

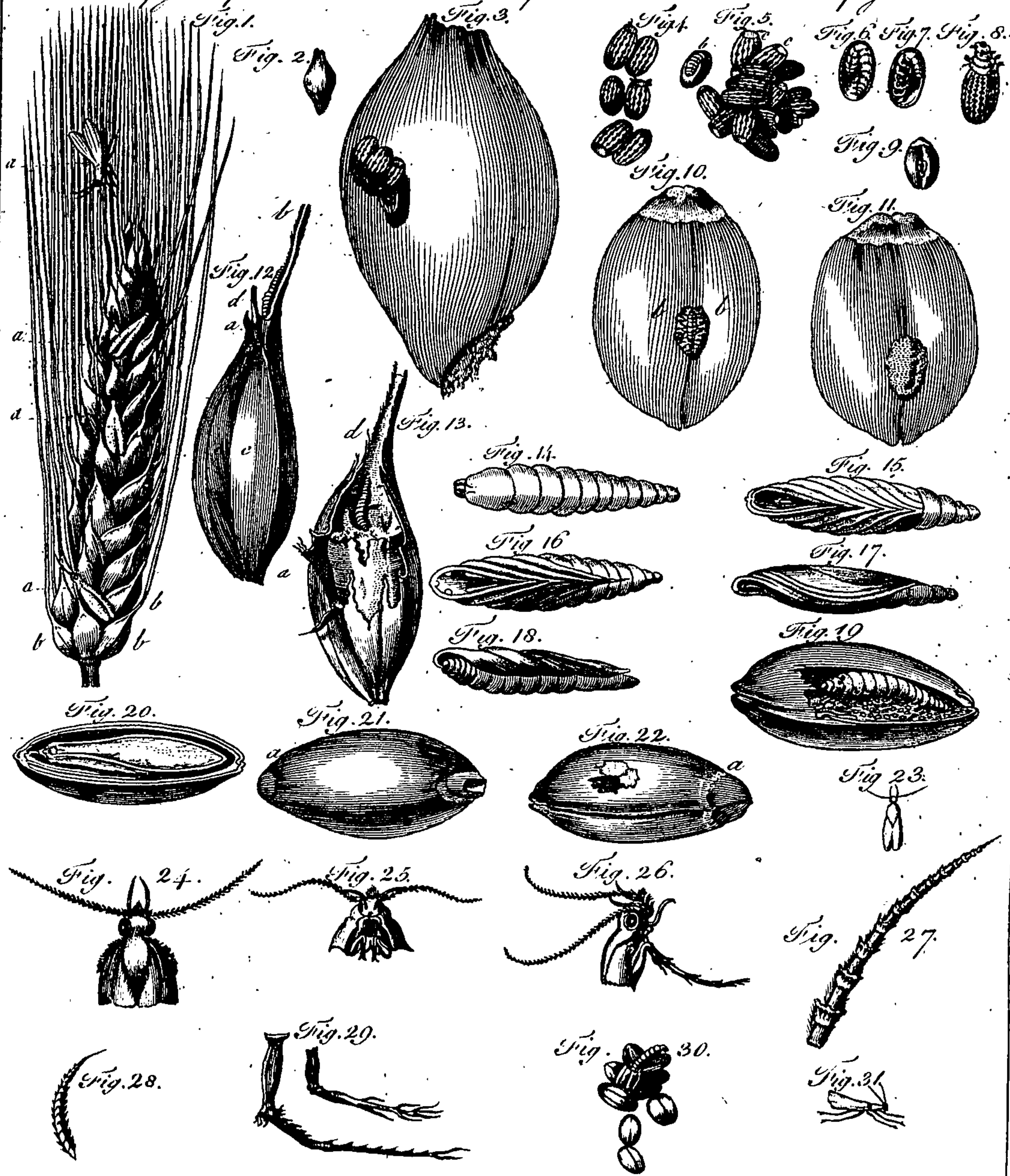
The difference of price some years is certainly much higher than appears in this table. Thus in 1777 the difference in half a year in the price of wheat was 1s. 1d. a bushel. In 1774 it was 10d. and 6d. in 1773, and in such years the difference is still higher if only the finest corn in the market is attended to; such years tempt farmers to listen to accounts which, though true in themselves, are utterly false as an argument for speculating: nor do they take into the account other years in which prices fall instead of rise: thus in 1781 wheat fell 4d. from Christmas to Midsummer. It fell in 1779. In 1778, 7d. and 9d. in 1775; indeed conversation rarely turns on this subject without many instances occurring of farmers that have lost instead of gaining by their speculation.

Hence, therefore, we may very safely advise every farmer to reject all speculation, as sure in the long run to prove a loss; but to thresh and sell his corn all within the season of feeding his cattle with the straw. He will gain more in their well-doing, and in avoiding the depredation of vermin, than he can ever justly expect to gain by the rise of markets.

CORN-CROWFOOT, a weed very common among the corn. It has an upright stalk; the leaves are of a pale green, and cut into long, narrow, acute segments. The flowers are much smaller and paler than the crowfoot of the pastures: but the seed-vessels are the most remarkable, being covered all over with prickles. See Plate V. fig. 33.

CORN-

The figures from 1 to 31, Inclusive, are explained in the Article Butterfly.



CORN-FLAG, a very troublesome weed, multiplying exceedingly by its roots. It has a round compressed tuberos root, which is of a yellowish colour, and covered with a brown furrowed skin, like that of the vernal crocus. From this root arises two flat sword-shaped leaves, which embrace each other at their base; and between these arises the flower-stalk, which grows near two feet high, having one or two narrow leaves, embracing it like a sheath. This stalk is terminated by five or six purple flowers, standing above each other at some distance, and ranged on one side of the stalk; each of these has a sheath, which covers the flower-bud, before it expands, but splits open lengthways when the flowers blow, and afterwards shrivels up to a dry skin, which remains about the seed-vessel, till the seeds are ripe, which is in the beginning of August. The flowers come out in the beginning of May, or in June. Some of these flowers are white, and others flesh-coloured.

Corn-flag is extremely difficult to root out, as every part of the root will grow. The best manner of extirpating it is that already mentioned under the article colts-foot. See **COLTS-FOOT**.

CORN-MARYGOLD, the name of a very troublesome weed, of which there are two species, one common in corn-fields, and the other in moist pastures. The leaves of the first sort embrace the stalks, the upper being jagged, and the lower indented like a saw. The second is, by C. Bauhine, called the greater wild daisy, with a leafy stalk. It rises with stalks near two feet high, furnished with oblong indented leaves, which embrace the stalks with their base. Each of these stalks is terminated by one white flower, shaped like that of the daisy, but four times as large. It flowers in June. See Plate V. fig. 34.

The corn-marygold has a perennial woody root, which striking deep requires a considerable quantity of food, and therefore must be a great enemy to the corn. Considerable pains must be taken before this weed can be extirpated, as it is highly probable, that, besides multiplying by its roots, its seed will grow, if ploughed in, as that of the garden marygold will do when dug in. Deep and repeated hoeings are therefore necessary, before it runs to seed.

CORN-PARSLEY, the name of a low branching plant common among corn. The branches grow thick together, and are knotted and crooked. The flowers grow close together after the manner of parsley, and are of a white colour inclining to yellow. The seeds are large in proportion to the plant; and are set about with little crooked bristles, which makes them adhere to the stockings in great plenty, when the seeds are ripe, which is generally about harvest. See Plate V. fig. 35.

CORN-WORM, the insect lately observed in France to be so very destructive to corn. See the article **BUTTER-FLY**.

CORNER-TEETH, are the teeth which appear when a horse is coming five years old. See the article **AGE**.

CORONET, the lowest part of a horse's pastern, which runs round the coffin, and is distinguished by the hair which joins and covers the upper part of the hoof.

COSH, the same with pods. See the article **POD**.

COSSART, or *Coffet Lamb*, a lamb left by its dam's dying before it is capable of shifting for itself; or it is a lamb taken from an ewe that brings two, three, or four lambs at a yeanning, and consequently is incapable of bringing them all up. The word is also applied to a colt, calf, &c.

In either of these cases, if there be not another ewe at liberty to suckle it, it must be brought up by the hand, or perith. By an ewe at liberty is meant, one that has, by some accident, lost her lamb, and has milk enough to suckle a lamb yeanned by another.

COSTIVENESS, a complaint to which horses are often subject; sometimes occasioned by violent and hard exercise, especially in hot weather; and sometimes by standing long at hard meat, without grass, or other cleansing diet, and with very little exercise.

The cure for this complaint is easy, only by giving him an open diet for some time; and if any thing more is wanting, lenitive mild purges are the most likely to succeed. Such as Glauber's salts with lenitive electuary, four ounces of each, dissolved in warm ale or water, and repeated every other day. This, with scalded bran given every day, will soon remove the complaint, and carry off the viscid slime engendered in the guts, which is generally the cause of his costiveness.

But there is another kind of costiveness in horses, which

is much harder to be removed, viz: that which seems to be natural, or grown into a habit. We find some very good horses liable to this disorder; and, when it is of long continuance, they are apt to grow lean and emaciated; feel hot and dry, their hair staring, and there is danger of some approaching sickness.

This disorder is not easily removed, nor is it often necessary to bring such horses into a contrary habit; for where this is natural, it may proceed from a more than ordinary strength and rigidity in the small fibres of the stomach and guts, which makes them digest their aliment well, and retain their excrements longer, and when such a habit can be kept within any proper medium, the horse will continue in strength and vigour, without any inconvenience; and it is observable, that these horses are, for the most part, able to endure great fatigue and labour. However, it is proper to give such horses, at all convenient times, an opening diet. For if this habit happens, by any accident, to grow into an habitual costiveness, so as to produce ill effects, as heat; dryness of the constitution, little scabby eruptions over the skin, and a rough coat; it will then be necessary to remove it in some degree, which cannot be done but by a continual use of emollients, joined by a loose opening diet.

Purging is here also necessary, and ought by all means to be complied with; but purging in the common way with Barbadoes or other plantation aloes, seldom has any great effect longer than the purge is working; for when that is over, the same habit of costiveness generally returns as strong as ever. Scalded bran, and the common opening diet, seldom makes any great alteration in these horses. The aloetic purges will scarcely work, especially if they are made strong, for they then chiefly run off by urine, which does the creature little service in this case. But after the common purges have failed, the following will succeed beyond expectation.

Take succotrine aloes, six drams; spermiaceti, half an ounce; fenugreek-seeds in powder, two ounces; make the whole into two balls, with a sufficient quantity of honey, or common treacle, and give them in a morning fasting.

Let the horse have scalded barley instead of scalded bran, and the liquor of the barley for his drink, milk warm. This will work very gently; where stronger purges have little other effect upon costive horses than to gripe and make them sick. It ought to be repeated once in four days, and may be continued till he has taken six doses. Let him have an ounce of fenugreek-seeds once a day, in one of his mashes, and when the purgation is over, continue the use of the fenugreek; and sometimes give linseed in the same manner, either in his dry or moist feeds, until the horse grows smooth and well coated, and his dung moist and in good order. *Gibson's Farriery, vol. II. p. 134.*

COTYLEDONS, rinds, or husks.

COUCH-GRASS, *quick-grass, knot-grass, or dog-grass*, is one of the worst of weeds among corn, and one of the most difficult to extirpate in arable land; every joint of its long creeping roots being capable of soon producing a new plant, after those roots have been broken by the plough. The usual way of destroying it, is by laying the land fallow in summer, and frequently harrowing it well over, to draw out the roots, every piece of which should then be burnt, for the reason already mentioned. Where this is carefully done, the ground may be so well cleansed in one summer, that the remaining roots will not do any great injury to the ensuing crop: but the best way is to sow the land in which this weed prevails with such plants as require the horse-hoeing culture. The blade of this grass is so rough, that the cattle will not feed upon it when green.

Mr. Young, in his *Annals of Agriculture*, recommends trench-ploughing as a proper method to destroy couch-grass; where he says one earth given deeply with his skim-plough, and after that a hoeing system on the surface, will convert the couch to a manure.

COUVERT, sheltered, not open, not exposed.

COUGH, a convulsive motion of the lungs, being an effort of nature to throw up some offending matter.

Horses are very subject to coughs, which are sometimes occasioned by colds, and often by the injudicious treatment of an inflammation of the lungs; the consequence of which is often settled habitual coughs, which frequently degenerate into asthmas, and broken wind.

Nothing has more perplexed practitioners than the cure

of settled coughs; the cause of which, perhaps, has been their want of attention to the different symptoms which distinguish one cough from another; for without strict observance thereof, it is impossible to find out the true method of cure.

Thus, if a horse's cough is of long standing, attended with a loss of appetite, wasting of flesh, and weakness, it denotes a consumption; and that the lungs are full of knots, hard substances, called tubercles, which have often been discovered on dissection.

The following signs denote when the cough proceeds from phlegm, and slimy matter, that stuff up the vessels of the lungs.

The horse's flanks have a sudden quick motion; he breathes thick, but not with his nostrils open, like a horse in a fever, or that is broken winded; his cough is sometimes dry and husky, sometimes moist, before which he wheezes, rattles in the throat, and sometimes throws out of his nose and mouth great lumps of white phlegm, especially after drinking, or when he begins or ends his exercise, which discharge commonly gives great relief. Some such horses wheeze and rattle to such a degree, and are so thick winded, that they can scarce move on, till they have been out some time in the air; though then they will perform beyond expectation.

These are properly asthmatic cases, and ought to be distinguished in their symptoms from that puriveness and thick windedness we see in some horses, occasioned by too full, or foul feeding, want of due exercise, or their being taken up from winter's grass. But these two last cases are easily cured by proper diet and exercise; the one by lowering his keeping, and the other by increasing it.

The above asthmatic case proves often very obstinate; but, if it happens to a young horse, and the cough is not of long standing, it is greatly relieved, if not totally cured, by the following method.

If the horse is full of flesh, bleed him plentifully; if low in flesh, more sparingly; which may occasionally be repeated, on very great oppressions, and difficulty of breathing, in proportionate quantities.

As mercurial medicines are found remarkably useful in these cases, give a mercurial ball, with two drams of calomel, over night, and a common purge the next morning; or the following, which is much recommended by Mr. Gibson:

Take gum-galbanum, ammoniacum, and assa-fœtida, of each two drams; fine aloes, one ounce; saffron, one dram; oil of aniseeds, two drams; oil of amber, one dram; with honey enough to form into a ball.

They may be repeated at proper intervals, with the usual cautions. In the intermediate days, and for some time after, one of the following balls may be given every morning:

Take cinnabar of antimony, finely levigated, six ounces; gum-ammoniacum, galbanum, and assa-fœtida, of each two ounces; garlic, four ounces; saffron, half an ounce: make into a paste for balls, with a proper quantity of honey.

These balls are extremely well calculated for this purpose: but if they are thought too expensive, the cordial ball may be given, with an eighth part of powdered squills and Barbadoes tar: or equal quantities of the above, and the cordial ball, may be beat up together; and where they can be afforded, balsam of Peru, balsam of sulphur, and flower of Benjamin, would undoubtedly, added to the cordial ball, make it a more efficacious medicine, in cases of this sort, as thus:

Take of the pectoral or cordial ball, one pound: balsam of Peru, half an ounce; balsam of sulphur anisated, one ounce; flower of Benjamin, half an ounce; honey as much as is sufficient to form them into a paste: give the size of a pigeon's egg every morning.

Exercise in a free open air is very serviceable, and the diet should be moderate. Horses subject to any inward oppressions of the lungs, should never be suffered to have a belly full; that is, they should never be permitted to distend their stomach with meat or water, as to press against the midriff, which of course would hinder respiration. Their hay should even be abridged, given in small quantities, and sprinkled with water; and their usual allowance, both of corn and water, should be divided into several portions: by such a regulation in diet, horses may be so recovered as to do great service; and in all disorders of the lungs, it is what should principally be attended to.

The following are the symptoms of a dry cough, or asthma.

The horse afflicted with this cough, eats heartily, hunts, and goes through his business with alacrity, appears well coated, and has all the signs of perfect health; yet he shall cough at particular times almost incessantly, without throwing up any thing, except that the violence of the cough will cause a little clear water to distil from his nose. Though this cough is not periodical, yet some of these horses cough most in a morning, after drinking.

This may properly be styled a nervous asthma in a horse, as probably it chiefly affects the nerves in the membranous parts of the lungs and midriff; and is a case very doubtful at least, if not incurable: but when the horse is young, the following method may be successful.

Take away first a moderate quantity of blood; then give him two drams of calomel, mixed up with an ounce of diapente, for two nights; and the next morning a purging ball. Keep him well clothed and littered, and feed him with scalded bran and warm water.

Once in eight or ten days this purge may be repeated, with one mercurial ball only given over night.

The following balls may then be taken, one every day; about the size of a pullet's egg, the horse fasting two hours afterwards; and should be continued two months, or longer, to be of real service.

Take native cinnabar, of cinnabar of antimony, half a pound; gum-guaiacum, four ounces; myrrh, and gum-ammoniacum, of each two ounces; Venice soap, half a pound: the cinnabar must be finely levigated, as before observed, and the whole mixed up with honey, or oxymel squills.

The following also will be found a useful remedy in obstinate dry coughs:

Take gum-ammoniacum, squills, and Venice soap, of each four ounces; balsam of sulphur, with aniseeds, one ounce; beat up into a mass, and give as the former.

These mercurial and ponderous medicines are well adapted to open obstructions in the lungs, and prevent those little knots, or tubercles, which so frequently ulcerate, and lay the foundation of an incurable malady, or consumption; but the common pectorals alone will avail nothing in old stubborn coughs, their efficacy being lost in the long tour they have to make, before they come to the lungs; and indeed, were it otherwise, without they had such powerful openers joined with them, they would be of little consequence; for where there are expectations from medicines, such are chiefly to be relied on which have a power of dissolving and attenuating the viscid humours, opening the small obstructed vessels, and promoting all the natural secretions.

Before we conclude this article, it may be necessary to observe here, that some young horses are subject to coughs on cutting their teeth, their eyes are also affected from the same cause. In these cases always bleed, and if the cough is obstinate, repeat it, and give warm mashes; which, in general, are alone sufficient to remove this complaint. But when the cough is an attendant on worms, as it often is in young horses, you must give such medicines as have a power to destroy those animals: particularly mercurial physic, at proper intervals, and immediately half an ounce of Æthiop's mineral, mixed up with the cordial; or pectoral balls may be given every day. See WORMS. Bartlett's Farriery, p. 51.

But horses are not the only animals subject to this disorder: it is so common among sheep, that one seldom passes near a flock without hearing it in several. They cure this disorder in the Ardennes by throwing up their nostrils with a syringe blanchéd almonds pounded in wine, for six or eight days successively.

COUPLES, ewes and lambs.

COW, the female of the bull.

Cows are very serviceable to the husbandmen for work, and for the supply of the family and market. The best breed is reckoned that of Yorkshire, Derbyshire, Lancashire, Staffordshire, &c. and a good hardy sort for fattening on barren, or middling sort of land, are your Anglesea's and Welsh. The hardiest are the Scotch; but the best sort of cows for the pail, only they are tender and require very good keeping, are the long-legged, short-horned cow, of the Dutch breed, which is to be had in some places of Lincolnshire, but mostly in Kent; many of these cows will

will give two gallons of milk at a meal: but in furnishing yourself with cattle, you ought to consider the goodness of your land, and the use you design your cattle for, as whether for breed, milk, or work.

If for breed, the better your land is, the larger may your kind be; and the cheaper, the more will be your profit: only observe, that of what kind soever your breed is, that it be the best of the sort; and let your bull be of the same country with your cow, for a mixed breed is not reckoned to be so good.

The cow ought to have a broad forehead, black eyes, large clean horns, her neck long and thin, a large deep belly, thick thighs, round legs, short joints, a white large deep udder, having four teats, and her feet large. In the winter management of dairy cows, one circumstance may be noted: that of their being frequently kept (in conformity to a modern practice adopted by some leading men) in sheds, continually throughout winter, from the time of their being taken up in autumn, to that of their being turned to graze in the spring; generally four months, without any exercise.

Some discerning individuals, however, have already discovered the inconveniences of this practice, especially that of their hoofs cracking, let them loose in a yard, a few hours every day, to moisten their feet, as well as to exercise their legs, and clean their coats.

Though a dairyman may in general rear his own cows, he must be fortunate indeed if he never have occasion to purchase a cow.

Mr. Marshall, in his *Rural Economy of Gloucestershire*, says as follows: The favourite points of a milking-cow here are, a thin thigh; a lank thin-skinned bag hanging backward; teats long, and sufficiently free of milk without spilling it; dug veins large; and horns yellow. I will not vouch for the infallibility of all these points; but this I can say, that I never noticed a cow with a thick fleshy thigh which was a good milker.

The dimensions of the handfomest cow I have seen of the true Vale breed, rising five years old, and within a few months of calving, are as follow:

Height at the withers, four feet, five inches.

—— of the brisket, eighteen and a half inches.

Smallest girt, seven feet one inch.

Largest girt, nine feet two inches.

Width at the shoulder, twenty-one and a half inches.

—— huckle, twenty-four inches.

—— round-bone, nineteen inches.

Length from forehead to nache, seven feet five inches.

—— center of the shoulder-knob to center of the huckle, three feet eleven inches.

—— center of huckle to the out of the nache, twenty-one inches.

Length of the horns, ten inches.

Width at the points, eighteen and a half inches.

Head, neck, and leg, fine and clean.

Chine full, and back level.

Colour, a darkish red mottled with white.

There is a disadvantage common to all the varieties of the short horned breed. This is their difficulty in calving. For notwithstanding the fleshiness of the hind-quarter has been sufficiently done away, the bones still remain. The loin is still broad, and the huckles still protuberate; perhaps too much, either for lightness or use.

An improper treatment of the cow may encrease the difficulty. A cow can scarcely be too low in flesh a month before she calves. Good keep three weeks or a month before calving gives due strength and a flush of milk. The cause may be difficult to point out with precision; but the effect is well ascertained.

It is a fact, that short-horned cows seldom calve without assistance. Their hour of calving is watched with obstetric solicitude; the person who has the care of them frequently rising in the night, and sometimes sitting up with them the night through. From constant observation, however, a good dairyman will judge at bed-time the hour of calving, sufficiently near to know whether it will be necessary for him to rise before his usual time.

Mr. Young, in his *Annals of Agriculture*, vol. xii. gives, from a letter of Mr. Macro, the following experiment, wherein he says, "I have just seen, on looking over my last year's pocket book, an account of two experiments I made last summer, on milking a cow from two to four times in a day, which I do not remember to have given you, and which are as under.

May 21st, 1789.			October 22d, 1789.		
First meal,	—	Pints. 9½	First meal,	—	Pints. 11
Second ditto,	—	13	Second ditto,	—	6
		22½			17
May 22d.			October 23d.		
First meal,	—	13	First meal,	—	11
Second ditto,	—	8	Second ditto,	—	3
Third ditto,	—	5	Third ditto,	—	3
		26			17
May 23d.			October 24th.		
First meal,	—	12	First meal,	—	10
Second ditto,	—	7	Second ditto,	—	11
Third ditto,	—	6	Third ditto,	—	3
Fourth ditto,	—	1	Fourth ditto,	—	3
		26			16

Mr. Young, in the thirteenth volume of his useful work, gives a letter from Mr. John Foote of Brandon in Suffolk, who says, "In the year 1782, I had an experiment tried on a cow about ten years old, that had had six or seven calves; found she was going off profit; had not taken the bull: had her spayed in the spring; kept her two or three weeks from the cold, soon after she began to thrive and do well,—by the latter end of summer was near fat; had she gone in good pasture would probably have been quite so. She improved apace and paid well; was worth about 25s. when cut; and sold most of her at 3s. 6d. a stone, her weight 25 stone. The spaying of cows may be of service if properly attended to, such cows as grow less profitable to the pail, may answer well for grazing: the spaying them affords time, and renders them safe from calves, which otherwise they would not be, where any bull is kept near them. There appears little hazard in having it done by a skilful hand; the parts taken away are only the ends called the luffs; when done throw in a handful of salt, and stitch up the wound with a double wax thread.

"In January 1787, I had a cow spayed, about fourteen years old, after calving about a month, having had a large calf which was forced to be drawn from her by four men; that she was very weak, yet did very well; in a week's time seemed little affected by being cut; and afterwards another. These cows after spaying, milked a considerable time longer than usual; improved apace and fattened well. A cow of five or six years old, that does not answer to milk would improve to graze by being spayed. Some other farmers in the neighbourhood have experienced the same."

As for the size of your cows, as of all other cattle, it must be suited to the goodness of your land, though the largest commonly give the most milk: and whether you design them for breed, fattening, or the dairy, let them be such as come off a worse ground than your own, if possible. The best time to breed calves is from three years old to twelve. See the article CALVES.

For a fortnight or three weeks before a cow calves, put her into good graze; or, if it be in winter, give her hay; and be sure to keep her in the house the first day and night after she has calved, and let a little of the cold be taken off the water which you give her: the next day, if well, and she be well cleaned, turn her out about the middle of the day, and take her in two or three nights more, giving her water a little warmed every morning, before you turn her out. *Mortimer's Husbandry*, vol. I. p. 225. See CATTLE and DAIRY.

COW-LEASE, pasture, or meadow-ground, kept for feeding of cows.

COWHERD-MILK, implies milk received from the hands of the cowherd, a person whose office it is to attend upon, and look after, the herd of cows in places where they run in common.

COWL, a term used in some counties of England to signify a tub.

COW-PARSLEY, the name of a plant common in pasture grounds, and of which cows are said to be very fond. This plant should be rooted out of all pastures, for it is one of the most early plants in shooting, so that by the beginning of April its leaves are two feet high. The seeds of this plant spread greatly over the ground, and as the roots are perennial, so they are often very troublesome weeds to destroy.

COW-PARSNIP, wild parsnip, meadow parsnip, or madrep, the name of a weed that grows to near three feet high. The stalk is round, furrowed, and hollow. The leaves proceed from a large membrane or sheath. They grow

grow on long hairy stalks, and are divided and downy. The flowers grow in large umbels, are white, and consist of five irregular petals: two oval, streaked, compressed surrounded by a wing, succeed each flower.

COW-WHEAT, by some called *fox-tail*, is a pernicious weed in many countries. Its seed is something like wheat, and, according to Clusius, spoils the meal with which it is ground, by giving it a dark colour, and a bitter taste: though Mr. Ray says he could never perceive any disagreeable relish in the bread with which it was mixed. Mr. Miller says it is a delicious food for cattle, particularly for fattening of oxen and cows, and that it may be worth while to cultivate it for that purpose.

Its seed seldom grow the first year, unless they chance to be sown, or sow themselves, in autumn, soon after they are ripe. See **MEADOW FOX-TAIL**.

CRADLE, a part often added to a scythe, the better to gather the corn, when low, into swarths when it is mowed.

CRAGG, *cragge*, a name given in Suffolk to the remains of marine shells, of various kinds, and in which the greater part of the British cliffs abound.

This is a very excellent manure for cold, wet, or clay land; so that every farmer would do well to search his grounds, in order to know whether he is, or is not, possessed of this treasure, which will insure him of very large crops of corn, though his lands were before worn out by continual labour.

CRAKE, a name given in the northern counties to the crow.

CRAKE-NEEDLE, the shepherd's needle; or rather the seed-vessels of it.

CRANE'S-BILL. See **CROW-FOOT**, **CRANE'S-BILL**.

CRAP, a name given in some parts of England to darnel; and in others to buck-wheat.

CRATCH, or *critch*, a rack.

CREAM, the unctuous, or oily part of milk. See **DAIRY**.

CUBBITTING, a vice to which some horses are subject; consisting in their catching hold of the manger, sucking in of the air, and swallowing it down in gulphs, till they are often so full that they are ready to burst. Some do it only on their collar reins, and some on every post and gate they come at.

This vice is more common in London than any where else, and may either come upon horses from very low feeding, whilst they are young, and have appetites, or, perhaps, by standing much at the crib while they are shedding their teeth; for then their mouths are hot, and their gums tender and itching, which may readily make them suck in the air to cool their mouths: but young horses are the more apt to imbibe this ill habit when they stand next those that do it, for young horses often follow others. Horses addicted to this vice are but of small value; they drop a great part of their food unchewed, which makes them always look lean and jaded, with a staring coat, and consequently few of them are able to endure much labour; besides their being frequently subject to the gripes, and other disorders, owing to their continual sucking in the air. There is no method yet known that has proved effectual in the cure of this vice. *Gibson on Horses*, vol. I. p. 40.

CRIBBLE, coarse meal, or that but one degree better than bran.

CROFT, a small field or inclosure. In the northern counties it is used as a small close or inclosure, one end of which contains the dwelling-house and kitchen-garden.

CRONES, old ewes.

CROP, the produce, or the quantity of corn, grass, &c. growing on any parcel of land.

CROSS-TINING, a method of harrowing land, consisting in drawing the harrow up the interval it went down before, and down that which it was drawn up.

CROTCH, a hook.

CROW, an iron bar, with a claw at one end, used as a lever, and for making holes in the ground, &c.

CROW-FOOT, or **CRANE'S-BILL**, the name of a perennial weed common in pastures. The leaves are divided almost to the middle, usually into seven parts. The stalk commonly divides into two branches, and each of these into two more. From the corner of each division comes a flower-stalk, supporting two large blue flowers; consisting of five roundish, entire petals, succeeded by a long seed-vessel, resembling a crane's-bill. This bill-like seed-vessel is thick and rough, but not so long as in some other plants.

CROWS. See the article **ROOKS**.

CROWN-SCAB, a disease in horses, consisting in an humour that breaks out round the coronet, of a very sharp and itching nature, and attended with scurfiness. Sharp waters prepared with vitriol are generally used for the cure of this disorder: but the safest way is first to mix equal parts of marshmallow ointment and yellow basilicon together, spreading the composition on tow; and laying it all round the coronet. A dose or two of physic may be very proper to carry off the humour. *Bartlett's Farriery*, p. 206.

CUCKOW-FLOWER. See the article **LADIES SMOCK**.

CUCKOW-LAMBS, a name given in Hertfordshire to such lambs as are yeaned in April or May, because they fall in cuckow time. They are generally either the lambs of very young, or very old sheep, and occasioned by their taking ram very late in the season. These lambs are usually of the smallest sort, and therefore both ewe and lamb should have the best of keeping, in order to fatten the lamb for the butcher; for such diminutive lambs are improper to be kept for store-sheep. Besides, as these lambs are yeaned later than ordinary, it is very likely they will meet with green meat sufficient to fatten them apace, and come in season to be sold for the more money, as they are of the youngest sort, and fatted late. *Ellis on Sheep*, p. 79.

CUCKOW-SPIT, a kind of frothy substance frequently found on plants, containing one or two insects.

M. Poupert tells us, that as soon as the little creature comes out of its egg, it hastens to some plant, which it touches with its fundament, and fastens there a drop of white liquor full of air; it drops a second near the first, then a third, and so on, till it covers itself all over with a scum, or froth; this froth defends it from the heat of the sun, and also from the attacks of the spiders, which would otherwise devour it. Mr. Lisle is of opinion, that this froth is nothing more than the nightly dew which falls upon the fork or joint of the plant, and which the little insect, with its proboscis, as with a pair of bellows, works into froth.

CULMIFEROUS Plants, such as have a smooth jointed stalk, and their seeds are contained in chaffy husks.

CULTIVATION, the art of improving soils, and forwarding or meliorating the produce of the earth, by manual labour, manure, &c.

CULTIVATOR, a name given by foreign husbandmen to instruments invented for stirring the earth, on the principles of the New Husbandry. These instruments are generally called in England horse-hoes. We shall here give a description of those invented by Mess. de Chateauvieux and de Villiers, and describe those invented in England under the article horse-hoe. See **HORSE-HOE**.

Description of M. de Chateauvieux's single CULTIVATOR.

M. de Chateauvieux, having remarked the good effects of his plough in stirring the alleys between the rows of corn, rightly judged that the instrument we are now going to describe, which is much lighter and simple in its make, would answer the same end; or at least that it might be used alternately with the plough, employing this last only when a greater quantity of earth is to be turned up towards the rows of corn: "For, says he, it is to be observed, that the cultivator hardly changes the situation of the earth, but divides and breaks it in the place it is in, so as to render it loose and light, and fit for the roots of plants to penetrate with ease. This instrument, like the miner, works chiefly under ground, where it cuts the earth, divides its particles, raises it up, and lightens it. It has this further advantage, that one horse is sufficient to draw it. The cultivator, Plate VII. is composed of a beam, AB. fig. 1. the handles CD, and the share EF, which is more particularly represented in fig. 2, 3, 4, 5, and 6.

"The beam AB is three feet and a half, or four feet long. Its diameter ought not to exceed three inches at most; and, if it be square, the edges should be rounded off. It should be pierced with mortises under the letters G, H, in order to let through the cross staves I, L; in the same manner as in the fore-carriage of the plough; and is fixed to the keys K, M, or the pin a, b. The middle of the handles should be exactly opposite to the beams; that is to say, the space between them should be equal on both sides. These handles should be made lighter than those of the plough before referred to, and they should be fixed to the

the beam by a tenon in a mortise; riveted at N, and supported behind by the prop P:

"The end A of the share, fig. 3, and the two fins B, C, are made flat. The crooked handle ABC, fig. 4, should be triangular, and somewhat sharp before, to answer the end of a coulter, as in fig. 2, and 5.

"This share is to be let into a groove cut in the under part of the beam, as represented in fig. 7, and 8; and fastened there by a single ferrule, as in fig. 9. If it should cut too deep, that may be remedied by altering the position of the wheel, as in the plough, or by inserting a very small wedge g, fig. 10, between the handle of the share and the beam. If it does not cut deep enough, that wedge must be inserted, as at h, fig. 11, at the other end of the handle.

"When this instrument is used, the beam before described is to be substituted in the place of that of the plough, which is to be taken off. The two cross staves I, L, fig. 1, of the fore-carriage of the plough, are then run through the mortises G, H, of this beam, which is thereby fixed to that fore-carriage.

"This cultivator is very easily guided: the ploughman may hold it upright, or incline it to the right or left, just as the intended ploughing may require. The share and its handle enter so deep into the earth, as to be quite buried in it, if a deep ploughing is intended to be given: and in that case the tail A of the beam touches the ground. Though the share is but small, it stirs the earth at least a foot round it. Its point should be of steel, and somewhat inclined towards the earth.

"The share of this instrument, like that of the plough, may be brought as near as one pleases to the rows of corn, by placing the beam according to the frame."

Description of M. de Chateauxvieux's double CULTIVATOR.

"This instrument, Plate VII. fig. 12, 13, and 14, has two shares. It has a beam AB, and the shares CD, EF, fig. 13, which being exactly like that of the single cultivator, I have only to point out wherein these instruments differ. The beam of this should be ten or twelve inches longer than that of the other. It has likewise two mortises more, under the letters G and H, to let through the cross staves EK, IL, which bear the handles MN, OP, of the shares. The cross staves EK, IL, are riveted permanently to the beam: the handles MN, OP, are moveable upon the cross staves, to which they are fastened by the keys R, S, Q, T; so that the shares may be set at a greater or less distance from each other, according as the quality or situation of the ground may require to allow.

"This instrument stirs the earth extremely well, and does a great deal of work in a little time. Each share being about fifteen inches wide at AC, BD, fig. 14, and the distance between them from A to B, fig. 14, being about four inches, or, upon occasion, six; and the earth being stirred about two inches on each side beyond the extent of the utmost fins of the shares; each cut of this cultivator stirs about two feet breadth of ground. This double cultivator requires two horses, unless the soil be very light; in which case, I fancy one may do, though I have not yet tried it.

"If one had a mind to fix a coulter in the middle of the beam, just before the shares, I see no inconveniency that could arise from thence, provided it be a very light one.

"The way to use this cultivator is to fasten it to the fore-carriage of the plough, by running the two cross staves V, X, fig. 13, through the beam A, B.

"I would particularly recommend not to make the wood work of this cultivator too thick or heavy, and therefore by no means to exceed the dimensions I have given: for the lighter these instruments are, the more easily they are managed both by men and cattle."

Description of M. de Chateauxvieux's CULTIVATOR, with two Mould-boards.

"If, says M. de Chateauxvieux, I could have imagined, that my proposing for the use of the New Husbandry, some other instruments besides the plough, properly called, could have been looked upon as either so expensive or so troublesome as to discourage people from practising that husbandry, I should not, by any means, have thought of communicating them to the public.

"But why should not agriculture enjoy the same advantages as almost all great manufactories, in which every useful discovery and improvement, either to perfect the manufacture, or to fabricate it in less time and with less expence, is readily adopted?

"It is with a view to facilitate the various labours of cultivation, to execute them better, more speedily, and with much less expence; that I have introduced the use of my new instruments in the culture of my own lands. If others think proper to do so too, they will enjoy the same advantages. I offer them not as things absolutely necessary, for the plough alone may suffice, but as things of which I have experienced the good effects during the years 1753 and 1754, and which, for that reason, I think it incumbent on me to recommend to those who adopt the New Husbandry.

"The cultivator with two mould-boards differs from the single cultivator before described, only in the two mould-boards which I have added to it, one on each side, and which are represented in Plate VII. fig. 15. A, C, E, H, is the mould-board on the left-hand side of the plough; and B, D, G, I, the mould-board on the right-hand side. The whole of this fig. 15, represents an entire and a perspective view of the share and mould-boards.

"The mould-boards are made of plates of iron, either cast or hammered, about the twelfth part of an inch thick, which is sufficient to resist the pressure of the earth. Thicker plates than these would render the share too heavy, and it would be much more difficult to give them their proper bent.

"The two mould-boards join to the handle at HL, and lap about an inch one over the other; or else they are fastened together by rivets. They form, in that part, an angle E, H, F, of somewhat less than ninety-degrees, which is sufficiently acute to serve instead of a coulter: though a coulter may also be used upon occasion by placing it a little more forward.

"From the lower part L of the handle, the mould-board should pass underneath the fin L, G, of the single share, and follow the direction of that fin, as at G; being let in beneath, about an inch and an half, according to the pointed line LG, and firmly riveted by three strong rivets.

"The hind-part of the mould-boards is fixed and supported by the stay F, to which they are strongly riveted. This stay must have exactly the same bend as the mould-board.

"Behind the lower part of the handle is another stay, M, N, quite close to it, and about two inches below the top of the mould-boards, to which it is riveted at both ends. This stay helps to keep them firm: but its chief use is to prevent their being raised up by the pressure of the earth against their extremities A and B, which would throw their common angle H too forward, and misplace the share.

"The proper slope of the mould-boards cannot be so well described by words, as it may be conceived by the figure, which represents at F the convex inside of the one, and at Q the concave outside of the other. The distance to which the earth is turned over, when the cultivator opens it in order to make a large furrow, depends on the degree of this bending, and the space between the two upper extremities of the mould-boards E, F.

"The hind-most part of the mould-boards is cut sloping at C and D, almost in a segment of a circle. This shape helps to effect a greater division of the earth.

"The plate of iron, before it is bent, should be cut nearly in the shape of fig. 16.

"The size of the mould-boards, as well as their proper bending, depends a little upon the quality of the land intended to be cultivated. I have found that, for light soils, they need not be bent quite so much; so that the distance from C to D, fig. 15, may be twelve or thirteen, and even fifteen or sixteen inches. This same cultivator may likewise be used in stiff lands.

"Nothing hinders making these mould-boards two or three inches longer, from B to G, and from E to H; or varying some of their proportions, as the husbandman may think best.

"This share, with the mould-board is fixed to a beam, as in the single cultivator, fig. 1, where it is fastened to the fore-carriage, by the cross staves I, L.

"If this description does not convey a sufficiently clear idea of the shape and proportions of this cultivator, I will answer for its success when used. I describe it after one of

the same kind, which I have made use of for two years past with very great success."

Directions for using the CULTIVATOR, with two Mould-boards, by M. de Chateaufvieux.

"This cultivator opens the main furrow in the middle of the alley, by turning the earth over on both sides at the same time; and I have found by experience, that as much work is done by that means, by one turn of this instrument, as could be done by two, and frequently three turns of the common plough, and that without using a greater number of cattle. I must now prove this proposition; though I am persuaded that it will easily be allowed by whoever only casts an eye upon fig. 15, Plate VII. which represents the share of this cultivator." *See the article ALLEY.*

Description of a CULTIVATOR invented by M. de Villiers.

"This instrument is composed of a share, Plate VII. fig. 17, the two fins of which are eight inches and a half asunder at their extremities *a, b*. The socket *c*, which is between the two fins, projects some inches, and the hollow in it is three inches long, and one inch wide. It does not descend so low down as the fins, to prevent its touching the earth. The length of this share, from the point *d*, to the extremity of the fins *a* or *b*, is from 12 to 13 inches. At the distance of five inches from the point *d*, is a hole *e*, into which is inserted the crooked point *f*, of the iron safeguard, fig. 18, which is used in some countries in order to fasten the ear to the share of the plough. Upon the share is placed a small triangular ear *h*, fig. 20, 21, and 22, somewhat concave at bottom, that the two small ears may join exactly to the share at about an inch distance from the edge of the fins. This ear is about two inches and a half high at *a*, fig. 21, and is fastened firmly to the share of a double and angular safeguard, which covers its edge as far as *b*. It is fixed at one end of its point, which enters into the hole *e*, fig. 17, in the share, and by four small pins fastened to the ear. Fig. 18 and 19 represent this safeguard. The double ear is fastened at its other extremity, by the sheet or upright piece, *e, g*, fig. 21, which passes through the ground-rest of the hinder part of the ear, and beam, and by a piece of iron *c d* bent in a right angle. This piece of iron covers the fore part of the sheet, and rests upon the tail of the ear, against which the beam presses it very tight, by means of a wedge *e*, driven into the sheet. The piece *c d* may likewise serve to fix two mould-boards from *g* to *c*. It is nine inches high. *f* is another sheet or upright piece, which joins the beam to the ground-rest, to add to the strength and solidity of the instrument, which is increased also by the lower part of handles being fixed in the ground-rest at *i*, and traversed by the beam at *k*."

M. de Villiers, in a letter to M. Duhamel, gives the following account of his manner of using this cultivator.

"Finding it impossible to plough my alleys well when they were but three feet, or three feet and a half wide, without greatly damaging the rows of corn bordering upon them, I resolved to make them four feet wide, and took particular care to have the rows drilled very strait: but even then I found only one way of ploughing them well, which is to open the first furrow so near to the bed, that the next furrow within that may come within two or three inches of the nearest row of plants in the bed; turning over the earth of these furrows towards the alley. After two or three such turns of the plough, the ploughman will be sure not to make any mistake. It is of great importance to cut this first furrow, by which all the others are directed, quite parallel to the rows. The rest of the work will then go on regularly, and without any of that confusion which would be capable of giving many people a dislike to the new husbandry. My horses were led by hand, till they were sufficiently accustom'd to this work; but that was necessary only for the first furrow, which they afterwards follow of their own accord, so that the rest of the alley is ploughed with great ease.

"The earth of the second furrow, which is cut very near the rows, is turned over in the same direction as that of the first, that is to say from the bed.

"The third furrow is ploughed the contrary way, and the earth is then turned over towards the rows, so that the last furrow is filled up by this ploughing, and a considerable

quantity of well divided earth is turned over to the rows, for the plants to extend their roots in the spring.

"I then continue ploughing in the same direction, cutting the furrow that is turned over towards the rows as thick as possible, till the whole alley is ploughed almost close to the opposite bed, when, by turning over one large furrow on that side, the small one cut there at first is filled up. By this means, the spring hoeing is completely executed.

"I begin the second ploughing on the side where I ended the first, turning the earth over that way, which is the contrary to what was done before. When I come to the other side of the alley, I leave there, as was left before on the side I now begin at, the breadth of a small furrow, which I do not plough, but over which I turn the earth of my last furrow.

"I think this second hoeing may be deferred, when the ground does not produce many weeds: and in this case I perform it with the cultivator, which I bring almost close to the rows.

"After thus using, sometimes the plough, and sometimes the cultivator, according as the condition of the ground seems to require, I finish all my hoeings by putting two horses to the cultivator, and drawing it once or twice through the middle of the alleys, because it cuts four or five inches deeper than the plough."

M. de Villiers adds, that he could not always turn the earth over towards the rows, as M. Duhamel directs, because the wheel of his plough, getting too deep in the middle furrow, altered the direction of the share. To this M. Duhamel observes, that he himself met with the same difficulty, and found no other way of remedying it, but by opening a small furrow near the rows, by the help of which he turned the earth over towards the alleys, and then filled up the furrow immediately; taking care at the same time to turn the mould over towards the roots of the plants, so as to earth them up as much as possible. I am glad, adds he, that I have had this opportunity of giving M. de Villiers's method, because I think it a good one, and believe it will be of great service to such as may be inclined to practise the new husbandry." *Duhamel's Cultures des Terres, tome I.*

The cultivators invented by these gentlemen abroad, are many of them ingeniously contrived, but are by no means proper to be substituted in the room of the hoe-plough, because they do not turn the soil, and expose a new surface to the air as the hoe-plough does, which is an essential circumstance in horse hoeing. By the exposure of the immediate action of the air, dews, frost, &c. the soil is pulverised to a much greater degree, than when it lies at any depth, and is much more impregnated by the nutritious particles in the atmosphere, by which it is enriched so much, as to produce constant successive crops of corn, with little or no manure, as in the horse-hoeing husbandry; but without being thus turned and exposed, the land acquires no such fertility, as every farmer knows by experience.

M. de Chateaufvieux's cultivators, the single one particularly, does not turn the soil, but, as he observes, goes under ground, raising the earth a little, which falls down again in the same place, for which reason he gave it the name of a miner. Mr. Wynn Baker made use of it to hoe his drilled wheat alternately with the hoe-plough, which appears to have been one principal reason of his ill success in that experiment of horse-hoed wheat. He attributes the failure of his drilled wheat to the narrowness of his ridges; but they were five feet broad, which is some inches broader than Mr. Tull's, and others since, who have succeeded in this culture. He likewise limited his tillage to four hoeings, though he found his crops declining; whereas had he given his wheat two or three hoeings, which cost him but one shilling each per English acre, or sown some light manure upon the rows, as Mr. Tull directs in such cases, these would have kept up the fertility of his land, though he had continued to make use of the cultivators.

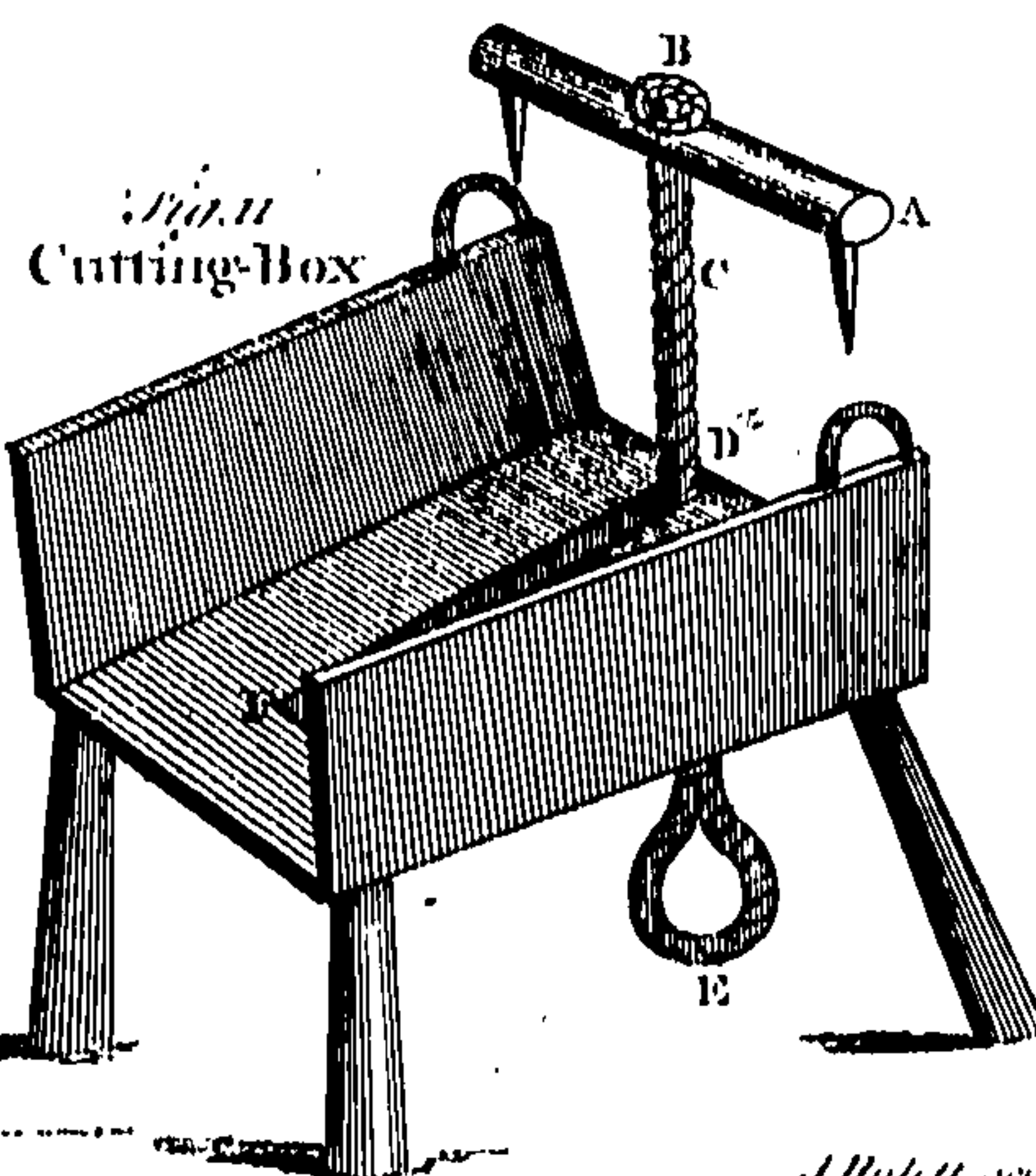
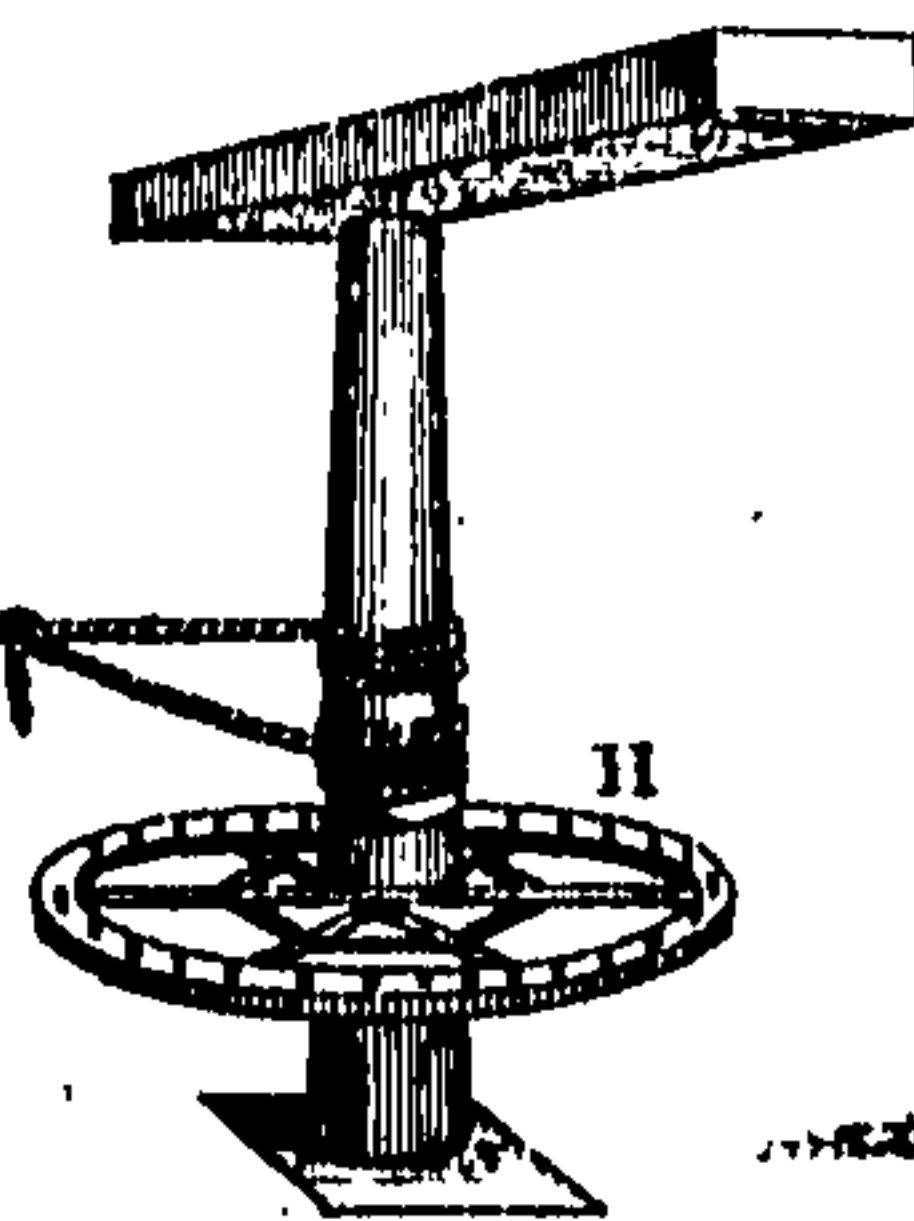
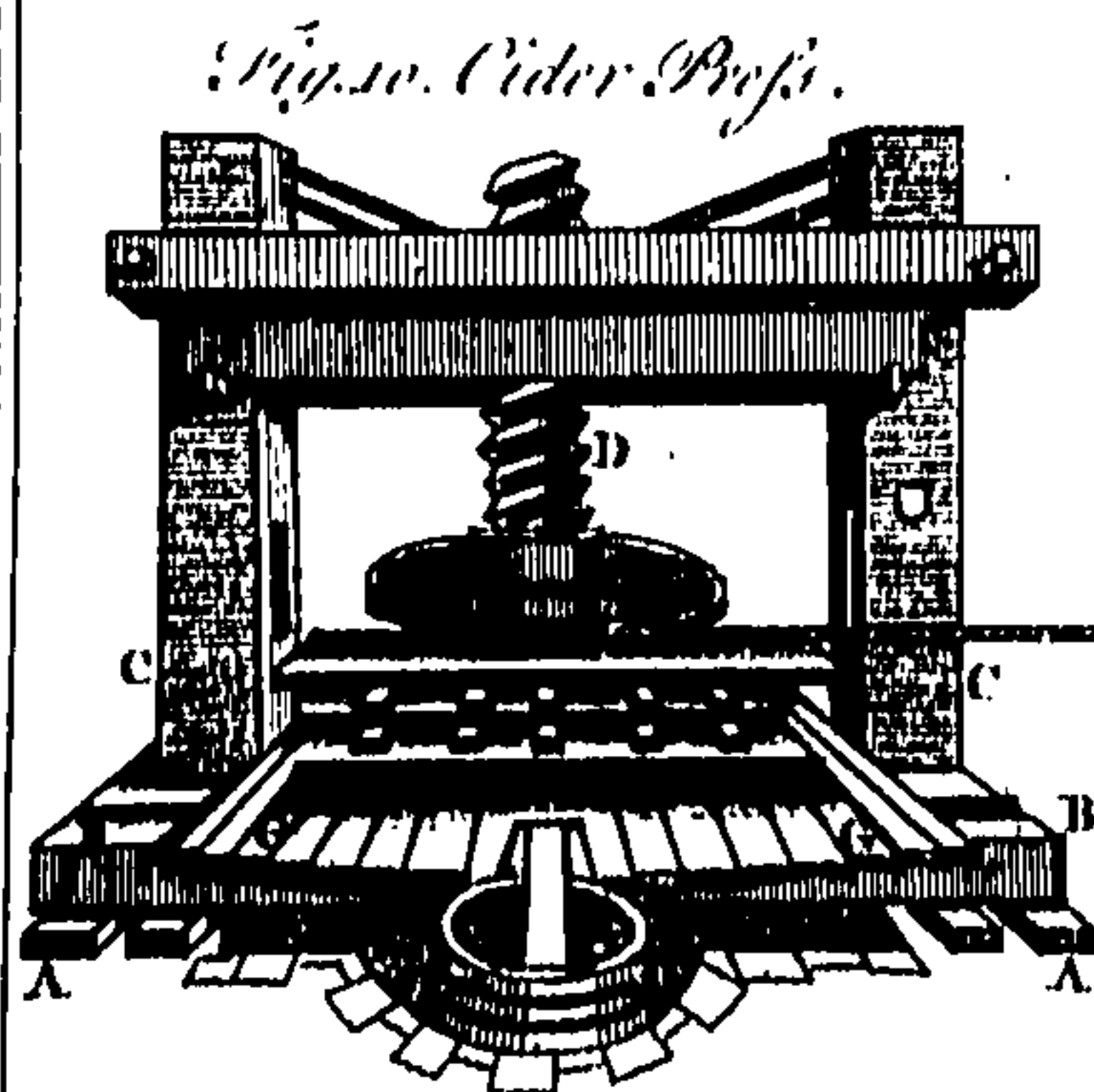
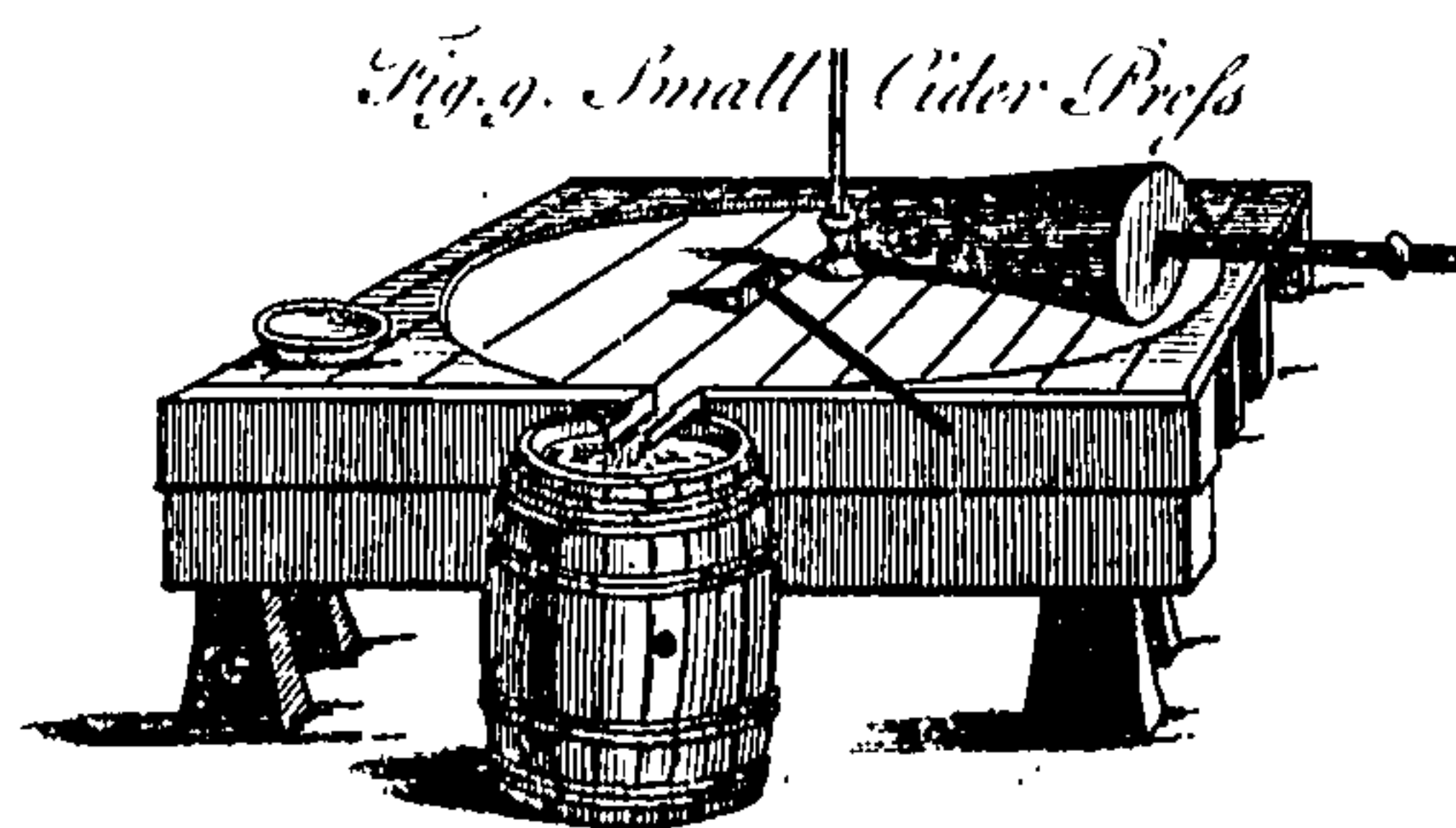
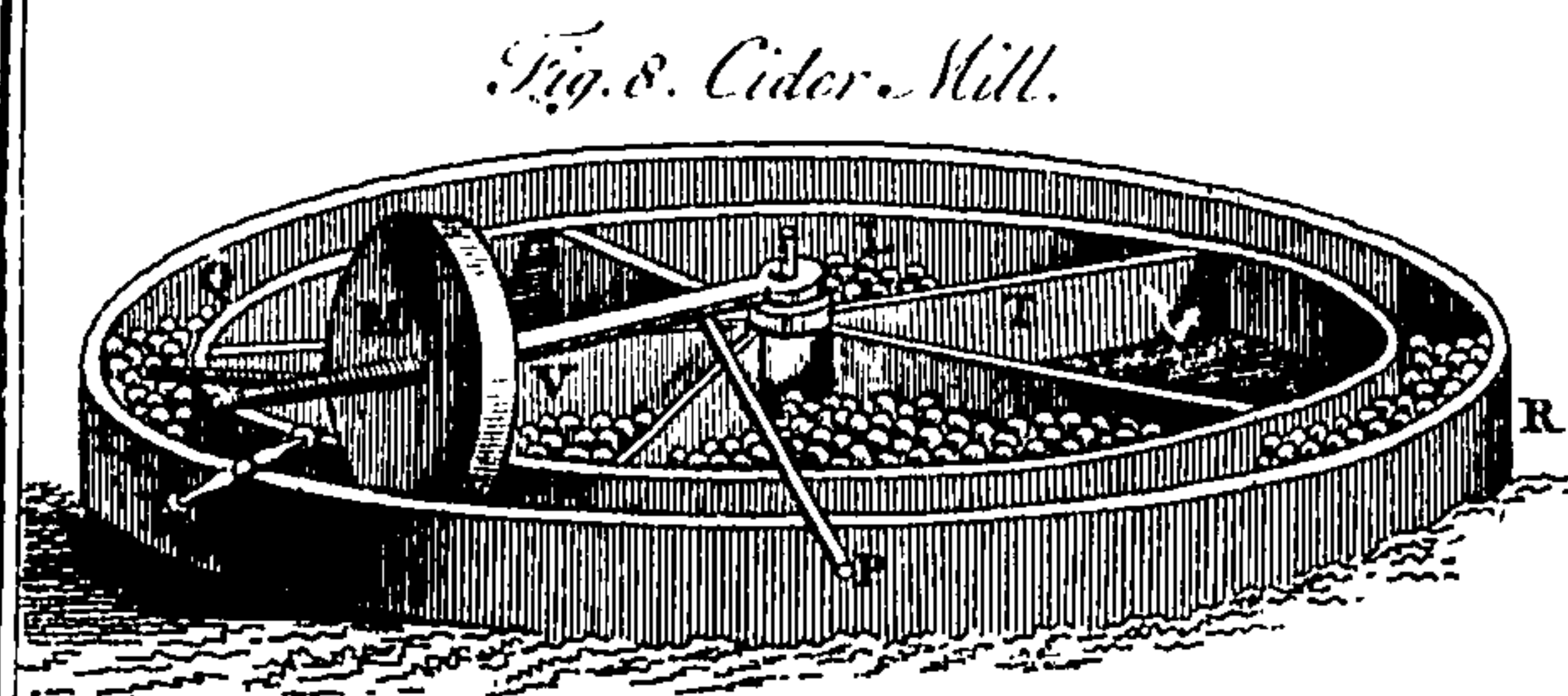
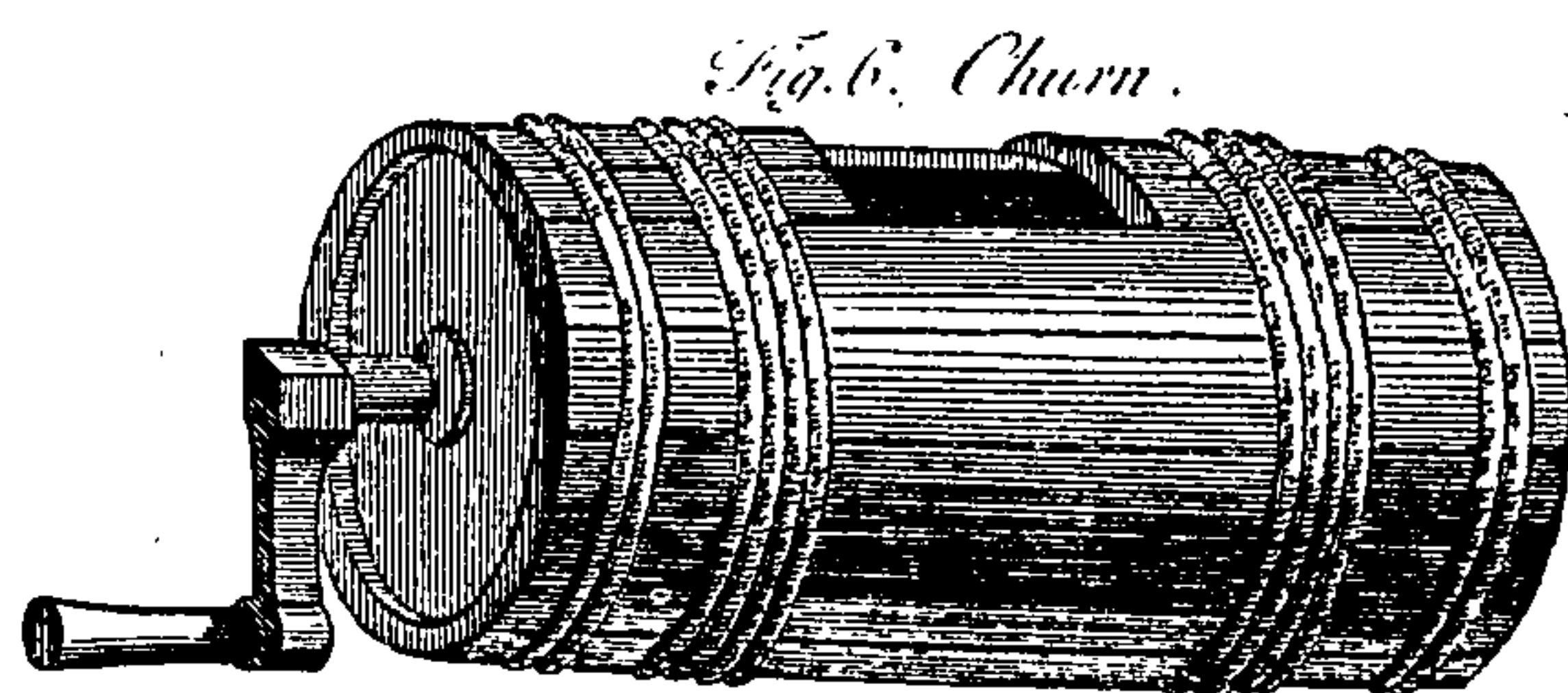
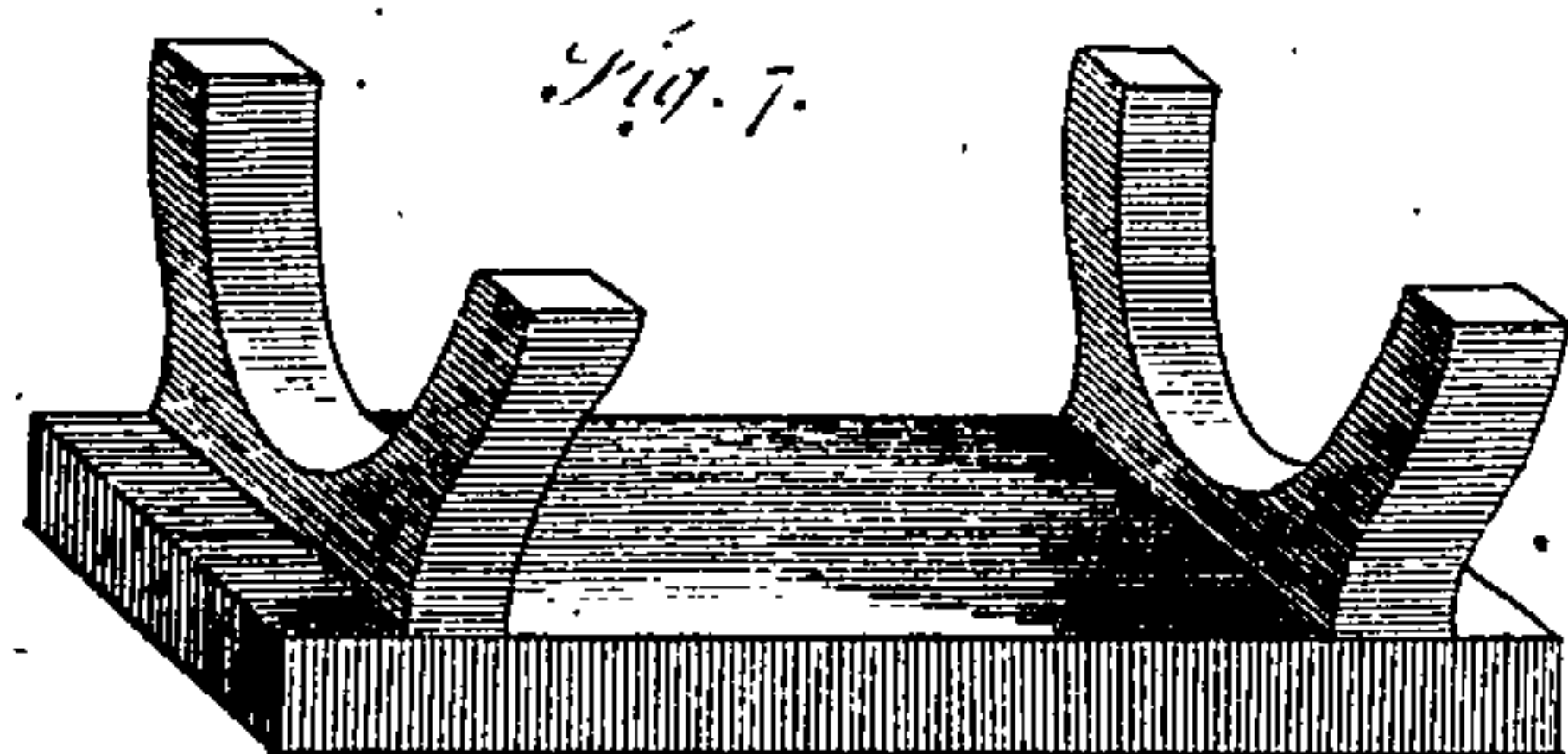
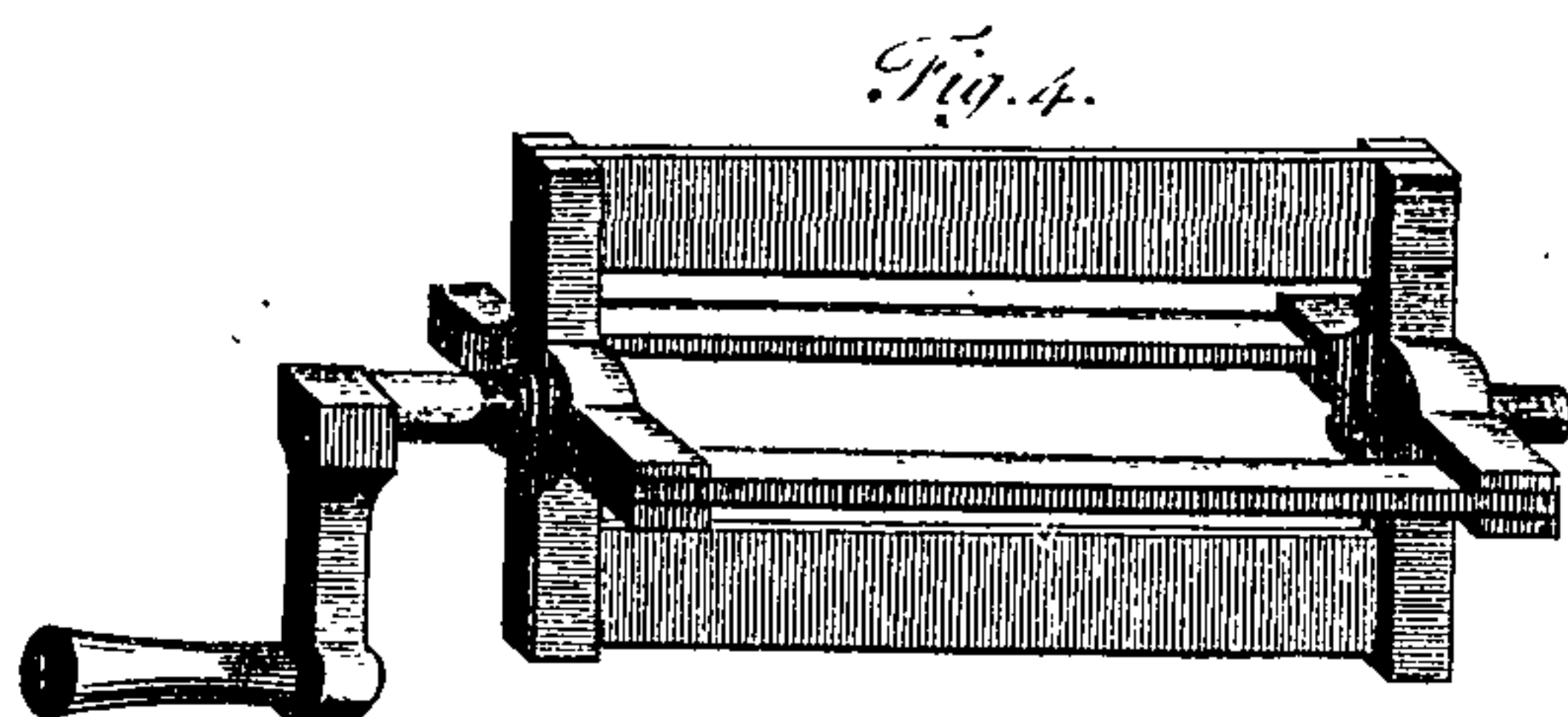
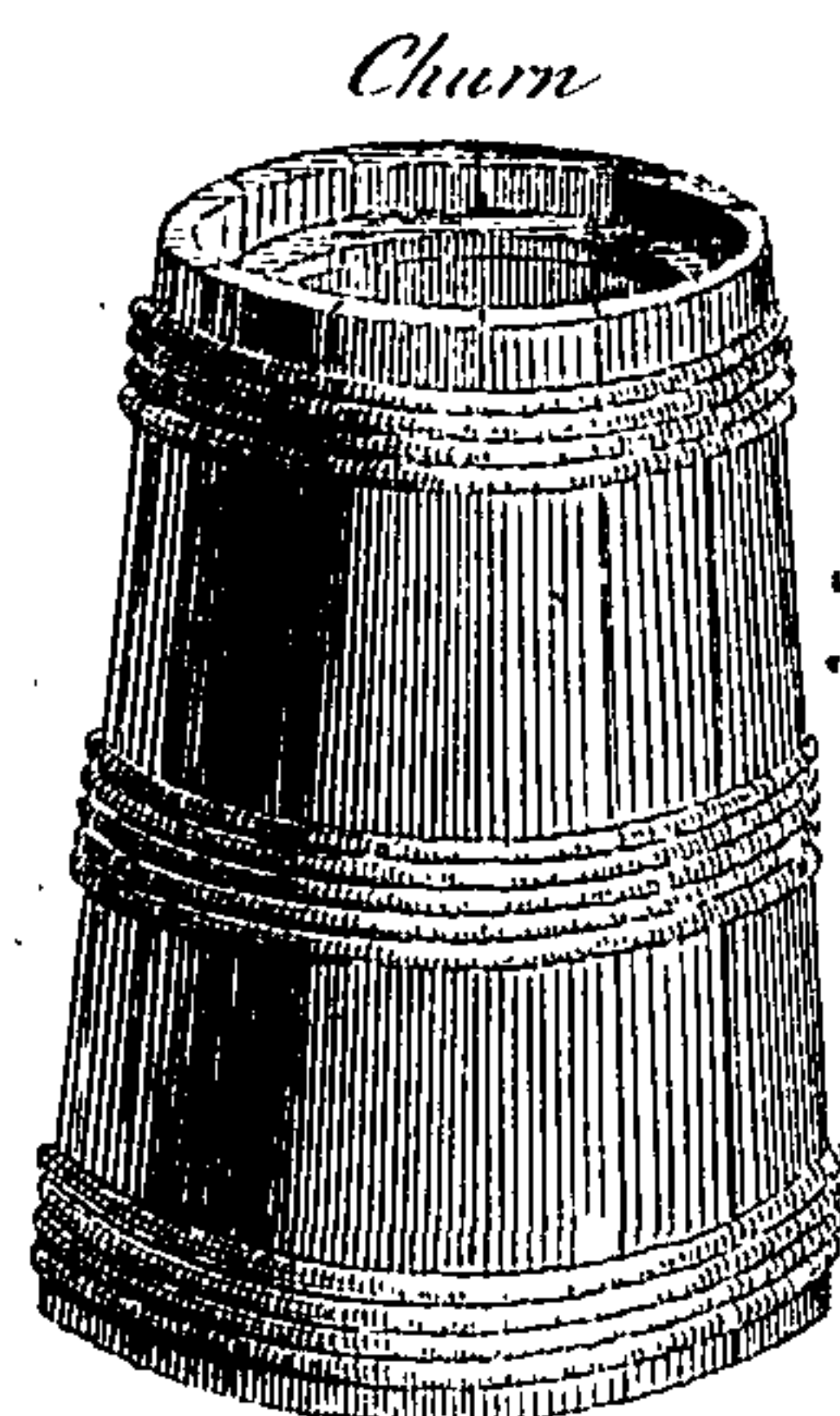
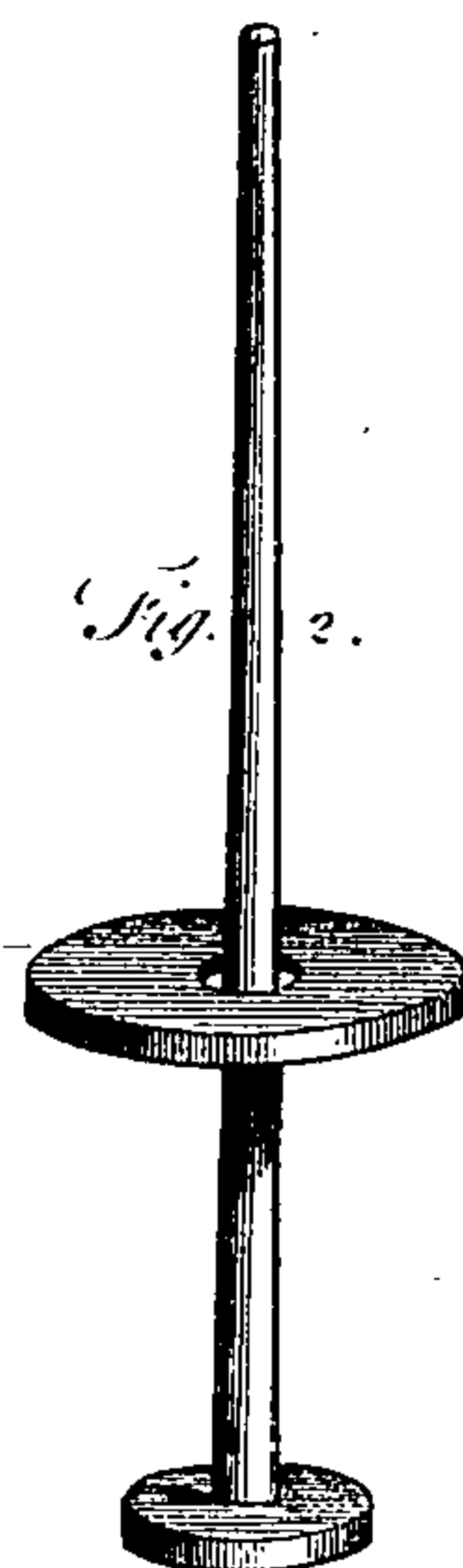
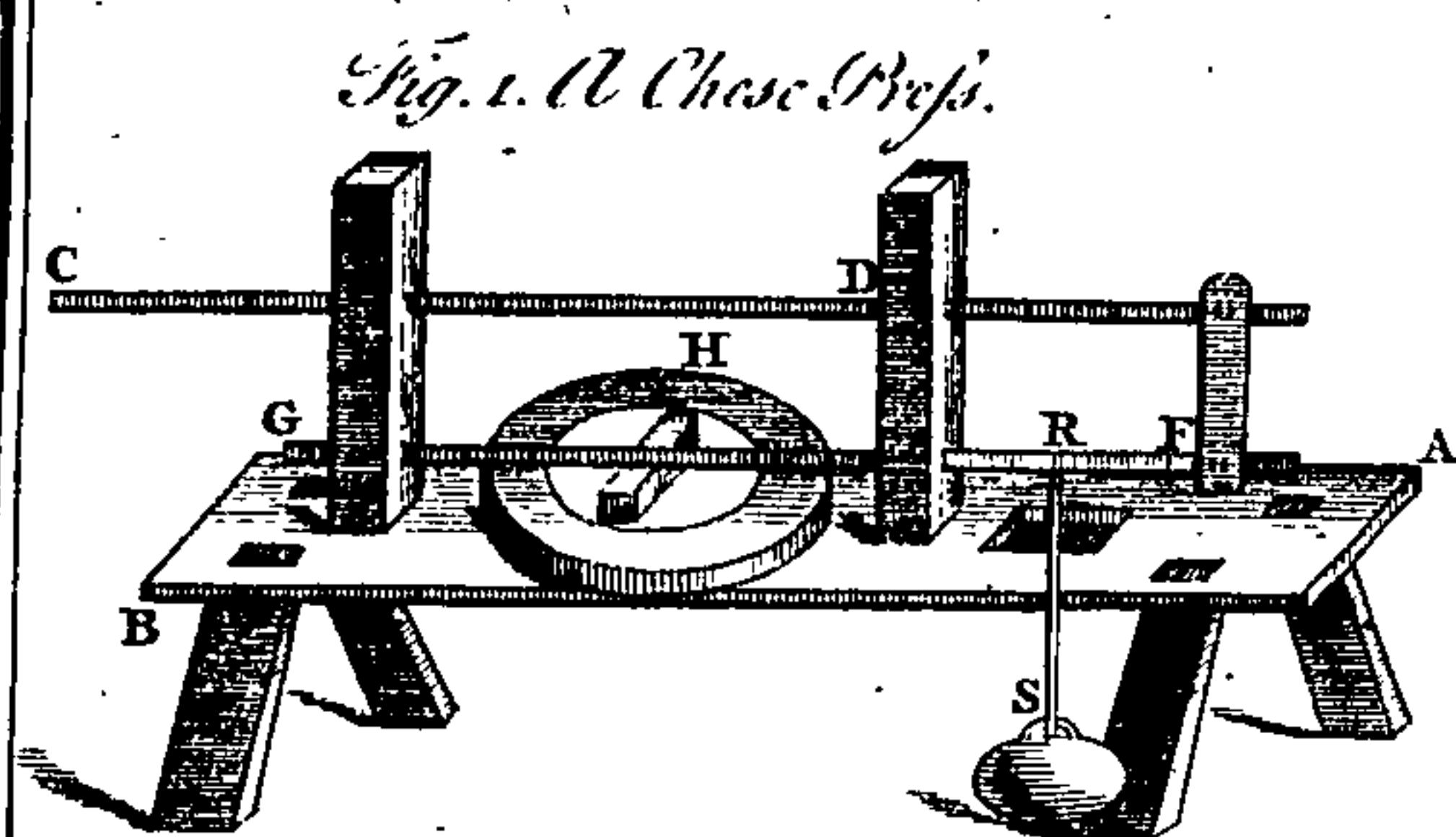
CULTUR, or rather *Coulter*, the piece of iron that cuts the earth before the plough-share. *See the article PLOUGH.*

CULTURE, the art of cultivating, improving, or meliorating the soil.

CULVER, a pigeon.

CURB, an iron chain fastened to the upper part of the branches of the bridle, in a part called the eye, and running over the beard of the horse.

CURN, is also the name of a disease of horses, consisting in a swelling at the junctures of the bones of the hind part



A. Hattori, compiler.

part of the hock, forming a pretty large tumour over the back part of the hind leg, attended with stiffness, and sometimes with pain and lameness.

A curb proceeds from hard riding, strains, blows, or kicks. The cure at first is in general easily enough effected by blistering, repeated two or three times, or even oftener. If it does not submit to this treatment, but grows excessive hard, the quickest and surest way is to fire with a thin iron, making a line down the middle from top to bottom, and drawing several lines in a pennyform manner, pretty deep; and then to apply a mild blistering plaister or ointment over it. This method will entirely remove it. *Bartlett's Farriery*, p. 262.

CURRY-COMB, an iron instrument full of small teeth, used for currying horses.

CUSPATED flowers, those whose petals or flower-leaves end in a point.

CUTTING-BOX, a machine for cutting fodder; as straw, hay, haum, &c. into small pieces, commonly called chaff, for the use of cattle.

We have given, on plate VI. fig. II. a cut taken from the *Museum Rusticum*, Vol. VI. page 10, of an improved cutting-box. The improvement consists in what the inventor calls a presser, which is a piece of wood as long as the box is wide, with three iron tongues in it, like those of a hay-fork. These tongues are put into the bundle of hay or straw to be cut; and by means of a rope fixed thereto, and extending under the box, the presser is forced down by the left foot of the cutter, and consequently the bundle kept tight. By this means the chaff is cut with great ease; and, after every cut, the operator rises his left-foot, pushes his sheaf or bundle forward with his left-hand, then presses it down again with his foot and takes another cut. In this manner, he continues working, till the whole bundle is reduced to chaff.

This description will be very easily understood by inspecting the figure above referred to, where A is the presser, B a large knot at the end of the rope, which fastens it to the presser. C the rope, D F the slit in which the rope moves, as the cutter pushes the bundle forward. E the loop in which the cutter puts his left-foot. F the box to contain the hay, straw, &c. The knife is not delineated in this figure, as the manner of placing it is sufficiently known.

A correspondent of the editors of the *Museum Rusticum* tells us, that he never gives his horses any pure corn, but always makes use of his cutting box, in which his servants cut his horse-meat, which consists of unthreshed oats, tares, pease, or beans. They cut off the heads where the corn lies, and take besides a cut or two of the straw to mix with it. This he gives to his horses instead of corn, it being a very nourishing food, and of which they are very fond. Nor is there any danger of their being surfeited with it, which they often are with pure corn; many of their disorders arising from their being over-fed.

I cannot, continues he, enough commend the use of a cutting-box, though I am persuaded the ploughmen will endeavour to prepossess their masters against it, because the cutting of the horse-meat is pretty tough work, and they do not, in general, love to do more than they can help.

When oats, beans, pease, or tares, are intended to be thus cut for horse-meat, it is best to mow them before they are quite ripe, as by that means fewer of them will be lost by shaling, and the straw, or stalks, will be of a better quality, and more nourishing for the cattle.

Care must, however, be taken that the crop be well dried before it is housed, lest it heat in the mow and take damage, if not set the barn, or stack, on fire. *Museum Rusticum*, Vol. I. p. 258.

Mr. Marshall, in his *Rural Economy of the Midland Counties*, under the head of barn-management, says, "Chaff-cutting, as it is pretty generally termed, but here provincially 'straw cutting,'—is in great use. Not, however, the ordinary practice of cutting hay and straw into what is, in most places, called chaff or cut-chaff, but, here, more properly 'cutmeat;' but by reducing oats, in straw, into this species of fodder; which is given, not to horses only, but to cattle; especially fattening cattle. It is thought to give, not only fatness, but a fineness of skin, to all sorts of stock.

"The chaff-box made use of, here, is of a peculiar construction. It unites, in some measure, the old single-hand machine, and the modern one with a wheel of blades.

This, in use here, has a long upright knife; but feeds itself; by which means the cutter has both hands at liberty; for the knife. It is made at or near Birmingham, and sold at most of the market towns of the district. It is, however, somewhat complex; and fitter for a man who makes a business of 'straw cutting,' than for a farmer's servant.

"The price of cutting, three farthings a heaped bushel; but it is cut extraordinarily fine."

CYDER, or *Cider*, a liquor made from the juice of apples, expressed and fermented.

A Herefordshire planter has given us the following method of making cyder in that county, which has been so famous for this liquor.

"The worse, says he, the apple is for the table, the better it is, in general, esteemed for cyder, such as grow all over this country, and are, in a manner, wild, harsh, and crabbed to the taste. These go under various names, as the redstreak, the white and green musts, the gennet-moyl, the stocking apple, the summer and winter fillets, &c. &c. of all which I prefer the first, provided it is a good sort, which is not always the case, particularly in some parts of Worcester and Gloucestershire, where they grow in great plenty.

"I have long laid down from experience, the best mistress; that, first, the more red an apple is in its rind, the fitter it is for cyder; that is to say, if it is at all fit; for I have seen an apple of a very deep red, by some called sopsy-wine, quasi sopped in wine, which was worth nothing for this purpose.

"Secondly, that the paler the rind, the worse the juice.

"Thirdly, I have found it a maxim, in general true, that a sweet apple with a tough rind will always yield a good vinous liquor.

"Forthly, The more yellow the flesh of the fruit, the better and finer coloured will the cyder be.

"The few maxims, not too scrupulously adhered to, have been of great service to me in life; for though I have a high opinion of them, I do not absolutely rely on them. There is no rule so general, but an exception may be made to it; but a man of reflection, with a few well-founded rules, will seldom be at a loss how to act in this, or in any other case.

"I seldom suffer my apples to be gathered till they begin of themselves to drop from the trees; nature then tells me they have, for the most part, acquired a proper degree of maturity.

"Great care is taken in the gathering of them, for fear they should be bruised in the operation; and this I have always found a very necessary precaution.

"As they are gathered, I have them sorted, according to the several degrees of ripeness they are of, making, in general, three sorts, which a little experience easily teaches to separate properly, the difference being apparent enough at first sight.

"As fast as they are gathered and sorted, they are carried under a shed prepared for that purpose, and laid in large heaps to meliorate: this practice I cannot enough recommend, as being of great service to the liquor, improving its quality, and making it keep, without comparison, better; and all this is caused by a little sweating in the heap.

"Yet, good as this practice may be, some avaricious planters cannot be induced to adopt it, because, say they, the apples fresh from the tree will yield better; as, of these last, about twenty bushels will give a hoghead of cyder; whereas, of the other apples, which have been heaped, it will take about twenty-five to make the same quantity.

"I suffer my apples to lie in the heap a longer or a shorter time, according to the nature of them, such as are harsh and solid requiring to lie longer, by several days, than those that are mellow and pulpy; and the degree of maturity the apples had attained before they were heaped, makes also some difference in this respect.

"I have already observed, that I divide my fruit into three several sorts, according to the state of its maturity: I have now to add, that, from these three sortings, I have no less than six several kinds of cyder, each different from the other in taste, flavour, and quality.

"As fast as the fruit is ground (I need not, I think, mention that I used the ripest first) the pulp is put into a large vat near the press: at the bottom of the vat is a tap, through which a considerable quantity of the prime vinous

juice will run without any pressing, induced by its own weight only: this produces my best cyder; and I always tun it up by itself: the pulp is afterwards pressed in the usual way. The same process is used in all the three sortings of apples; by which means I get, as I said before, six sorts of cyder.

"The first runnings from the vat I immediately put into the vessels in which it is to remain; only, if it happens, by any accident, to be too foul, I strain it first. I allow here but a small vent-hole, and when it has done working, I fill the vessel with some of the same liquor reserved for that purpose: I afterwards, by degrees, close the vent till it is finally and well-stopped.

"As to the juice, which undergoes the action of the press, I put this, as soon as it runs off, into vessels, where I suffer it to remain about thirty hours, according to the season, till the fæces are precipitated, or fallen to the bottom; after which I draw it off, and tun it up in the vessels in which it is to remain, with the precautions however, above-mentioned, when I treated of the first runnings.

"The kind of vessels I use, and which I think by far best, are upright hogsheds, broader at the upper head than at the bottom; and I often, after my cyder has done fermenting, cast two or three handfulls of wheat-bran into each vessel, which serves to thicken the head or cream of the liquor, and makes it keep better.

"I am very careful with respect to the vessels into which I put my cyder, always avoiding new ones, if possible, as they give the liquor a twang, or bad taste, and hurt its colour; my usual way is, to season all my new casks, that I possibly can, with small beer, which I use in common in my family, though I live in a cyder county; and if I have not an opportunity of doing this, I scald them with water, in which a considerable quantity of apple-pulp has been boiled.

"If a vessel is not sweet, it may easily be cured, unless very bad indeed, by putting some unslacked lime into it, adding some cold water, stopping it close, and rolling it about till the noise within is no longer heard.

"I have often found it of great use towards enlivening the liquor, to slice about a dozen sweet apples into a hoghead: I am also inclined to think it makes it keep better.

"The best cyder I ever had was a few years ago, when I put in each hoghead about three quarts of good wheat, first boiled and hulled, so as to have, in some measure, the appearance of boiled rice.

"When I am obliged to put any cyder into a cask I suspect, and afterwards discover it has given the liquor a bad taste, I cause some mustard-seed to be ground in a quern with some cyder: this mixture, being put into the hoghead, is often of great service, and restores it to its original good taste.

"Cyder, when it is tunned, is very apt to lose that fine mild spirit which renders it so pleasant and brisk a liquor; therefore great caution should be used with respect to the vent. The wild, furious, and ungovernable spirit should be suffered to escape; which may easily be effected by leaving a small vent open for a few days; after which the barrel must be close stopped, for if it gets any vent, the liquor will stand a great chance of being entirely spoiled; on the contrary, if well bunged, though it may be dead and flat at first, it will soon recover itself, mature, and be fit for drinking. This particular part of the management of cyder is critical, and depends greatly on the temperature of the air, so that it is impossible to give any absolute directions about it, as something must still be left to be learned by experience, and governed by discretion.

"I must give one particular piece of advice to such as intend making cyder, which is, that they diligently watch the alterations in it upon every change of weather, as a small neglect, at such times, is often fatal to many hogsheds, and the danger is much greater in summer than in winter. There is scarcely any disease incident to this liquor, but what may easily be cured by a timely application: if it is only a little inclined to tartness, wheat, managed as above-mentioned, will cure it; and the same thing is also very good to preserve it, when it is drawn out of one cask into another: the quantity when the liquor is tart is about half a peck to a hoghead; I have sometimes even put a quart more.

"This simple remedy will, I say, often cure the tartness I mentioned; but sometimes, when it is very thick and sourish, it may be necessary to raise a new fermentation, to

purge off the impurities, and make them subside: this may be soon done by bruising the flesh of a few apples to a pulp with some of the liquor, and putting the whole into the bung-hole of the vessel; this will raise a ferment, and cure the cyder: when that is over, it will be proper to draw it off into another cask; and it will also be a very useful precaution, to put into the last mentioned vessel about a quarter of a peck of wheat, prepared as I have already directed: this will give it new life and spirits, and make it keep better, and drink much pleasanter.

"I have sometimes also used another method to cure tart cyder; but it has not always succeeded with me; why, I cannot say, as some people who live not many miles from me, have great dependence on it. Something may depend on their soil differing from mine, though this may, to some of your readers, seem to have a very remote analogy to the case in hand. The remedy is, to break half a dozen new-laid eggs, and beat them up, shells and all, till they are brought to a frothy oil: this is put into the bung-hole of a hoghead, and, as I am credibly informed, sometimes proves a very efficacious remedy: it has succeeded with me, but not so often as to induce me to depend much upon it; I mention it, however, as it may prove of more efficacy with others than it has with me.

"An industrious planter will, by the constancy of his observations and remarks, always have it in his power to cure his own liquor by receipts of his own discovering; and for this purpose I would recommend, that he be continually making experiments, and that whatever trials he makes, be in various modes and proportions; for the remedy that may be of no service in one form, may possibly be very efficacious when altered with judgment, which judgment can only be acquired by experience and observation.

"It is to be noticed, that, if the cyder is acid, and at the same time clear, it is in a very dangerous state, being but rarely recovered: therefore, in general, when this is the case, the cure is scarcely worth attempting.

"I have often used wheat for the recovery of my cyder in other forms, sometimes putting about half a peck, underground, into a hoghead for it to feed on; at other times I have made dough of coarse meal with the bran in it, adding some leaven, using no salt, and putting warm cyder, or white wine, instead of water, in the mixture: this dough I make into lumps about as large as my fist, and thrust them into the bung-hole of the hoghead, the quantity being about half a peck of the meal to a hoghead.

"Many mix different kinds of spice with their liquor, particularly ginger, which they think of great service; but I never use it now, seldom having found any great effect resulting from it, and being of opinion that it renders the cyder more unwholesome than it can possibly in its own nature be; for though the ginger may not make any very sensible alteration in the immediate taste of the liquor, it must, I think, strongly impregnate it with its fiery particles, and thereby greatly irritate the mass of blood, and inflame the lungs of such as drink any quantities of liquor wherein it has been infused: others, however, may differ in opinion from me; I know, indeed, many that do so, therefore, I only declare my opinion. *Museum Rusticum*, vol. II. p. 37.

It is of great importance in the making of cyder, that the fruit be thoroughly ripe. The juices of unripe apples retain their harsh, sour taste, in spite of all endeavours, and never acquire that racy mellow flavour, which the sun only can bestow. Sweating together in a heap will, indeed, give them an artificial ripeness; but this is not equivalent for that which they receive from nature, which though it receives some assistance from the industry of man, can never be completely imitated by art.

It should, therefore, be the first care of every one concerned in the making of cyder, to let his apples hang upon the tree till they arrive at full maturity. But no certain time can be assigned for this: it varies with the nature of the fruit, and the circumstances of the season. Different apples have different times of ripening; and the same, according to the weather, change their time considerably from one year to another: but signs there always are sufficient to direct the husbandman. The brownness of the kernels, their rattling in the apple, the fragrant smell of the fruit itself, and its spontaneously falling from the tree in calm weather, are certain indications, which, in all kinds, may be depended on. It is, however, an useful caution in this, as in every other case, to err on the right-

side; and to let the apples hang too long, rather than too little. Summer fruit, indeed, will suffer by this method, grow pulpy, dry, and mealy, and afford little or no juice. In every other case the rule is good; and in the best fruits, most. The harsher kinds can hardly hang too long, for they daily mend upon the tree: their juices mellow, throw off their crude and watery parts; and consequently, as the crude juices lessen in quantity, the apples improve proportionably in quality. They may hang upon the tree as long as the weather can be expected to continue open: but severe frost should be most carefully avoided; because it destroys the texture of the fruit so much, that even cold water, the only remedy in such case, will not restore it to its former state: for as all fluids enlarge their dimensions when frozen, the containing vessels of all succulent substances must be thereby burst, and this has upon the fruit an effect similar to a bruise; or any other cause that destroys the vessels, whereby the extravasated liquors soon putrify. From this cause it is that the strongest forest trees are often rent asunder in very severe frosts.

When your apples are fit for gathering, it is essential to choose dry weather for that purpose, for water is a bad ingredient in all vinous liquors, and your fruit should therefore be guarded from it with peculiar care. The wet which adheres to the apples after rain or dew, or even the smaller quantity of moisture which they might contract by falling or lying upon grass, is sufficient to impoverish your cyder in a sensible degree. Gather your fruit therefore in the driest day, and in the driest part of it, when the dew is thoroughly exhaled; and, of choice, gather it by hand. This method may, perhaps, be troublesome and difficult in plantations of great extent, and where the trees are very tall: but wherever it can be used it is of great advantage, and certainly quits cost. You then can choose your apples, and leave upon the tree those which are not of a sufficient ripeness: you save your fruit from bruises, and your trees from the damage they frequently receive by violent unskilful shaking.

The gathering by hand is so essential, especially for winter fruit, which is to be sweated for a considerable time, that it should not by any means be dispensed with; because, as every wounded part of an apple will rot in the sweating, a very great loss must be occasioned, both in the quantity of the fruit; and in the longer time taken up in wiping and rubbing off every speck of rottenness upon each single apple. This last labour is indispensable; because, otherwise, the putrid taint would ever remain in the liquor. Those who plead the want of time, where a great quantity of fruit is to be pressed, may be answered, that it would be more to their advantage to have only half the quantity of good cyder than the whole of indifferent; and the gathering may certainly be expeditiously performed by means of step-ladders. The apples may be put into baskets, as they are gathered, and thereby preserved free from hurt, and the tree will not be injured, as the support of the ladders here recommended is independent of the tree. However, for those who will follow the contrary practice, the best method is to cover the ground under the trees with a sufficient thickness of straw to save the apples in their fall, and to lay blankets upon the straw; then, with an easy motion, to shake the boughs successively, removing, at every shaking, the apples already fallen, that they may not be bruised by the next. By these means all your apples are kept dry, and, for the most part, free from bruises; and with a little additional care you may also, in this method, separate the fruits according to their ripeness: for if you proceed regularly from bough to bough, and give each a gentle swing, the ripest will fall first, and the unripe remain upon the tree till more violent motion brings them down.

Windfalls, as they are generally termed, bruised apples, and those which have not been well ripened, should not by any means be mixed with the choice fruit: for if they are, it would be in vain to expect good cyder: the quantity of it indeed may be large, but it will always be proportionably bad. This fruit need not, however, be thrown away, excepting only that part of it where the bruise appears black and mouldy; for a very little of this would communicate an offensive taste to the whole liquor. The rest will make inferior kinds of cyder; and if care be taken that the windfalls do not lie too long upon the ground, and if keeping cyder be not expected from bruised apples, they will answer tolerably well: nay, Mr. Newburg tells us, in a letter subjoined to Mr. Evelyn's Pomona, that a neighbour of his assured him he had made a quantity of

very good cyder with windfalls, which he ripened by sweating them for about a month; that they were beaten off the tree earlier than the season when nature would otherwise have compleated their maturity; but that all the neighbours of this person, who pressed their untimely fruit as soon as it fell, had a crude, austere, indigested liquor, not worth the name of cyder.

The sweating of the apples has, however, been made a matter of some dispute. The writer of the twenty-fourth letter in the Dublin Society's Weekly Observations, disapproves of it for choice ripe fruit, and instances his having been informed of some curious gentlemen who carried their thoroughly ripe apples directly from the tree to the grinding mill, without any previous sweating; and obtained from them some of the best cyder they ever tasted. As to the winter fruits, he thinks it probable that the necessity of sweating them might be removed, by leaving them upon the trees somewhat longer than is necessary to ripen them; "no reason," (says he, without having perhaps sufficiently attended to the benefit which fruit receives from being discharged of its watery parts) "hitherto appearing to make us think that this fermentation by sweating serves any other use than to increase the degree of maturity which the fruit had acquired upon the tree—It is indeed possible," continues he, "that it may answer farther purposes, and dispose the fruit to an easier emission of its juices: and as our reasonings upon nature frequently lose their way, where experience does not guide them, it is from trials only that we can form a judgment to be depended on: recourse must therefore be had to actual experiments, which in this case are easy, and will certainly quit cost: for which ever way the question be determined, something must be found very well worth the knowing. Should sweating answer some purpose not to be attained upon the tree, it will, when once discovered, ascertain the nature, the use, and the degree of sweating: or should nothing of this kind appear, it will correct a practice, which, if it does no good, must certainly do mischief; since it is evident to common sense, that if maturity be all that is wanting, it is more perfectly and more naturally attained upon the tree." However, till this is determined by experience, it will be right to continue the practice of sweating every apple; for as to windfalls, and other hard and unripe fruit, it is out of dispute, that they are deprived of natural maturity; they must be assisted by art.

Upon the whole, there seems in this case one rule which may be allowed for all fruits, namely, to press their juice for fermenting at the time when the fruit itself is in the greatest perfection for eating. Experience teaches us, that there are few apples which do not require time for their being mellowed, before they attain to the highest flavour. The golden pippin, for example, is in its greatest perfection when kept till October; and in favourable years it will retain its flavour and juiciness even till Christmas, or longer. The nonpareil does not attain its chief excellence till near Christmas, and after that it continues in perfection several weeks. It is therefore during the time these apples continue in perfection that they are fittest to be pressed for cyder; and the same will doubtless hold good of the other sorts, none of which should be pressed before they have attained their highest flavour, nor after they have begun to lose it. A principal advantage accruing from the sweating of apples is, that the fruit is thereby deprived of the watery parts of its juice, which would only weaken the liquor; while its pulp yields a greater quantity of the enriched juice after it has been mellowed.

The material points to be observed in the sweating of apples are, that the fruits be separated according to their different degrees of ripeness, and that the floor on which they are laid be as dry as possible. The more strictly the former of these cautions is observed, the better it will be; and the more the fruit in every heap is alike in its maturity, the sooner the sweating will be over, and the less damage will accrue to the ripest and best apples in the heap. However, if care be taken not to mix any that are very ripe with others that are very green, the injury will not be great: but if this should be neglected, as it too frequently is, either the ripe apples will rot, or the green ones will remain unmellowed; and in either of these cases, the cyder will be considerably lessened in its value. Boarded floors will best answer the intention of the second caution, because they are driest; earthen floors, however, if covered some inches deep with wheat, rye, or oat straw, will do tolerably well. It is likewise essential, for the better preservation

vation of the apples, that they do not touch the walls or sides of the store-room in which they are laid to sweat. To heap them up in the orchard, or any where else upon the grass, or on an uncovered floor where the rains and dews have free access to them, is a sure way to make the cyder weak and watery, and frequently musty and ill-tasted.

Sweating being then undeniably necessary, at least for unripe, hard, and winter fruit, the husbandman, who makes a considerable quantity of cyder, will find a great convenience in having near his orchard a building, of which his mill and press should occupy the lower floor, and his apples be sweated in that above, from whence they may be conveyed into the mill by a proper trunk. The duration of the time of sweating is best determined by the smell of the fruit, that is, whenever it emits a full scent of the apples, they are fit for the press. Different kinds require different lengths of time, viz. from eight days, to six weeks. The harsher the apple is, the more time it wants.

Apples that have laid any time in heaps, are generally covered with a clammy moisture, proceeding from their sweating. This should be well wiped off; for it is a watery juice, which would impoverish the cyder; and at the same time every bruised and rotten part of the apple should be carefully cut out, and thrown away, and it should be cleared of its stalk; because the former would give a putrid taste, and the latter too much roughness, to the cyder.

The common practice is to carry immediately the apples from the heap where they have been sweated, to the mill, and then to grind them; but if we attend to the length of time during which they will remain in a succulent state after having been sweated, carefully wiped dry, and properly laid up in a place of preservation; we shall find, that if these directions are duly observed, the fruit will continue in a perfectly sound state, and fit to be made into cyder, till it may be convenient for the husbandman to press it: but before he does this, or rather before he sweats his apples, he should take care to sort them, or at least all the most valuable kinds, and particularly the fire, under-leaf, fox-whelp, and golden pippin, which hitherto have not been found to do so well in mixtures, as each of them does by itself.

The juice of the apples is obtained either by pounding the fruit in a trough, or grinding it in a mill. The former of these is least approved, because it is so tedious as to suit only small quantities, and the work is performed by it unequally, and with waste; much of the liquor being dashed out of the trough by the beating, and some of the apples being hardly broken, when others are reduced to a perfect pomice.

There are several engines used for grinding the apples; but one in particular, resembling a tanner's mill, is used in many parts of England. It consists of a circular trough in which apples are bruised by a large flat stone moved round upon its edge. This engine we have represented on Plate VI. fig. 8, where M is the stone set upon its edge; N, the spring-tree bar, or that to which the horse is fastened; P, Q, R, the circular trough in which the stone moves; T, L, V, compartments, or divisions for different sorts of apples.

When the apples are ground, some carry them directly to the press, but others empty them out of the trough into tubs, or large, wide, shallow vats. This work is done with most ease by broad wooden shovels: which should also be used to turn the pomice in the vats five or six times a day, to prevent any fermentation; the whole of this operation being chiefly intended to give the pomice a red colour, which afterwards heightens that of the cyder, and brings it to a deep, fine amber. This business is over in two days.

From these vats the pomice is carried directly to the presses, of which there are several kinds: we have given figures of two kinds on Plate VI, where fig. 9, is the small cyder press, by which the juice is pressed out of the pomice by means of a stone, or block of heavy wood, cut in the form of the frustrum of a cone, and moveable about the center. The pomice is spread upon the bed of the press, where a conical presser is turned round by means of a lever inserted upon its basis, by which means the juice is forced out, and conveyed by notches cut in the bed to the vessel, by means of a spout, and represented in the figure.

Fig. 10, is a large cyder-press, where A B is the base with its supporters. C, C, the cheeks, which are upright beams, whose lower extremities are sunk in the earth, where they are firmly fixed by cross-bars and masonry.

They are connected at the top by two beams, the lowermost of which contains the nut, or female screw. D is the screw with its wheel; below which is the bearer, or large piece of timber on which the force of the screw is exerted, in order to sink the beams crossing the planks that cover the pomice or cheese, as it is then called. G, G, are the planks on which the pomice is deposited in hair bags, in order to be squeezed: these planks are cut in notches to conduct the liquor to a vessel properly placed to receive it. The bed of this press is supported on a massive work of masonry. It is the wheel which forces down the screw and bearer upon the pomice laid in hair bags upon the bed of the press. This is done by turning the wheel H round; for by that motion the cord is wound round its axis, and by that means the wheel fixed on the bottom of the screw is turned round, and the bearer together, with the cross planks under it, are forced down upon the pomice, laid in bags upon the bed.

These bags hold about two or three bushels, or as much as the mill can grind at once; and these are heaped over each other till the press is full. The larger presses will hold from eight to fifteen bags, which yield from one to two hundred gallons of liquor, according to the largeness of the cheese. To perform the work neatly, it is necessary to have two sets of these bags, for they clog and fur in pressing, and, consequently, become unfit for use till they have been washed and dried; so that while this is doing, either the press must stand, or another set be ready to employ it.

Some, instead of hair-bags, lay long straw under the pomice, the ends of which they turn up over it; then cover the pomice entirely with fresh clean straw, upon which they spread another layer of pomice, and so on, alternately, till the press is full. Either of the above methods will do: but those who are desirous of doing the work in the neatest and best manner, generally use bags.

It is usual to dispose of all the liquor pressed out of the cheeses, the same way, and without distinction: but if the analogy holds, as it surely does, between cyder and other vinous liquors, this must be a considerable error. Experience has sufficiently shewn, that in making wines, there is a very great difference between the first yieldings of the grapes, and the juices which are afterwards extracted by hard pressings; and this difference is always in favour of the former; so that, if the same be true of cyder, the richest, and choicest kinds are lost, by an imprudent mixture of the whole.

It is an opinion generally received, and the writer of the letters in the Dublin Society's Weekly Observations, already mentioned, has adopted it; namely, that summer fruit do not make good cyder. "Summer fruit, or sweet apples, says he, afford only a weak, pert, windy juice, agreeable enough to the palate from its liveliness and tartness, but in a great degree unwholesome. It has no body, and therefore will not keep, and scarcely deserves the name of cyder." But sir Paul Neile, whose reasoning we shall give in his own words, judged very differently.

"I assert, says he, that the best apples will make the pleasanter, which in my opinion is the best, cyder; and I account those the best apples, whose juice is the pleasanter at that time when first pressed, before fermentation. I shall need, besides the experience of the last ten years, only to say, that it is an undeniable thing in all wines, that the pleasanter grapes make the richest and pleasanter wines, and that cyder is really but the wine of apples, and not only made by the same way of compression, but, left to itself, hath the same way of fermentation, and therefore must be liable to the same measures in the choice of the materials.

"This truth was not formerly owned, by reason that in Herefordshire, and those countries where they abound with pippins and hard apples of all sorts, they make cyder of both kinds and used them alike; that is, as soon as they had ground and pressed the apples and strained the liquor, they put it into their vessels, and there let it lie till it had worked, and afterwards was settled again and fined, as not thinking it wholesome to drink till it had thus, as they call it, purged itself; and this was the frequent custom of most men in the more southern and western parts of England also. Now, when cyder was thus managed, it is no wonder that when they came to broach it, they for the most part found their pippin cyder not so pleasant as their moyle or red-streak cyder; but to them it seemed a wonder, because they did

not know the reason of it, which I shall next explain: for till they knew the reason of this effect, they had no cause but to think it was the nature of the several apples that produced it; and consequently to prefer the hard apple cyder, and to use the other apples, which were good to eat raw, for the table, for which the hard apples were totally improper.

"To shew that, in Herefordshire, they knew not what was the true cause why their pippin-cyder was not, as they used it, so good as the cyder made of hard apples, I say, that for all liquors which are vinous, the cause that makes them sometimes harder or less pleasant to the taste, than they were at the first pressing, is the too much fermenting. If wine or cyder by any accidental cause do ferment twice, it will be harder than if it had fermented but once; and if it ferment thrice, it is harder and worse than if it had fermented but twice; and so onward, the oftener it ferments, and the longer it ferments, it still grows harder.

"According to the old method of making and putting up the cyder, they took little care to put up only the clear part of their liquor into their vessels or casks. Now pippins being a softer fruit, are in the mill bruised into smaller particles, than the harder sorts of apples; and consequently more of those small parts pass the strainer in the pippin cyder, than in the cyder of hard apples. This causeth a stronger fermentation, and, according to my former principle, a greater loss of the native sweetness, than in the hard apple cyder; and not only so, but the lee of the hard apple cyder being compounded of greater particles than the lee of the pippin cyder, every individual particle is in itself of a greater weight than the particles of the lee of the pippin cyder, and consequently less apt to rise upon small motions. When the fermentation of the hard apple cyder is once over, a second fermentation seldom happens, unless the vessels be stirred: but in pippin cyder it is otherwise; for if the gross lee be still remaining with the cyder, it needs not the motion of the vessel to cause a new fermentation; but every motion of the air, by a change of weather, will cause a new fermentation, and consequently make it work till it hath destroyed itself by losing its native sweetness. This alone hath been the cause why commonly when they broach their pippin cyder, they find it so unpleasant.

"What first gave me the hint of this, is that in divers parts they make three sorts of wine out of one and the same grapes; that is, they first take the juice of the grapes without any more pressing than what comes from their own weight, and the bruising they receive when put into the vat; which causeth the ripest of these grapes to break, and the juice, without any pressing at all, makes the pleasantest and most delicate wine. The second sort they press a little, which makes a wine neither so pleasant as the first, nor so harsh as the last, which is made by the utmost pressing of the very skins of the grapes, and is, by much, more harsh than either of the other two. Now I presume the cause of this at least in part, to be, that in the first sort of wine, which hath little of the substance, besides the very juice of the grape, there is little lee, and consequently little fermentation; and because it doth not work long, it loses but little of its original sweetness. The second sort, being a little more pressed, hath somewhat more of the substance of the grape added to the juice, and therefore, having in it more of that part which causes fermentation, ferments more strongly, and is therefore, when it hath done working, less pleasant than the first sort, which worked less. For the same reason the third sort, being most of all pressed, hath most of the substance of the grape mingled with the liquor, and worketh the longest: but at the end of the working, when it has settled and is clear, it is much more harsh than either of the two first sorts. The thought of this made me first apprehend, that the substance of the apple mingled with the juice, was the cause of fermentation, which is really nothing else but an endeavour of the liquor to free itself from these heterogeneous parts which are mixed with it: and when there is the greatest portion of those dissimilar parts mingled with the liquor, the endeavour of nature must be stronger, and take up the more time to perfect the separation, which, when finished, leaves all the liquor clear, and the gross parts called the lee, settled to the bottom of the vessel. Nor did this apprehension deceive me: for when I began to separate a considerable part of the lee

from the cyder before it had fermented, I found it to retain a very great part of its original sweetness; more than it would have done if the lee had not been taken away before the fermentation; and this not once, but constantly for seven years.

"The method which I used was this: when the cyder was first strained, I put it into a great vat, and there let it stand twenty-four hours at least, but sometimes more; if the apples were more ripe than ordinary: then, at a tap, before prepared in the vessel, three or four inches from the bottom, I drew it into pails, and from thence filled the hoghead, or lesser vessel, leaving the greatest part of the lee behind. During this time that the cyder stood in the vat, I kept it as close covered with hair-cloths, or sacks, as I could; that so too much of the spirits might not evaporate.

"Now possibly I might be asked why I did not, since I kept it so close in the vat, put it at first in the vessel: to which I answer, that had I put it at first into the vessel, it would possibly, especially if the weather had chanced to prove wet and warm, have begun to ferment before that time had been expired; and then there would have been no possibility to separate any part of the gross lee, before the fermentation had been wholly finished; which keeping it only covered with these cloths was not in danger: for though I kept it warm in some degree, yet some of the spirits had still liberty to evaporate; which had it been in the hoghead with the bung only open, they would not freely have done; but in the first twenty-four hours it would have begun to ferment, and so my design had been fully lost: for those spirits, if they had been too strongly reverberated into the liquor, would have caused a fermentation before I could have taken away any part of the gross lee. The great mystery of the whole lies in this; to let so many of the spirits evaporate, that the liquor shall not ferment before the gross lee be taken away: and yet to keep spirits enough to cause a fermentation when you would have it; for if you put it up as soon as it is strained, and do not let some of the spirits evaporate, but suffer the gross lee to be separated by its own weight only, without fermentation, it will ferment too much, and lose its sweetness; whilst on the other hand, if none be left, it will not ferment at all, and then the cyder will be dead, flat, and sour."

Experience taught sir Paul, that it was necessary to delay the fermentation till late, or till the cold weather had come in, as he informs us, when he says, "It is necessary that the apples have a little time to sweat in the house before the cyder is made; but not too much: for if they be not full ripe before they are gathered, and not suffered to lie a while in the heap, the cyder will not be so pleasant; and if they be too ripe when they are gathered, or lie too long in the heap, it will be very difficult to separate the cyder from the gross lee before the fermentation begins; and in that case it will work so long, that when it fines, the cyder will be hard: for when the apples are too mellow, they will break into such small particles, that it will be long before the lee settles by its own weight only; and then the fermentation may begin before it be separated, and so destroy your intention of taking away the gross lee. And if the apples be not mellow enough, the cyder will not be so pleasant as it ought to be."

To the cause above assigned by sir Paul Neile for the liquors fermenting too much, another may be added; namely, that as the summer fruits are fermented earlier than the hard apples, the warmth of the weather hurries the fermentation on too fast, and by this means renders the liquor much less palatable: or it may even hurry it beyond the vinous state, till the acetous fermentation begins. The sweetness of the summer fruits make them likewise more liable to ferment too much; whereas, the sour roughness of hard apples retards that operation, and makes a longer time necessary to perfect the vinous fermentation. These causes render it necessary that great care be taken in preparing the juice as directed by sir Paul, and that there be a cellar in which the heat is suited to carry on as slow a fermentation as possible. If the maker of the cyder is not provided with such a cellar, the juice of the apples may be buried in cold spring water, as before mentioned, and be kept there till the temperature of the weather becomes fit for its being fermented.

"What has been said of the time for making the pippin cyder, may, adds sir Paul Neile, with due allowances, for the nature of the apples, serve for all other summer fruit; as the Kentish-codlin, marigold, gilly-flowers, summer-pearmain, summer-pippins, Holland-pippins, go den-pippins,

pippins, and even winter-pearmain. For though they must not be made at the same time of the year, yet they must be made at the time when each respective fruit is in the condition before directed for the pippin: Nay, even in the making of that cyder, you are not tied precisely to that particular time, but, as the condition of the year hath been, you may make your cyder one, two, three, or four weeks later."

When the pressing of the apples is finished, the most careful makers of cyder strain their liquor through a hair sieve, to separate from it the coarsest dregs; which is a practice every way adviseable. It must then be left to itself, till it has undergone the necessary fermentation, and deposited its grosser lees. To this purpose some put it immediately into hogheads, others into large tubs or vats, and the most curious into a vessel intended for that very use, wide at top, and growing narrower all the way down to the bottom, near which is a tap to draw off the liquor. This vessel is fixed upon a stand, or stilling, and frequently contains from five to twenty hogheads. In these vessels the heavier lees subside, and the lighter form at top a crust, which by its sinking, afterwards, gives timely notice that the ferment is gone off, and that the liquor is fit for racking. Some gentlemen, who spare no pains to make their cyder as fine as possible, think that the excellence of the liquor depends greatly on catching the very instant when this crust breaks; and in order to be sure of it, they set a person to watch and give immediate notice of the crack or noise which the crust makes in breaking. They hold this to be the critical time for racking off the liquor, and maintain, that so much of its spirit is evaporated very speedily after, as to render the cyder irrecoverably vapid. This, therefore, should be carefully attended to; and upon the first appearance of the crust's falling, the cyder, which is then become tolerably fine, should be drawn off the grosser lees, and turned into the hogheads. The usual time taken up in this primary fermentation is from thirty-six to forty-eight hours; more or less, according to the weather. Some affirm that they have had good cyder by turning it directly from the press, without any other caution than leaving room for the liquor to ferment in the hoghead, where it remains from first to last: but this method is liable to many hazards, and successful, where it has been so, only in favourable seasons. The gross lees are apt to rise on every considerable change of weather, and when they do, they set the cyder on the fret, which, should it do no worse, certainly robs it of its spirit, and, when over, leaves it flat and vapid. Besides, repeated experiments have proved, that sourness in all fermented liquors begins even at the lees, and therefore the more of them is left among the cyder, the more readily it will turn eager.

Here I must observe, that a most important precaution is too often overlooked by many of those who make cyder of winter fruits; for that a sufficient warmth of the air is as essential to ferment the rough juices of hard apples, as it is dangerous to suffer the heat to be too great in the fermenting of cyder made of summer fruits. If the weather is very cold when the hard apples are pressed, the help of fires should be recurred to; or if that has been neglected, or could not be conveniently used, it will be right to carry the cyder to a place warmed considerably by the sun for a short time, in the summer, and there to place it out of the immediate reach of the rays of the sun. The bung of the cask must be loosened, because there will arise a degree of fermentation, which will attenuate any viscosity not overcome by the first fermentation. Great care must be taken that this fermentation be not carried beyond the nice point of correcting the rough raw taste of the fruit: for if it goes farther, the liquor will either become vapid, or turn to vinegar. As soon as the desired point is obtained, the liquor should be racked off, especially if much feculence has sunk to the bottom, and it should then be carried down into the vault, where it may be preserved long in perfection.

The choice of proper vessels to keep the cyder in after it has fermented is very material; no liquor being so apt as this to take the taste or twang of cask. New vessels, tho' the wood be ever so well seasoned, generally give a disagreeable relish to all liquors, and will do so remarkably to cyder, unless due caution be used before hand. Frequent scalding with hot water, into which some handfuls of salt have been first thrown, or with water in which some of the pomice has been boiled, and washing afterwards with cyder, are the usual remedies against this evil, and seldom fail of removing it effectually. Of old casks, beer vessels are the worst; they always spoil cyder, as, in return, cyder casks infallibly spoil

beer. Canary and brandy casks do well, and all wine vessels tolerably; for, provided the tartar adhering to their sides be carefully scraped off, and they well scalded, there is no danger in using them. The best way of scalding them, is to boil a parcel of dried wormwood in water, and with that and a brush of the same plant to rub and scour their insides. This will correct the acid of the tartar; and so will likewise all vegetable ashes used in the same manner. Those who advise fumigating the casks with brimstone, confidently affirm that the cyder becomes stronger, and keeps better, when the vessels have been thus prepared, and for this reason they tun immediately after the operation, and before the smoke evaporates. To enable such as may choose to examine, by fair trials, how far this is true in fact, I shall here add the neatest method of performance. Melt a pennyworth of brimstone, and dip in it a piece of new cloth, or of canvass, till all the brimstone is imbibed, and the cloth or canvass looks like a piece of searcloth: then roll it close, tie it, and with a wire suspend it at the bung, three parts in four within the vessel; light it, and let it burn till it is ready to fall into the cask, then take it out, and tun without delay. Some add a little powdered cinnamon, cloves, pepper, or other spice to the brimstone for fumigating, but I see no great reason for their so doing.

The best shaped vessels for keeping cyder in are, as advised by captain Syllas Taylor, in a letter subjoined to Mr. Evelyn's Pomona, and by Mr. Worlidge, those of which the barrel-boards are strait, the vessel broader at one end than the other, and standing on the lesser end, with the bung hole in the top. The advantage of this form is, that in the drawing of the cyder, though but slowly, the skin or cream contracted by its fermentation (as is the case of all strong liquors) descends, and covers the liquor by means of the tapering of the vessel, and thereby preserves to the last the spirits of the cyder, which would otherwise evaporate and waste. A little wheaten-bran cast in after the fermentation, thickens this coat or cream of the liquor, and thereby conduces much to its preservation.

We come now to a point of great importance, and hitherto of as great uncertainty, which has raised among the curious a controversy of long standing, and not likely to be brought to a speedy decision, without a course of regular experiments. Some maintain that continued fermentation and frequent racking, certainly spoil the cyder; whilst others assert, that it can never be good without them. Some rack once, some twice, and others whenever the liquor frets. Some look upon the lees as the food and nourishment of cyder; others as a cause at hand, upon every change of weather, to set it on the fret, and turn it sour. Every man has a system of his own, and a peculiar practice consequent thereon; and so great is the variety of methods, that nothing certain can be drawn from them but this one general conclusion, that we are still at guess work, and must be obliged to future trials for any rules that can be thoroughly depended on. I shall therefore here relate the several ways now in use, and then give my own general opinion of this matter; but I strongly recommend the making of accurate experiments on each.

One method is, to leave the cyder in the vats some days longer than was before advised, and till it fines in a greater measure: then to tun it into hogheads, where it is to remain without any farther racking. Those who recommend this practice say, that their cyder is thereby rendered the stronger and mellow: and those who object to it reply, that lying on the grosser lees, which cannot all be fallen in the vats, it must be apt to fret, turn sour, and, in unsettled weather, eager.

A second and more common method is, a fortnight after tunning, to rack into other hogheads. There the cyder undergoes a second gentle fermentation, and while this lasts, the bung must be left open; afterwards, when the fermentation lessens, covered only with a wet cloth, or a tile; and when it is quite over, stopped down close with well tempered clay, kept moist to prevent its cracking, by strewing over it a handful of bay-salt.

To this second racking others add a third in March or April, when the lees have thoroughly subsided. This again is followed by a little fermentation, and for that reason chiefly it is objected to by those who think every fermentation hurtful which is not strictly necessary.

Others, on the contrary, and particularly those of Devonshire, where the strongest cyders are made, look upon a thorough fermentation as the great secret to have their cyder fine, light, and free from dregs, and accordingly they not

only approve of the above last mentioned method, but proceed much farther, as follows :

At first running they do not fill their hogheads to the bung, but leave an empty space to receive a pailful of fresh cyder from the press : this renews or increases the fermentation, and sets the whole on working with some violence. The froth which rises at the bung is carefully skimmed off, and the waste of liquor thus occasioned is constantly replenished with unfermented cyder. By these means the whole is kept from the fret for a considerable time : for it is not uncommon to have cyder thus managed working for a fortnight. A month after this operation, and the stopping of the vessels, the cyder is racked, and, generally speaking, in two months more, a second time : and if it frets, which however is said seldom to happen in this method, it is racked off a third and a fourth time.

To make a proper choice among the several above recited methods, they should be tried together, with the same fruit of equal ripeness ; the cyders should be kept to the same age, and their different qualities should be attentively observed. Just information cannot be obtained in any other way : for the want of accuracy and exactness will render the experiment fruitless and insignificant. Every one will tell you, that his method affords good cyder : but this general expression gives no determinate idea, and forwards knowledge very little. Would gentlemen be at the trouble to keep notes, and minute down all the differences observable in the same cyders under different managements, it might soon be known what method gives the strongest, which the neatest, the roughest, mellowest, or lightest cyders : and every one might then pursue, as his taste or interest should direct, that which would answer best : but till something of this kind be done, only very slow and inconsiderable improvements can be expected.

In the mean time I must observe, in general, that whenever the lees of cyder are in such quantity as that the liquor cannot preserve them from a tendency to putrefaction, as must be the case with the first, and generally the second lees, it is certainly advisable to rack off the liquor ; and that, if the cyder is kept in a place not subject to the various changes of the weather, the little fermentations raised by racking cannot be attended with any great danger, nor will the frettings return. But as to the frequently repeated fermentations which are said to be, of choice, the practice of the makers of cyder in Devonshire, they surely are by no means advisable.

The few points which experience has hitherto determined in regard to the making of cyder are, that weak cyder cannot bear above one or two rackings without too great a loss of spirits ; that strong cyder made of winter apples will stand several rackings, and thereby grow mellow, and be the sooner fit for drinking ; that the more the liquor is fermented, the rougher it will grow ; that fermentation is no other way so well promoted, as by putting into the hoghead, from time to time, some of the liquor fresh drawn from the press : and lastly, that to have a rich, racy, palatable cyder, a little inclining to the sweet, great care must be taken to prevent all future fermentation after the liquor is once become fine. If it should be foul, isinglass will help to fine it, by precipitating the flying lees.

In general, the cyder that is longest in fining is the strongest and most lasting, if it has been made of thoroughly ripe fruit : but, as was before observed in the article of wines, all liquors will be much longer in clearing in mild moist weather, than in cold dry weather, or frost.

When the bung-hole of the vessel is closed up, a small vent-hole should be left open, or but loosely stopped with a peg, for several days, till the wild spirit of the liquor be spent ; for otherwise it will break the cask, or find some other vent, which, though but small, will always abide open, and prove the ruin of the cyder. Many have spoiled their cyder by this only neglect, and never apprehended the cause thereof. After this wild spirit is spent, the vent-hole, as well as the bung, should be stopped quite close ; and then the cyder, though seemingly flatish at first, will soon improve, and become brisk and pleasant.

Deadness or flatness in cyder, if occasioned by a too free admission of air into the vessel, for want of right stopping is remedied by grinding a small parcel of apples, and putting them into the cask, which should then be stopped up close : but care must also be taken to open the vent sometimes, or the vessel will be in danger of bursting. The liquor thus managed must likewise be drawn off in a few

days, either into bottles, or into another cask, lest the muck should corrupt the whole mass ; to prevent which some put in only the juice of the newly pressed apples. The same may be done to flat bottled cyder, by adding about a spoonful or two of new must to each bottle of the dead liquor, and stopping it again. Cyder that is dead or flat will often revive again of itself, if closely stopped, upon the revolution of the year, and the approach of summer : but cyder which has acquired a deadness or flatness by being kept in a beer vessel, cannot be revived again.

Thick cyder may be rendered clear and good by a second fermentation, or sometimes by only throwing into it two or three quite mellow apples. But cyder in which the acetous fermentation has taken place, can never be restored. If it be only a little sourish, or drawn off in another vessel, about a gallon of wheat (blanched is best) to a hoghead of cyder, and so in proportion for any other quantity, will both amend and preserve it : or if it is so sour that the wheat does not answer that purpose, it may be corrected by egg shells, powdered alabaster, &c.

Cyder which has contracted any ill flavour or taste from the vessel, or from any other cause, will be helped by the addition of a little mustard seed ground with some of the cyder.

Ginger accelerates the maturation of cyder, gives it more brisk spirits, helps fermentation, promotes its duration, and corrects its windiness.

When the juice is too thin or weak, it is a common and very advisable practice to give by art that strength which nature had not bestowed. To this end, raisins of the sun, or the lees of rich wines, are used with good success ; as is also sugar. Writers on this subject give various directions for the use of this ingredient : but it would be needless to repeat them here, as it is of very little importance in what manner it be done, the giving a body to the liquor being the only thing wanting, and this a proper quantity of sugar will effect, in whatever shape it is used. When the design is to colour the cyder, the sugar is boiled till it becomes brown, and then put into the cask.

Mr. Marshall, in his Rural Economy of Gloucestershire, having paid particular attention to this subject, and given such useful information to those concerned in this article, it would be doing him and the public injustice to withhold it. He says, " To adapt the register of this art to the public eye, and to render it as clear, yet full, as the nature of it requires, it will be necessary to describe, distinctly and minutely, its several stages. And previous to this detail of the art itself, it will be proper to take a view of its requisite apparatus.

" A mill house, on an orchard farm, is as necessary as a barn. It is generally one end of an out building : or, perhaps, an open shed, under which straw or small implements are occasionally laid up.

" The smallest dimensions, to render it any way convenient, are twenty-four feet by twenty ; with a floor thrown over it, at seven feet high ; with a door in the middle of the front, and a window opposite ; with the mill on one side, the press on the other side, of the window ; as much room being left in front, towards the door, for fruit and utensils, as the nature of the mill and the press will allow.

" The mill consists of a stone wheel, provincially a runner, somewhat in the shape of a corn millstone, running on its edge in a circular stone-trough, provincially, the chace.

" The size of the runner varies from two and a half to four and a half feet diameter, and from nine to twelve inches in thickness ; which, in general, is even like that of a grindstone : nor varying like that of a millstone : the weight one or two tons.

" The bottom of the chace is somewhat wider than the runner, that this may run freely. The inner side rises perpendicularly, but the outer side spreads, so as to make the top of the trough some six or eight inches wider than the bottom ; to give freedom to the runner, and room to scatter in the fruit, stir it up while grinding, and take out the ground matter. The depth nine or ten inches.

" The outer rim of the trough is three or four inches wide and the diameter of the inner circle, which the trough circumscribes, from four and a half to five feet ; according to the size of the mill.

" This is sometimes raised by a table of thick plant fixed upon the stone ; with a curb of wood, lessening to an angle fixed upon the circumference of the trough ; making the whole depth of the trough about equal to its width at the

bottom. This lessens the quantity of the stone ; and the plank upon the center answers a purpose hereafter to be noticed.

" The entire bed of a middle sized mill is about nine feet, some ten, and some few twelve feet diameter : the whole being composed of two, three, or four stones, cramped together as one ; and worked, or at least finished, after they are cramped together.

" The best stones are raised in the forest of Dean. They are mostly a dark reddish grit-stone (non-calcareous), working with sufficient freedom, yet sufficiently hard, for this intention. The bed of the mill is formed, and the trough partly hollowed, at the quarry ; leaving a few inches at the edge of each stone, uncut out, as a bond to prevent its breaking in carriage. Much depends on the quality of the stone. It ought not to be calcareous, in whole or in part, as the acid of the liquor would corrode it. Some of the Herefordshire stones have calcareous pebbles in them, which being of course dissolved, leave holes in the stone. Nor should it be such as will communicate a disagreeable tinge to the liquor. A clean-grained grindstone girt is the fittest for this purpose.

" The runner is moved by means of an axle passing through the center ; with a long arm, reaching without the bed of the mill, for a horse to draw by ; and with a short one passing to an upright swivel, turning upon a pivot, in the center of the stone ; and steadied at the top, by entering a bearing of the floor, above. An iron bolt, with a large head, passes through an eye, in the lower part of the swivel, into the end of the inner arm of the axis. Thus the requisite double motion is obtained, and the stone kept perfectly upright (which it ought to be) with great simplicity, and without stress to any part of the machine.

" This is the ordinary method of hanging the runner. There is a more complex way of doing it ; but I see no advantage arising from it. There are some few mills, it seems, with two runners, one opposite the other.

" On the inner arm of the axis, about a foot from the runner, is fixed (or ought to be, though it is frequently wanting) a cogged wheel working in a circle of cogs, fixed upon the bed of the mill. Their diameter of the wheel is determined by the height of the axis above the bed of the mill. The diameter of the ring of cogs, by the distance of the wheel from the center of motion. The use of these wheels is to prevent the runner from sliding ; to which it is liable, when the mill is full ; the matter, when nearly ground, rising up in a body before the stone. Besides, by assisting the rotatory motion of the stone, it renders the work more easy to the horse. These wheels require to be made with great exactness ; and in a country, where carpenters are unaccustomed to them, a mill-wright should be employed in fixing them.

" The situation of the mill is such as to leave a horse path, about three feet wide, between the bed and the walls ; so that a moderate-sized mill, with its horse path, takes up a space of fourteen or fifteen feet every way.

" The press is situated, as near the horse path, as convenience will allow, for the more easy conveyance of the ground materials, from the mill to the press.

" The principle of the press is that of the packing press and the common napkin press ; a skrew working within a square frame.

" The sizes of presses are various. The bed, or bottom, is about five feet square, of strong plank, or of stone, placed on sleepers, about a foot from the ground floor ; or raised on mason's work, to two or three feet high. On each side rises a strong upright cheek, provincially a sifter ; and across the top (the upper surface level with the chamber floor) lies a nut, or dimensions suitable to the size of the skrew, which is usually about ten inches in diameter. The foot of the skrew is square, with cross holes for inserting a lever ; or has a wheel fixed round it for that purpose. A sinker, provincially the bridge, is hung beneath it, and steadied by the cheeks, in the usual manner.

" The bed or floor of the press, which is now composed entirely of wood, or of stones, not of lead, has a channel cut a few inches within its outer edge, to catch the liquor as it is expressed, and convey it to a lip, formed by a projection on that side of the bed opposite to the mill ; under which lip a stone trough, or wooden vessel, is sunk within the ground (when the bed is fixed low), to receive it.

" The press is worked with levers of different lengths ; first, a short one ; next, one of a moderate size, by hand ;

and lastly, with a strong bar, eight or nine feet long, by means of a species of capstone, provincially a windlass ; an upright post, about six inches in diameter, with a pike or pivot at either end ; one of them being inserted in the ground floor, the other in a bearing of the chamber. From the upper part of this post passes a very strong rope, with an eye at the end to receive the end of the bar ; which has a cross pin, or a shoulder, a few inches from the end, to prevent the rope from slipping. In the lower part of the post, about three feet from the ground, is one or more holes, for a lever or levers. By these means an excessive purchase is obtained.

" The utensils belonging to a mill-house are few : the fruit is brought in carts or baskets, and the liquor carried out in pails. The haircloths, which will be mentioned, are the principal addition to the mill and press.

" The expence of fitting up a cyder-mill-house depends on the size and quality of the mill and press. One of a moderate size, for a farm, may be furnished, completely, for twenty to twenty-five pounds. One, on a small scale, might be furnished for ten to fifteen pounds : much depending on the distance of carriage of the stone.

" This expence is usually borne by the landlord.

" A mill-house substantially fitted up, will last many years. I have observed a mill and press which, by the date upon them, have been set up more than twenty years ; yet they appear almost as fresh as new. Many of the old mills and presses, which are seen, may, compared with these, seem to be a century old ; or, the mills, more particularly, a greater age ; and are probably the original mills of the farms they are upon.

" The general subject naturally separates into the following principal parts :

" The fruit and its management—grinding, and the management of the ground fruit—pressing, and the management of the residue—fermenting—correcting—laying up—bottling.

" of fruit, the particulars to be attended to in this first stage of the art, are,

" The time of gathering, the method of gathering, maturing the fruit, preparing it for the mill, and mixing different sorts for liquor.

" Time of gathering is varied by the season and the sort of fruit. The early pears are fit for the mill, in September. This year (1789) there was not, in the middle of October, a quash spear left in the country for a specimen.

" But there are few apples ready for gathering, provincially picking, before Michaelmas ; though the winds sometimes throw them down, in quantity, before that time. And this year, the drink houses having long been dry, apples were gathered by the time they were fully grown. Many trees were stripped, and their produce made into cyder and drank, before Michaelmas.

" For sale cyder, however, and for keeping drink, they are suffered to hang upon the trees, until they be fully ripe. This year, (a forward season), Herefordshire was in the height of fruit picking, the latter end of October. In the Vale of Gloucester, the store apple, a somewhat early fruit, was much of it shook down, by the high winds of September ; and many orchards were cleared of them before Michaelmas. But the middle of October, in a common season, esteemed the time of gathering the store apple.

" The criterion of a due degree of ripeness, is that of the fruit's falling spontaneously from the tree. Nature is the best judge of this crisis. No art has yet been discovered to mature unripe fruit, in any way equal to nature's process. Fruit, in all human probability, does not quit the tree (in an undisturbed state) until it has received its full complement of nourishment. But having obtained this (or presently afterward) it is probable, that the fruits, under consideration, are suffered to disengage themselves by their own specific gravity : consequently, to force them away, before that period, is defrauding them, in all human probability, of their most valuable particles.

" The harvesting of fruit is widely different, in this respect, from the harvesting of grain ; which has the intire plant to feed it, after its separation from the soil ; while fruit, after it is severed from the tree, is cut off from all possibility of a further supply of nourishment ; and although it may have reached its wonted size, some of its more essential particles are, it is abundantly evident, left behind in the tree.

" Some of the later-ripe fruits, however, will hang on, until they be in danger of being caught in the frosts ; which, if

if severe and lasting, injure materially for the purpose of liquor. In the great fruitage of 1784, a very considerable part of the best fruits were in a manner lost by the frosts. The buyers of sale liquors fixed their price for cyder so very low, that the farmers obstinately suffered the apples to be frozen on the trees, or in heaps if collected, rather than accept of the price they were offered. The consequence proved disadvantageous to the buyers, as well as the farmers; they being afterwards obliged to nearly double the price, to those who had worked their fruit, or had saved it from the frost.

"The ordinary method of gathering which I have seen used, and which is, I believe, the prevailing practice of the country, is to send men with long slender poles or rods, provincially polting lugs, to beat the trees; and women, with baskets, to pick up the fruit. I have seen two men and eight women, thus employed, as a set; with an ox wain, and a boy to drive it, receive the apples as they were collected; clearing the trees as they went.

"But this is contrary to the foregoing principles. The apples of the same tree differ, perhaps many days, perhaps some weeks, in their times of ripening; owing to aspect-exposure, and perhaps other causes which we are unacquainted with. Consequently, some part of the natural richness and flavor of the fruit is cut off so effectually, that no art can retrieve it: brown sugar and brandy are but mean substitutes.

"Nor may the loss of the richness, strength, flavor and colour, which are left behind in the tree, be the only evil of the ordinary method of gathering fruit for cyder. Every thing depends on the vinous fermentation, which the liquor has to pass through. If this be interrupted, or rendered complex, by a mixture of ripe and unripe fruits, and the liquor be not in the first instance sufficiently purged from its feculencies, it may be difficult, afterward, to effect the purgation, without injury to the liquor. Brimstone and bullock's blood may alleviate, but cannot altogether remedy the evil.

"Some few men, on these principles, or in pursuance of the dictates of their own experience, go over their fruit trees twice: once, when the spontaneous fall begins to take place, with a hook, leaving such of the fruit to mature, as will not quit the boughs, with a gentle agitation. And a second time, when those are sufficiently ripened, or winter is likely to set in, with the polting lugs; finally clearing the trees.

"If art may, with propriety, be used, in this stage of the business, these appear to be the most rational means of applying it.

"By way of correcting the crudity of the unripe fruit, which in the common practice has been forced from the trees, in the way that has been mentioned, the whole is laid together in large heaps, in the open air, exposed to the weather, until the ripest, that is to say the richest and finest of the fruit, is beginning to rot. Thus destroying by an injudicious application of art, the natural perfection of the whole.

"Such, at least, is the ordinary management of fruit; under which management three-fourths, or perhaps a much greater proportion of the cyder produced in the district is made.

"There are men, however, aware of the impropriety of the practice; but they differ in their ideas on the means of rectifying it. One is of opinion, that the ripe fruit, having dropped spontaneously, or having been shook down by a gentle agitation of the boughs, should lie ten days under the trees, as it falls; and then be gathered, and carried immediately to the mill; without any further maturation. And, in pursuance of this idea, some few orchards, and even cultivated grounds, are seen with fruit lying under the trees, so thick, that the foot could not well be set down among it.

"Others object to this practice; as exposing the fruit; not only to pigs and other live stock; but to the weather: alledging that rain and dews are injurious to fruit after it has quitted the trees.

"Their opinion is, that it ought to drop ripe from the tree: to be picked up while dry; and to be kept dry, under cover, some time afterwards to mature; and, some will have it, to take a degree of heat: while others object violently against its heating; consequently against lofts; thinking, that it cannot be kept too cool, in the open air; and that rain water is not injurious to it.

"Reason and common sense, however, object to this. All vegetable substances, after they are severed from the soil,

lose their flavor, at least, in being exposed to the weather. With regard to this, apples, as hay and corn, ought, no doubt, to be harvested dry.

"Upon the whole, we may conclude, that, in strictness of management, fruit ought to drop spontaneously from the tree; to be collected while perfectly dry; and to be laid up, under cover, spread abroad of such a thickness as to prevent any injurious degree of heat. It is the opinion of those, who are best able to judge of this matter, and whose practice accord with their opinion, that, in a room, fruit ought not to lie more than ten inches thick; and that in a fruit-loft a thorough air should be preserved.

"Every mill house should have a fruit camber over it; with a trap door to lower the fruit down into the mill house. Or there may be a valve over the bed of the mill, furnished with a cloth spout or tunnel, reaching down to the chace; in which the fruit may, of course, be scattered at pleasure.

"No straw is used in the lofts. Sometimes the fruit is turned. But this, I believe, is not a common practice.

"The due degree of maturation of fruit for liquor is however, a subject, about which men, even in every district, differ much in their ideas. The prevailing practice (as has been intimated) is to let it lie in heaps, until the ripest begin to rot, or are actually rotten. But this is wasting the best of the fruit; and is by no means an accurate criterion. Some shake the fruit and judge by the rattling of the kernels: others cut it through the middle and judge by their blackness. But none of these appear to be a proper test. It is not the state of the kernels, but of the flesh; not of a few individuals, but of the major part of the prime fruit; which renders the collective body fit or unfit to be sent to mill. It is true, a few individuals, or the kernels of the middle-ripe fruit may be some guide to the state of the flesh of the majority; but why consult a criterion when the subject itself is present? The most rational test of the ripeness of fruit, which I have met with, is that of the flesh having acquired such a degree of mellowness, its texture such a degree of tenderness, as to yield to moderate pressure. Thus when the knuckle, or the end of the thumb can, with moderate exertion, be forced into the pulp of the fruit, it is deemed in a fit state for grinding. Or, in less practical terms, the proper state of maturation is when the flesh has acquired its highest degree of richness, and the kernels their highest degree of flavor; and while the rind yet retains its brightness and pungency.

"But although the right management of the fruit may appear to be pretty accurately understood; and not difficult to be executed; yet in practice, ripe and unripe fruit are not to be kept separate so easily as theory may suggest. It is tedious to wait the ripening of every apple, and to collect every apple as it drops. Besides, high winds do not always make the requisite distinction: the unripe and those which are sufficiently matured for gathering, are frequently thrown down together: and if the hook be used, the effect is in some degree similar.

"In practice, therefore, there is only one method of avoiding a mixture of fruit: that of separating it by hand; either when it is laid up, or at the time of sending it to the mill. And it is more than probable, that this is one of the grand secrets of cyder-making; by which those who excel in the art are monopolizing the credit of it. It is matter of astonishment, however, seeing the obviousness of its utility, that it should not long ago have been adopted in common practice.

"Some extra trouble and expence is, no doubt, incurred by this practice. But there is no department of manufacture, which is not attended with trouble and expence. If the *ware* pay tenfold for it, the expence vanishes, and the trouble becomes a pleasurable employment. In the infancy of the woolen manufacture, for instance, it is probable the entire fleece was carded, spun, and woven together. But now the sorting of wool is become an employment of no small importance. And were the sorting of apples for cyder, once to become the established practice, farmers would as soon think of sowing wheat and vetches together, as of grinding unripe, ripe, and rotten fruit together in the cyder mill. Yet all the preparation, which the apples receive in common practice, at present, is that of picking out the black rotten, which is generally known to give the liquor a disagreeable flavor: and, even this work, I understand, is frequently done in a very imperfect manner.

"There are however, some few individuals, who pay attention to this department of the art. In the practice of

one man ; a dealer, who manufactures his own liquor ; more especially fire cyder ; and whose liquors are a proof of the excellency of his practice ; I found the brown as well as the black rotten carefully picked out : even if part of an apple be tainted, the faulty part is cut out ; the sound part only being suffered to go into the mill. And in that of another superior manager, whose practice may be said to be nearly perfect, not only the rotten, but the crabbed, that is, the small crude under-ripe fruit, are picked out, and thrown aside for family drink ; thus selecting the prime fruit, in a proper state of maturation, to be ground, alone, for liquor of the first quality.

" In the ordinary practice, no studied composition or selection of sorts is made. The different kinds are mixed, indiscriminately, or without any other distinction than that of keeping the early and the late fruits separate, and the old fruits distinct. A judicious assortment of fruits is, however, spoken of as highly beneficial to liquor ; but I have met with nothing, in practice, that establishes the position : and it is a well established fact, that the finer liquors are made from select fruits. Nevertheless, it is more than probable, that the liquor of ordinary fruits may be improved by a judicious mixture ; and, to those who have much ordinary fruit in their plantations, a proper mixture of it may be an object of attention. A person, in Herefordshire, is mentioned as an adept in the art of commixing : not fruit, however, but liquors which have been separately drawn, and while they are under the process of fermentation : while others are said to mix the liquors, according to their flavors, after they are manufactured. But these by way of hints.

" In the business of grinding, the cyderists of this district are far superior to those of the southern countries ; where, as has been said, a kind of cyder is sometimes made ; but where the mill not unfrequently consist of a wooden roller, stuck with hobnails, working against an upright slab, beset in a similar manner. With this petty machine, the apples are broken, or torn, into fragments, that the press may have fuller power over the juice, than it would have, if the fruit were placed in it whole. For there, and every where, I believe, except in what are called the cyder countries, it is generally considered, that the cellular juice of the pulp, only, is the requisite ingredient of good cyder.

" In this country, however, it seems to be generally understood, that cyder made from the juice of the pulp alone, is far from being perfect ; as wanting, in a great measure, one of its most valuable properties, flavor, and some will say colour : it being likewise, I believe, pretty generally understood, that the finer cyders owe their superior flavor to the kernels, and their colour to the rind.

" The Hagloe crab, however, is an evidence against this idea. It is one of the palest-rinded apples, which grow ; yet produces the highest-coloured cyder, which is made. The fire apple is likewise pale-rinded ; yet affords a high-coloured liquor. Some are of opinion, that the rind gives the strength. Others, that it communicates flavor to the liquor. From a slight examination of the rinds of fruit, they appear to be warm and aromatic ; qualities belonging to essential oil ; and it is probable, the pungency may pass at strength ; while the aroma may communicate additional flavor.

" Hence, in grinding, it becomes requisite to common good management, that the rind and the kernels, as well as the pulp, should be crushed or broken in such a manner, as to enable them to impart their qualities, with greater freedom to the liquor.

" The effect of the stalks of fruit has not, perhaps, been attended to. Attentive managers pick the largest off, in sorting the fruit ; but not, perhaps, with sufficient scrupulousness. The stalks of raisins are known, I believe, to have a bad effect on the wine made from that fruit, and those of apples may have a similar effect on cyder.

" In this intention, the stone runner and chace are much preferable to the petty contrivance mentioned above ; but they are not, in their present form, and under ordinary management, by any means equal to the entire reduction of the fruit. I have never seen any ground fruit go to the press (except in one instance) without having a large proportion of unreduced fragments of fruit among it : whereas, on the principles, which are here adopted, the whole ought to be reduced to a state of mucilage or pap. Nor have I yet seen any residuum come from the press, without a very large proportion of the kernels unbroken : whereas, on the principles received, every kernel should be crushed.

" Having observed the simplicity, and high degree of per-

fectness, with which the sugar-mills grind the canes, or rather press out their juice, between two plain iron rollers, the imperfections of the cyder mill may appear the more striking.

" But the sugar-cane is a long fibrous body, and readily passes through between the rollers ; whereas fruit, being globular, and of a cellular substance, is not easily laid hold of, or if caught, has no lengthened fibres to induce it to pass, like the cane, between plain rollers.

" It has, however, been found, that between fluted rollers it may be made to pass ; and, in consequence, these rollers are in use, though not common. They are of cast iron, hollow, about nine inches diameter, with flutes or teeth, about an inch wide, and nearly as much deep. In general, they are worked by hand, two men working against each other. Between these the fruit passes twice : the rollers being first set wide, to break it into fragments ; and afterwards closer, to reduce the fragments. But even this is not a perfect engine : in the residuum from the press, many kernels are found. Besides the acid of the fruit is liable to corrode the iron ; and this, in return, to tinge the liquor ; though neither of these inconveniences are acknowledged. In a country, however, where stone is not easily to be had, this may, perhaps be found the most eligible cyder-mill.

" But in this district where stone is sufficiently plentiful, the stone-runner and trough seem to be the most eligible mill at present known ; though it appears to me highly probable, that, with attention and perseverance, a more perfect machine might be invented.

" Be this as it may, however, the present mill appears to be capable of improvement.

" It is, at present, an unfinished machine : I mean when it is first turned out of the workman's hands ; time and constant wear, does that, in part at least, which the workman leaves undone.

" The acting parts of the machine ; those which are to bruise the rind, and crush the kernels, are the face of the roller and the bottom of the trough. But instead of their being adapted to each other, in such a manner as to effect these purposes with a degree of certainty, they are left in such a rough unfinished state, as in a great measure prevents them during the first fifty years at least, from performing that, which is their principal intention. Instead of being worked over, and fitted nicely to each other, with the square and chisel, they are hewn over with the stone-mason's peck only ; leaving holes and protuberances, which would save even horse beans from the pressure ; much more the kernels of fruit. A runner which has been worn two and twenty years, has holes left in it, which would lodge half a dozen kernels with safety.

" To account for this absurdity seems impossible. Perhaps the roughness was intended to prevent the runner from sliding ; but the use of the cogged wheels has superseded this intention. Perhaps it was left to gather up the fruits with greater effect ; but, surely, deep chisel marks, left in the form of flutes across the face, would have answered this purpose better ; and would, perhaps, have laid hold of, and fixed the kernels, so as to secure their being effectually broken, preferable to any other expedient equally simple. Or, perhaps, the custom was established, when the uses of the rind and kernel were not known ; and time has not yet corrected the error.

" I have been told that the roughness is left to cut the fruit the faster on its being first put into the trough ; and that on this ingenious principle, some will peck their runners over, so often as they were smooth. To such cyder-makers I would recommend the hobnail mill, which would come much cheaper, rid work still faster, and save the expence of pecking.

" Be the origin of folly what it may, it is painful to observe its effect. In this case, however, the folly, and, of course, its effect, may be easily removed. Having made the face of the roller as true as the square and the chisel can render it, work the bottom of the trough to it ; until not a mustard seed can escape them. The kernels of fruit are hard, slippery, and singularly difficult to fix : escaping pressure in a peculiar manner, and with singular alertness.

" Another improvement of the common cyder-mill appears to be much wanted : namely, a method of preventing the materials, in the last stage of grinding, from rising before the runner. And, another, a more mechanical way of stirring up, and adjusting them in the chace.

" Until these improvements be made, cyder-mills must remain, what most of them evidently are, at present, imperfect machines.

"The method of grinding is to scatter in the whole quantity to be ground together, at once: or, to ease the horse, at twice; observing to put in the whole before any of it be stirred. A woman, or more frequently a girl, drives the horse, and stirs up the fruit as it is ground, and beats down what lodges on the sides of the trough, with a large wooden spatula, somewhat in the form of a cricket bat: continuing until the whole be deemed sufficiently ground.

"The quantity ground at each mill-full varies very much; even in mills of the same size. A bag, about four corn bushels, is, I believe, the most usual quantity; for a middle-sized mill: but much more than that quantity is sometimes ground at once; and, in one instance, I observed only half that quantity was ground together, in a mill of the middle size. From the observations I have made respecting this operation, it appears a great error to grind too much at once. In the instance, in which half a bag, only, was ground, the work seemed to go off quicker, and to be more effectually done, than when the trough is choaked with a greater quantity.

"The quantities ground in a day, by mills of the same size, varies still more.—A man, who has two or three hundred hogsheds of liquor to make, is too anxious to get his work forward, to pay due attention to grinding his fruit; there has been instances of five or six hogsheds of perry being made in one day (working early and late:) but three hogsheds of perry, or two of cyder, is, I believe, the medium day's work. While some few men, who know the value of grinding effectually, never suffer more to be made than one hoghead of cyder a day: reducing as nearly as the present mill is capable of reducing, the entire substance of the fruit to a uniform pap or mucilage.

"From what goes before, it appears, that men, in general, have pretty accurate ideas of the manner in which fruit ought to be ground: though, through a want of leisure, or a want of industry, and, through the present imperfection of the mill, few men approach them in practice: but with respect to the management of the reduced materials—provincially the *must*. This term is, here, somewhat unfortunately applied. Must, in its accepted sense in the English language, signifies new liquor unfermented, whether from the wine press, the cyder press, the mash vat; but, here, it seems to stand for every thing else belonging to cyder making. The ground fruit, before it goes to the press, is called must; though from some expressions, in use, it should seem to mean only the fibres or indissoluble parts, which are mixed among the liquor; and the residuum, after pressing, is also termed must. The term, on its first introduction, has evidently been misapplied. I shall, therefore, to avoid confusion, lay it entirely aside. In Surry, the reduced fruit is called pomage, an apt term for it: pom-mash would be still more applicable.

"They are, in general, so far from the line of rectitude, that one would imagine their faint efforts, at reducing the rind and kernel, were made in compliance with custom, rather than on the principle of giving their cyder flavour, colour, or any other valuable quality; for, in common practice, the pomage is pressed immediately as it is ground (even though four or five hogsheds a day are made). No sooner is it out of the mill than it is into the press.

"By this conduct, the rind and kernel, let their powers be what they may, have no time to communicate their qualities to the liquor. They are not, like the flesh of the apple, tender cellular pulp; but fibrous and vascular substances; imparting their qualities less freely than the pulp; requiring the formal process of extraction before they part with them wholly. It would be equally reasonable to expect that the whole virtue of hops might be extracted by pouring the wort through them in a sieve, as to expect that the whole of the virtues of the rind and kernels of fruit can be extracted in a few minutes.

"This appears so evidently in theory, that it is no wonder men of reflection, and who wish to excel in the art, should let their liquor lie upon the must twenty-four hours, or a longer time; or that others, more fully impressed with this idea, should, after the pomage has lain, in open casks, twenty four hours or a longer time, re-grind it.

"By this means (supposing the mill to be perfect) the kernels, which were broken in the former grinding, being now no longer rigid untractable substances, are reduced to particles of the smallest size; and are, of course, no longer able to withhold their virtue from the liquor. Consequently, by these means, the entire apple is given to the cyder;

and (supposing the mill to be perfect) every thing done; which art, perhaps, can do, with respect to the grinding and management of the reduced fruit; previous to the pressing.

"Formerly the pomage was packed up; in a pile; on the bed of the press, in straw, layer between layer. But at present, hair cloths are commonly used in forming the pile—provincially the cheese—to be pressed.

"These cloths are made of common hair-cloth; such as is used, or was formerly used, in covering malt-kilns. The texture loose, frequently, perhaps, too loose to be perfect in their intention. The usual size about four feet square.

"The method of forming the pile varies. In Gloucestershire, a wooden rim, frame, mould, or gauge;—about three feet square, and four or five inches deep;—is generally used in making the cheese, (a term somewhat awkwardly borrowed from the dairy). In this case, the gauge is set, with great exactness, every way in the center of the press; a cloth spread evenly over it; and the pomage laded into it, with a large wooden dish or other utensil. A sufficient quantity being thrown in to form a layer; from two to three inches thick, it is spread evenly with the hands, and worked truly against the sides and into the corners of the mould; the skirts of the cloth laid over smooth, and folded neatly at the corners; a fresh cloth spread on; and filled in a similar manner: first raising the gauge a few inches; so that its upper edge may be level with the cloth when filled. Thus continuing to raise the moulds and fill the cloths, until ten or twelve cloths are filled, and the pile is, of course, raised from two to three feet high.

"The height of the pile when finished, however, depends much on the state of the pomage: for, as the pile rises, the superstructure acts as a press to the substrata; so that a considerable proportion of the juice of pears, or of apples which afford much, escapes during the operation.

"The pile being raised to the desired height, and the top made smooth and perfectly level; a broad, square leaf, of strong boards, framed firmly together, somewhat larger than the top of the pile, is placed upon it; and upon this, logs, or blocks, two-and-two across, are piled; until they reach the bridge; the base of the screw being previously wound up to the nut; for a purpose which will be mentioned.

"In Herefordshire, I observed, in several instances, a different mode of forming the pile. In this method, no gauge is used; the whole being done by the eye; nor is the pile carried up either plumb, or square. The corners are cut off; (for the greater convenience; I suppose, of securing the corners of the cloths) and the dimension of every layer is lessened as the pile rises; so that when finished, instead of being a cube, or nearly so, as in the first mentioned practice, it forms the lower frustum of a pyramid; being somewhat considerably wider at the bottom than the top.

"This, however, appears to my mind an improper form. All fluids endeavour to escape pressure: If it be applied in the perpendicular direction, they endeavour to fly out horizontally. Thus the pomage (a subfluid) is forced toward the outward edges of the cloths; which, in this form of the pile, have no immediate pressure: an indirect horizontal pressure, arising from the natural law of fluids; being all the compression which the outer sides of the pile receive.

"The method of applying the power of the press has been described. It is generally worked by one man; who, with the girl that attends the mill, and a man to fetch in the fruit, and carry away the liquor as the reservoir under the lip of the press fills, make a set, for the mill-house.

"The pressing is done leisurely, that the liquor may draw off the clearer; and to give the assistant time to keep the reservoir free. The first runnings come off foul and muddy; but the last, especially of perry, will be as clear, and as fine, as if filtered through paper: a sweet palatable beverage.

"In giving the last pinch of the press, with the purchase-roller, the man, or men, if more than one be employed, stoop under the rope: hence the use of raising the foot of the screw as high as may be, before the operation commences; and hence the use of raising the bed of the press; by which means fewer blocks are wanted; and a more convenient receptacle for the juice obtained.

"By encreasing the number of hands to three or four, the residuum may be reduced to almost any degree of dryness.

ness. Hence the cyder-press might be styled a most perfect engine.

"In the common practice of the country, the first residue is either thrown aside as offal (though perhaps very imperfectly pressed) or is returned (designedly underpressed) to the mill, to be washed: that is, to be reground, with water, for family drink. When the plantations are large in proportion to the farm, a sufficient quantity of family liquor is obtained, in a plentiful year of fruit, from the washings of the residue, to last the year round, or a longer time; where the plantations are proportionally small, and in a scarce year, water is thrown into the mill, while the fruit is grinding, thus lowering the quality, and encreasing the quantity of the liquor. In harvest, it is customary to allow some malt liquor, or cyder of the best making.

"Thus throwing away, or applying to a mean purpose, what might, in familiar language, be termed the essence of fruit liquor. The juices of the rind and kernels, which, common sense would tell us, were we not told it by men of experience and observation, come off most plentifully with the last runnings; but it is allowed, however, by experienced managers, that the richest of the liquor comes off with the first runnings.

"Hence, men, who excell in the art, continue to press so long as a drop can be drawn; and, unsatisfied with this, return the first residue to the mill, to be reground; not with water, but with some of the first runnings of the liquor; moistening the materials to be ground as occasion requires.

"It is found, that even breaking the cakes of refuse with the hands, only, gives the press fresh power over it: for though it has been pressed to the last drop, a gallon or more of additional liquor may be got from a press full by this simple means. Regrinding them has a still greater effect.

"In this state of the materials, the mill gains a degree of power over the more rigid parts of the fruit, which, in the first grinding, it could not reach. If the face of the runner and the bottom of the trough were dressed with a broad chisel, and made true to each other in the manner which has been proposed, and a moderate quantity of residue were ground at once, scarcely a kernel could escape unbroken, or a drop of liquor remain undrawn.

"From the foregoing observations, it appears, first, that the fruit should be entirely reduced, before the whole of its virtues can be communicated to the liquor. There is, however, one inconveniency in grinding the fruit very fine: the substance, as well as the liquor, escapes the hair cloth, and fills the fermenting vessel unnecessarily; besides, perhaps, being injurious during the fermentation. But this effect may be remedied: I have seen an instance, in which the first runnings were poured through a hair sieve to catch part of their foulness: a piece of hair cloth thrown over the tun dish, would, perhaps, be still more effectual. The malt-liquor mash-tub is furnished with a hose, which stops a great part of the feculencies. The liquor, in that case, comes off almost clear; and, perhaps, fruit liquor ought to be rendered equally clear, before it be committed to fermentation. This degree of purity is obtainable, by suffering the foulness to subside, in the first cask, and drawing off the clear liquor, into a fresh vessel, previous to the commencement of the fermentation. By this means, the fermenting vessel, as well as the process of fermentation, may be freed at least from the grosser foulness. In some cases, by catching the critical time, and by filtering the lees in the manner which will be described, the must may be rendered almost perfectly clear.

"Secondly, that the reduced fruit ought to remain some time, between the grinding and the pressing, that the liquor may have an opportunity of forming an extract with rind and kernels. It is observable, however, that the best cyder, which the art, perhaps, has yet been able to produce, was made under different management. But it ought likewise to be observed, that the judicious manager of this cyder, grinds only one pressful (affording perhaps not quite an hoghead of liquor) a day; consequently the first-ground fruit, has most of the day to make the required extract; and every succeeding mill-full has a proportionate time: and although the liquor, under this management, proved excellent, yet had more of the bitter and fragrance of the kernels been communicated to it, it possibly might have been better. An objection to this practice is, that it hurts the colour of cyder; and the most experienced managers object to its lying more than twelve hours on the must.

"Thirdly, that the present imperfections of the mill are such as render it almost impossible to reduce the fruit, sufficiently, by a single grinding: but the juice, or a principal part of it, having been drawn off by the press, the residue is capable of receiving the requisite degree of reduction.

"Hence, upon the whole, the most eligible management, in this stage of the art, for those I mean who have leisure to pursue it, appears to be this: grind one pressful a day: press, and regrind the residuum in the evening. Infuse the reduced matter, all night, among part of the first runnings; and, in the morning, repress, while the next pressful is grinding.

"In this department of fermenting, the nicest judgment is requisite. The former are mere manual operations. The right principle being adopted, and a suitable apparatus being prepared, the execution requires no great share either of genius or experience. But in conducting the fermentation properly, much skill, and a close attention are requisite.

"In the prevailing practice of the district, the liquor is tunned; that is, put into hogheads or other casks; immediately from the press. The casks in the ordinary practice, being filled to the bung hole. Some judicious managers, however, object to the filling up of the casks; esteeming it more eligible management to leave them about a pailful ullage. While others, still more deeply versed, perhaps, in this mystery, leave an ullage in proportion to the ripeness of the fruit: thus, with liquor from under-ripe fruit the cask is filled; but with that from fruit which is more mature, an ullage is left, in proportion to the state of ripeness.

"With respect to the temperature of the air, in which fruit liquor ought to be fermented, nothing accurate, I believe, is to be learnt in this district. Even the professional dealers, I understand, are strangers to the use of the thermometer. It is, however, generally understood, that fermenting liquors should not be exposed to frost. Nevertheless it has been remarked, that frost, previous to the commencement of the fermentation, though it formed a sheet of ice on the surface, had no observable bad effect. But, in the commencement of the season, it is thought they cannot be kept too cool. In the middle of October, the air then about 60°, the casks were placed in sheds, or in airy buildings of the same, or nearly the same, temperature as the common atmosphere; and frequently in the open air. In this case the casks have a small piece of tile or flat stone set over the bung-hole, propped by a wooden pin in a leaning posture to shoot off rain water, &c.

"Later in the season, the casks are placed in close buildings; with windows, however, to admit occasionally a thorough air; which is generally thought to be salutary to fermenting liquors. I have, nevertheless, seen liquor of the most delicate kind fermenting in a close hovel, without a thorough air. In a complete manufactory of fruit liquor, the fermenting room should be under the same roof with the mill-house; a continuation of the press room; or at least opening into it: with windows or doors on every side; to give a free admission of air; and with suitable barricadoes to guard against severe frost; with fruit lotts over it; and, beneath it, a vault for laying up the liquors, after fermentation; with small holes in the crown of the arch, to admit a leathern pipe; for the purpose of conveying the liquors, occasionally, from one situation to the other. The dealer's warehouses are fitted up in a manner somewhat similar to this.

"No ferment whatever is made use of. I have not, at least, on repeated enquiry, met with one instance of any being used: even the most intelligent seem surprised at the enquiry. Let the species of fruit, the degree of ripeness, and the weather be what they may, the liquor is left to fight its way with its own weapons.

"Hence the commencement of the fermentation is entirely uncertain. Perhaps the first, perhaps the second, perhaps not until the third day, or perhaps in cold weather not until a week, or a month, after the liquor be tunned. It is observable, however, that liquor, which has been agitated in a carriage, though taken immediately from the press, will sometimes, on being laid down, pass, almost immediately, into the state of fermentation.

"The continuance of the vinous fermentation (or more accurately speaking the first stage of it) is not less uncertain than its commencement. Liquor, under the last mentioned circumstances, will pass through it, perhaps, the same day.

day. But less agitated liquors I believe, seldom go through it in less than two or three days; will sometimes continue under it five or six days.

"With regard to any criterion whereby to judge of the fermentation, as to its being perfect, imperfect, or inordinate, I have not been able to collect a single idea worth registering. It is a subject, to which most cyder-makers appear to have paid little or no attention; notwithstanding they are fully aware of the change, which takes place during its natural process; learning, from their own experience, that the liquor owes its intoxicating quality entirely to fermentation. It is true, the manufacturers of sweet cyder pay some attention to the fermentation: but their whole art appears to consist not in regulating it to any certain degree, but in checking it with every means in their power; preventing as much as they are able, any degree whatever of the vinous fermentation from taking place.

"It is observable that fermentation operates somewhat differently on different liquors. Thus, cyders made from fruits properly matured, generally throw up a gross spume, resembling that of malt liquor; forming, on the top, a brown crust, of a thickness proportioned to the species and ripeness of the fruit; the riper the fruit the more brown must is thrown up. Perries, on the contrary, throw up little spume, and seldom cover it with a brown crust; nevertheless, I have seen barland perry with a head resembling that of cyder; which, it is observable, is sometimes, like perries, unable to form a head; or is intentionally prevented from doing it, by management.

"Having remained some days in the first vessel, the liquor is drawn off the lees, and put into fresh casks: an operation termed racking.

"It appears to be fully and universally understood, that there is a critical time of racking, on which the future quality of the liquor very much depends. Hence, in the dealer's warehouses, persons are employed to sit up all night, to catch the critical minute. But what is rather extraordinary, men differ in their ideas with respect to the proper juncture. The prevailing idea seems to be, that the proper time to rack is at the close of the first fermentation, while the liquor is clear: embracing the critical time between the subsiding of the foulness caused by the motion, and the falling of the spume; a circumstance which frequently takes place a short time after the fermentation ceases; whereby the liquor is not only fouled, but is probably furnished with the seeds of a fresh fermentation.

"But rational as this theory may seem, there are men, whose characters class high as managers of fruit liquors, yet, who think it right to rack before the fermentation ceases; while the liquor is yet foul.

"In common practice, however, the liquor itself is seldom examined in judging of this nice point. Secondary criterions are applied to. Thus cyder, in the practice of some men, is racked when the brown crust becomes firm enough, and dry enough, not to stick to the finger on being touched; while others stay until the crust crack, and the white scum which has formed under it begin to rise through the cracks. The ordinary criterion of the time for racking perry is before it is done hissing. In the particular practice abovementioned, the guide is when it begins to twinge the nose: that is, when the gas flies off in quantity; which it does when the liquor is at the top of fermentation. While the makers of sweet liquors will not even hear them hiss, if they can possibly prevent the disagreeable sound.

"The method of racking is to draw off the clearer liquor, at a tap fixed above the lees, and to put it immediately into a fresh cask, duly seasoned. When it begins to run foul, the tap is stopt, and the remainder is filtered through flannel or canvas bags; filtering bags are made in the form of jelly bags, the mouth wide enough to receive a wooden hoop, a foot or fourteen inches in diameter: the depth eighteen inches or more, tapering to a point at the bottom. Where much racking is done, these bags are hung in a frame, about three feet high, holding perhaps a dozen bags, with tubs placed underneath to catch the filtered liquor; or for want of these, through a hair-cloth; the four corners being hung upon a hook; thus forming a kind of bag adequate to this purpose. The intention being merely that of separating the liquor from the lees and scum. The filtered liquor which ought to drop fine from the bag, is added to the rest; from which it differs in three notable

qualities: it is higher-coloured than that which has not mixed with the lees; it is no longer prone to fermentation; on the contrary, it is found to check that of the liquor racked off; and, another, if it afterward lose its brightness it is difficult to be recovered.

"The degree of fullness of the fresh cask seems to be pretty generally the same; the cask is not filled up; but left with about a pailful ullage; so that the surface of the liquor can just be touched with the finger; the bung being still left out.

"The number of rackings depend on the state of the liquor, and the judgment of the manager. If the fresh fermentation, which mostly commences, in some degree, after racking, become violent, it is generally understood, that the liquor ought to be racked again, to check it. Hence, in the practice of some men, the same liquor will be racked five or six times. On the contrary, if a small degree of fermentation, only, take place; which is in this case termed fretting; it is, in ordinary management, suffered to remain in the same cask: but the degree of fretting, which requires the operation of racking, is by no means settled: one man would rack the same cask of liquor, which another would leave for time to quiet. In the common practice of farmers, cyder is seldom or ever racked more than once; and perry is sometimes suffered to remain, until time render it quiet and fine, in the first cask, into which it was turned. The general idea seems to be, that frequent rackings weaken the liquor, and that much fermentation roughens it. The farmers, therefore, rather choose to be at the risque of losing the richness, than to lower the strength and bestow upon it the labour of racking.

"But those who manufacture the finer liquors for sale; especially, perhaps, those who have checked the first fermentation; think it prudent to repeat the rackings, until the liquor will lie quiet, or nearly so. If it cannot be brought into this state by ordinary racking, the fresh casks are fumigated with sulphur; whose fumes are found to have a power of silencing, or greatly checking, the fretting. This expedient is termed stumming the casks.

"The method of stumming them is this: matches, made of thick linnen cloth, about ten inches long, and an inch broad, thickly coated with brimstone about eight inches of their length, being prepared; and the cask properly seasoned; every vent is tightly stopt, except the bung-hole, a match kindled; lowered down into the cask, and held, by the end undipped, until it be well lighted, and the bung be driven in; thus suspending the lighted match within the cask. Having burnt so long as the contained air will supply the fire, the match dies; the bung is raised, the remnant of the match drawn out, and the cask suffered to remain, before the liquor be put into it, some two or three hours, more or less, according to the degree of force required. For a few days the liquor retains a sulphurous flavour, which, however, in a short time vanishes, and no evil effect, I understand, is found to follow the operation.

"Thus far the method of fermenting in casks: a mode of fermentation, which ninety-nine hogheads of a hundred, made in the country, are subjected to. Nevertheless there are some few men, in different parts of the district, who ferment either in vats or open vessels.

"One instance of this practice I met with in the Vale of Gloucester. In this instance the liquor is set in cows or other open tubs, or in casks with one of the heads out. In these vessels it stands until the first fermentation be pretty well over; when the spume is carefully skimmed off; under the idea that it is the scum mixing with the clear liquor, which causes it to fret after racking. The fermentation having ceased, and the lees subsided, the liquor is racked off into a fresh cask, and the lees filtered in the manner which has been described. In this practice, the liquor is never racked a second time.

"Another instance of fermenting in open vessels occurs in a practice which has been repeatedly mentioned, and which is entitled to the highest attention. It is generally spoken of as being, what I apprehend it really is, the first practice in the country. In this instance, the liquor is fermented in broad shallow vats; not less than five feet diameter, nor much more than two feet deep; each vat containing about two hogheads. In these vats the liquor remains until it has done rising; that is, until the fermentation has ceased, or nearly so; when it is racked off, without skimming; the critical juncture being caught before the spume begins to fall; the whole sinking gradually down together,

as the liquor is drawn off. In this practice, likewise, the liquor, notwithstanding its superior quality, is seldom racked a second time.

"Chemists enumerate three species of fermentation. The vinous, the acetous, and the putrefactive.

"The juices of some vegetable productions; as those of fruits which are inclined to sweetness; will, while recent and in their natural state, with a due degree of heat, and a free communication of air, pass spontaneously into the first or vinous fermentation: will acquire heat and motion, become turbid, and, at length, disentangle themselves from their impurities: throwing down part to the bottom of the containing vessel, part up to the surface; leaving, in the middle, a vinous liquor, furnished with a greater or smaller quantity of inflammable spirit. Thus wine, perry, cyder, and the different kinds of ale are vinous liquors; their various degrees of strength being given by the quantity of inflammable spirit they respectively contain.

"The vessel still kept open, so as to allow a free admission of air, the vinous liquor will pass on to the second stage of dissolution, the acetous fermentation: by which the inflammable spirit will be thrown off, and another precipitation of gross matter will take place; and the vinous liquor will now be changed into a dilute vegetable acid, or vinegar; of a strength proportioned to the quantity of spirit thrown off.

"The subject being still exposed, the third or last stage at length commences. The vinegar becomes putrid; its acid is destroyed; and the remaining contents of the vessel are found to be, simply, common earth and water.

"This being the nature of the expressed juices of fruit, the first object of the cyderist is to bring on a due degree of vinous fermentation; and his second, to prevent the vinous liquor from passing on to the acetous fermentation.

"But, notwithstanding this general theory of dissolution, science remains destitute of a satisfactory theory of the vinous fermentation. I have not, at least, after some search, been able to find any other than arrangements of well sounding words, pleasing enough to the ear, but affording the understanding no gratification. Even the first mover, the innate stimulus, the natural principle of this species of fermentation, does not evidently appear.

"In collecting and registering the foregoing particulars, respecting the fermentation of fruit liquor, many theoretic, as well as practical ideas were suggested by reflection. But though the former may contain a principal part of the theory required, they are, at present, in a state altogether unfit for publication.

"Therefore, all I shall attempt, in this place, is to explain more fully the general effect of the vinous fermentation, on the fruit liquors under notice, and endeavour to draw some practical inferences.

"The most striking effect is that of its giving strength to the liquor which, before its operation, was not possessed of that quality: effecting almost a total change of its original nature: not only by furnishing it with an intoxicating quality, which it was entirely free from; but in reversing, in a remarkable manner, its medical, and of course, its dietetic properties.

"Another notable effect is that of its destroying, or lessening, the sweetness of the liquor. The loss appearing, from the information, I am in possession of, to be in proportion to the strength acquired.

"This, as a general position, will, perhaps, be objected to. Good cyder is said to be made from ill-tasted fruit. The Hagloe crab is mentioned as an instance. But the harshness of this apple proceeds, I apprehend, from its flesh, and fibres, not from its juice; which, when fully matured, accords sufficiently with the idea here offered.

"Hence the difference between rough and sweet liquors: the fermentation of the former has continued until the whole or principal part of its sweetness was destroyed; that of the latter has ceased, or been checked, while a principal part of its sweetness remained.

"It does not follow, however, that roughness is a proof of strength, or sweetness of a want of body. Much depends on the nature of the fruit; and much, probably, on and state of ripeness. Rich well-ripened fruits afford sweetness enough to furnish a sufficiency of strength, and enough more to retain a sufficiency of richness in the liquor. On the contrary, liquor drawn from harsh and under-ripe fruit is exhausted of its sweetness, before it has acquired a redundancy of strength. Or, if the fermentation be checked to

preserve its sweetness, it is rendered of course deficient in strength.

"Hence the crude flatulent quality of the common sweet liquors, which are either weak through a want of fermentation, or, having been sufficiently fermented, have afterward been sweetened by art. A kind of liquor which is palatable enough to taste, but which, on being drank, soon becomes nauseous to the palate.

"And hence the preference to be given to liquors of a middle richness; strong without roughness, and rich without sweetness. A generous liquor, this, which, to use the good fellow's phrase, may be sat by. A liquor which is seldom met with out of this district, and not frequently in it. A liquor, nevertheless, which, I am fully persuaded, men in general would prefer to most foreign fruit liquors that are at present imported, in disgraceful abundance.

"In these observations, the methods of producing the different species of fruit liquor, namely, the rough, the sweet, and the generous, pretty evidently appear.

"To produce rough liquor, chuse austere fruits; grind them in a crude, unripe state, and subject the liquor to a full fermentation.

"To produce sweet liquor, make choice of the sweeter fruits; mature them fully, and check the fermentation of the liquor.

"The ordinary methods of checking the fermentation have been mentioned to be those of racking the liquor, and fumigating the fresh cask.

"But the use of racking is differently understood. The prevailing idea seems to be, that the fresh fermentation, or the fretting, is caused by the spume or dregs of the preceding; and that by racking the liquor off clear, into a clean vessel, the foulness is got rid of.

"But the manufacturers of sweet liquors rack under different motives. Their idea is, that racking cools the liquor, and by that means checks the fermentation. They observe, that the smaller the stream, in racking, the more the fermentation is restrained: and, in pursuance of the same idea, they frequently spread the liquor, thin, in open vessels, and sometimes agitate, or rather ventilate it, in this situation, and obtain the desired end by these expedients.

"It appears to me, however, that the end is gained, not altogether by giving coolness to the liquor (though in some degree it may) but by giving the principle of fermentation an opportunity of flying off. Filtering the liquor, drop by drop, is found not to check, but to destroy the fermentation. Filtered liquor is found even to lower the fermentation of others: not, certainly by its coolness; because in this it can differ very little from liquor which has been racked; the atmosphere, in both cases, presently reducing them to the same temperature; but probably, by the fermentative principle having escaped wholly from the one, its proportion is consequently lessened in the other.

"Hence (by the way) it is probable, that by filtering the fresh liquor from the press, a valuable antiscorbutic might be obtained; and, under the same idea, it appears probable that sweet liquors, duly manufactured, may have their medicinal virtues.

"But leaving this idea to those whom it more concerns, and such liquors to those who may require them, we will proceed to the production of one of a more generous nature: a liquor which those who drink for fashion or amusement, or to heighten their friendships, or lighten their cares, should encourage, and which the manufacturers of sale liquors will then, of course, endeavour to produce. At present, their whole skill is exhausted on the art of rendering their liquors unfit for ordinary drinking. They are not at present saleable, unless they are sweet.

"To produce liquors of a middle richness. Much depends on the nature of the fruit, and much on the season it is matured in. The fruits to be made choice of are such as yield juices capable of affording a sufficiency both of richness and strength. Such are the fire apple, the Hagloe crab, the Longney russet, the woodcock apple, the squash pear, and probably numberless other sorts, were their respective natures individually examined. Nevertheless, it is probable there are others which are altogether unfit for this purpose, consequently altogether unfit to encumber the ground they grow on.

"Much, however, depends on proper management. From what has gone before, it appears, that to produce a free fermentation, air and heat, atmosphere and warmth, are requisite. Warmth to set in action the fermentative principle; atmosphere to receive the loosened particles to be thrown off. But it also appears, that the ordinary heat of

of the atmosphere is, generally, more than sufficient to give the required degree of motion; and that, in the manufacturing of the fruit-liquors under notice, coolness, rather than warmth, is requisite.

"Hence the preference to be given to open vats, which at once preserve the required coolness, thereby preventing too furious a fermentation from taking place, and at the same time admit a sufficiency of surface, to render that which does take place, free and uninterrupted. Two hogheads of liquor, spread in the vats which have been described, expose some yards of naked surface; while the same quantity of liquor in casks, filled to the bungs, have only a few inches. The disproportion of surface more than a hundred to one.

"Hence it appears to me evident, that if liquors be fermented in casks, which only perhaps can be conveniently used on a large scale, they ought not to be filled, nor ought they, in my opinion, to lie on the bulge, in the usual manner, but to be set on end, with the heads out, and to be filled to such a height only as will produce the requisite degree of fermentation.

"In whatever situation the liquor is fermented, I am clearly of opinion the first effort of fermentation ought not, under ordinary circumstances at least, to be frustrated. But, on the contrary, the liquor ought to be allowed one full free fermentation; the degree being regulated, not by compulsory means, but by the depth of the liquor; and this by the heat of the air in the fermenting-room, and the quality of the liquor.

"But having passed through the first stage; having been racked in the proper juncture; and being found to have acquired a sufficient body, it may be right to prevent, as much as possible, a fresh fermentation. Rack, spread thin, or even filter, to keep it in the desired state.

"Correcting is, provincially, and aptly enough, termed *doctoring*; for the want of it implies disease. My enquiries, however, have been directed to the art of producing sound liquor, rather than to that of healing the unsound. Nevertheless, on digesting the general mass of information collected on the subject, I find a few ideas have, as it were, spontaneously offered themselves on this department of it.

"The imperfections which art undertakes to supply are, the want of strength, the want of richness, the want of flavour, the want of colour, and the want of brightness; consequently, with the addition of the other two qualities of fruit liquor, acidity, and aquosity, or, in plainer terms, vinegar and water, we have in our power the whole art of making cyder, without the trouble of planting orchards.

"The want of strength is supplied with brandy or other spirits, in sufficient quantity, to prevent liquor which has been made from under-ripe fruit, and has been imperfectly fermented, from being carried off by the acetous fermentation.

"The want of richness is supplied by what are generally termed *sweets*, prepared in a manner which I have not enquired after; nor has it fallen incidentally under my notice.

"To supply the want of flavour, an infusion of hops is sometimes added. This is said to communicate an agreeable bitter, and at the same time a fragrance; consequently becomes a substitute for the juices of the rind and kernels, thrown away to the pigs and poultry, through insufficient grinding; or given to the servants, through a want of proper pressing.

"The want of colour is sometimes supplied by elderberries ground among the fruit. These are said to give a fine colour, and a kind of flavour which is not disagreeable. But they are made use of, I understand, by individuals, chiefly or solely in making liquor for their own drinking. The universal colouring of the profession is burnt sugar, which gives the desired colour, and a degree of bitterness that is highly commended. There are two ways of preparing this colouring: one of them, by melting the sugar on a salamander, and suffering it to drop, as it melts, into water: the other, to boil the sugar (in this case brown sugar) over the fire, until it acquire an agreeable bitter; then pour in boiling water, in the proportion of a gallon to two pounds of sugar, and stir until the liquor become uniform. A pint of this preparation will colour a hoghead of cyder.

"Brightness is obtained through different means. In stubborn cases, when the foulness is great, and the liquor will neither fine nor fret, being what is technically termed *sulky*, yet is under circumstances which require that it should presently put on a cheerful countenance; it is

drenched with bullocks blood; namely, the blood of cattle or sheep: the blood of swine is rejected with judicial scrupulousness.

"The method of preparing and administering the blood is this: the only preparation of it is that of stirring it well, as it is drawn from the animal, to prevent its parts from separating. Stirring it one way is not deemed sufficient; it ought to be stirred both ways for about a quarter of an hour. The next thing is to enquire whether the liquor be in the mood for taking the blood, which it is not, it seems, equally at all times. This is done by repeating experiments with it in a phial: if it will take the blood in a phial, it will take it in the cask. A quart, or less quantity, is sufficient for a hoghead. After the blood is poured in, the liquor should be violently agitated, to mix the whole intimately together. This is done by a stick slit into four quarters, inserted at the bung-hole, and worked about briskly, every way among the liquor, until the whole be evenly blended. In about twenty-four hours the blood will be gone down, and the liquor ought to be racked; for by lying upon the blood, even two or three days, the liquor is liable to receive a taint, which is not easily got rid of. A most extraordinary effect of this process is, that the blood carries down not only the feculency, but the colour of the liquor, rendering it, though ever so highly coloured, limpid almost as water. This, however, is a loss which is the less regretted, as the means of restoring it are so easy and so effectual.

"The other forces made use of in giving brightness to cyder, are the common ones of eggs, and isinglass, (or a combination of the two) used as in the practice of wine-merchants, who, as well as the dealers in cyder, have of late years, it seems, made a free use of the blood.

"Laying up, is one of the most difficult steps to be taken in the management of fruit liquor, yet appears to be the least attended to or understood.

"The common practice is to bung up the casks in some particular month, or at some certain time, without any guide to discriminate the critical juncture when each individual requires to be shut up. Thus the early made liquor lies open until January or February; that made at Christmas is sometimes left open until March or April.

"The intention of securing the liquor from the outward air is, evidently, that of preventing the vinous liquor from pursuing its natural propensity, that of entering the acetous fermentation; which, according to the general law of nature, all vinous liquors become liable to, as has been already observed, on their being exposed to the outward air, and a moderate degree of heat. Hence, liquors which have passed the vinous fermentation, and are kept open until the warm air of spring begins to exert its influence, necessarily become vinegar, or enter into a stage of dissolution, which, if not timely interrupted, terminates in vinegar. Hence the number of casks of liquor, which are every year lost, or materially injured, through a want of due attention to the time of laying up.

"The only criterion I have met with for judging the critical time of laying up, is when a fine white cream-like matter first begins to form upon the surface. But this may be too late; it is probably a symptom, at least, of the acetous fermentation, which, if it takes place in any degree, must be injurious. Yet, if the casks be bunged tight, some criterion is necessary; otherwise, if the vinous fermentation have not yet finally ceased, or should recommence, the casks will be endangered, and the liquor injured. Hence, in the practice of the most cautious manager, whose practice I have had an opportunity of observing, the bungs are first driven lightly, when the liquor is fine, and the vinous fermentation is judged to be over; and some time afterward, when all danger is passed, to fill up the casks, and drive the bungs in securely, with a rag, and rosin them over the top. Some open the casks again at six weeks, to refill them; others think this unnecessary.

"It is an idea pretty generally received, I believe, among the farmers at least, that liquor, after it has done fermenting, that is to say, presently after the last racking, should have something to feed on. Hence some feed it with parched beans; others with egg-shells; others with mutton suet, to the quantity of half a pound, cut into pieces as big as the finger, to each hoghead; and a variety of other things are put in to make it keep. There are men, however, who consider this as a vulgar error; being of opinion, that liquor cannot be laid up too clean. Nevertheless, it appears to me more than probable, that, when there

is danger to be apprehended from the acetous fermentation, something may be useful. Ifinglass is thought, by a most intelligent manager, to be serviceable in this intention, which is in my idea that of fixing the principle of the acetous fermentation, or at least clogging it so far as to lessen its activity.

"The dealers lay up much of their liquor in large casks, containing from four or five to eight or ten hogheads (of 110 gallons) each. In these casks, good cyder will lie many years. In hogheads, it is sometimes kept three or four years. But it is observable, that if cyder be kept too long in cask, it loses much of its richness and flavour, growing what is provincially called stummy, loses its mellowness, and becomes heady. This perhaps is owing to a decay of the richness, which before sheathed part of the spirit; but being now lost, the spirit obtains full power of action.

"The usual place of laying up liquor is a cellar or a vault; or for want of this, a room so situated as not to be liable to sudden change of heat and cold.

"The proper age at which to bottle, depends on the quality of the particular liquor to be bottled. Good cyder is seldom fit for bottling before it be a year old. It is sometimes unfit for this operation until it be two years old; something depending on the size of the cask, as well as on the quality of the liquor: the larger the casks, the longer the liquor may be suffered to lie in them.

"In bottling, as in almost every other step to be taken in the art under notice, there is a critical time, which ought to be observed, and which in this case is not difficult to be ascertained. Whatever degree of richness and flavour the liquor has at the time of bottling, the same, or nearly the same qualities, it will preserve in bottles for many years. Hence the critical time of bottling is, when the liquor has acquired, in cask, its highest degree of perfection, whether that juncture happen in one or two years, or in a longer or shorter time.

"A person, who has paid especial attention to this subject, and whose liquor is become in a manner proverbial throughout the district, has observed, that liquor which has been bottled in the fulness of its richness and flavour, has been friendly to the habit, passing off chiefly by insensible perspiration; while the same liquor, suffered to remain in cask until it has passed this juncture, became armed at all points; distracting to the head, in the first instance, and injurious to the whole frame.

"It is needless to say that the liquor ought to be fine at the time of bottling. If not so at the critical time, the common force of eggs or ifinglass is made use of.

"It ought likewise to be bottled in cool weather, otherwise the bottles are more liable to fly.

"Good cyder should be kept as wine; and as this may be kept to almost any age, the several species of fruit liquor being very similar in their nature.

"Cyder, which has been sweetened with Lisbon sugar, by the London dealers, to suit the palates of their customers, is apt to fly: the bottles therefore in this case should be kept upright. Also when the liquor, though genuine, is bottled at an early age, the bottles, in the first instance at least, ought not to be laid down." See ORCHARD and PERRY.

CYTISUS, the name of a plant much cultivated by the old Romans for the food of cattle, and called by some, shrub trefoil, and by others shrub lucern.

It rises to the height of five, six, or even more feet, with a shrubby stalk, covered with a greyish bark, and divided into many branches, covered with a hoary down while they are young, and garnished at each joint with trifoliate leaves standing upon foot-stalks about an inch in length. There are two or three of these at each joint, so that the branches are closely covered with them. The lobes

are small, spear-shaped, and hoary on their under-side; and these leaves remain all the year. The flowers, which are of a bright yellow, blow on footstalks which arise from the sides of the branches, each footstalk sustaining four or five flowers, and these are succeeded by compressed moon-shaped pods, each containing three or four kidney-shaped seeds.

The cytissus may be raised either from its seed sown about the middle of October, or in the beginning of April; or if greater speed be desired, from cutting slips or layers, planted in the spring or autumn, so as to leave a space of four feet between each plant. Such are the directions of Columella; who adds, that if the ground be well dunged for this planting, and well hoed up round the plant, which should be watered during the first fortnight, if rain does not fall, plentiful crops may be obtained from this excellent vegetable, equally fit for horses, oxen, cows, sheep, hogs, goats, and poultry. It is also singularly profitable for bees, whose honey it increases prodigiously. It has the same effect upon the milk of cows, besides greatly improving its quality. In the kingdom of Naples the goats feed upon it, and great quantities of excellent cheese are made from their milk. In the islands of the Archipelago, the Turks make handles for their sabres of the wood of this shrub, which, when full grown, is as hard as ebony, and of a fine yellow colour. It will bear cutting as often as its shoots are about fifteen or eighteen inches long, which may be several times in the year; for it shoots and flowers during eight months in the countries where it grows well, and continues green during the whole winter, if the season be at all favourable. Its seeds begin to ripen towards the end of August, and continue to do so until the cold stops them. It will be fit for cutting at the end of three years at farthest, and should be carefully kept clear of weeds, and hoed up between each cutting. If given as green fodder, which it affords during eight months of the year, about fifteen pounds weight of it are sufficient for the daily food of a horse, twenty pounds for an ox, and so in proportion for other cattle, according to their size and strength. When made into hay, it should be given more sparingly, because it is then more nourishing. In this state it should be steeped in water, before it is given to cattle, and then be mixed with chaff or straw. The time of cutting it for hay, is when the greater part of its seeds begin to grow large; and the manner of making this hay is, to let the swarths lie some hours in the sun, till they are faded, and then to dry them thoroughly in the shade. *Columella de Rustica, lib. V. cap. 12.*

Mr. Miller allows the cytissus every quality that can recommend it for the feeding of cattle in the countries where it grows naturally, such as the islands of the Archipelago, Sicily, and the warmest parts of Italy; but is persuaded that it will not thrive in England, so as to be of any real advantage for that purpose here, because it cannot bear such hard frosts as we sometimes have; or if it does not bear them so far as not to be absolutely killed, it will be so much damaged thereby, as not to be able to recover its verdure before the middle or latter end of May, nor even then, to put forth shoots that will bear cutting more than once in a summer; besides, their being so woody, if suffered to grow to any considerable length, as to render that cutting very troublesome, and of little service by way of fodder. He therefore thinks, upon the whole, that it can never answer the trouble and expence of cultivation in this country, where we have many other preferable plants; but that in hot, dry, rocky countries, of which we have now several in our colonies, where few other vegetables will thrive, this may be cultivated to great advantage, for it will live there many years, and prosper very well.

D.

DAB-CHICK, a chick newly hatched.

DAG, dew hanging upon the grass.

DAIRY, the occupation or art of making various kinds of food from milk, particularly butter and cheese. It also signifies the place where these operations are performed.

The following account of managing a dairy was written by a gentleman who has, for a considerable number of years, employed himself in that business, and acquired by his industry a plentiful fortune.

He begins with recommending the cultivation of sainfoin to every person concerned in a dairy, as it is observed to increase the milk of cows, both in quantity and quality, above any artificial pasture yet known, and therefore he advises the farmer to keep his cows upon it, and form a five years dairy.

"An acre of the worst land, continues he, will, when improved by this grass, maintain four cows very well from the first of April to the end of November, and afford besides a sufficient store of hay, to make the greater part of of their subsistence the four winter months following. You must buy then about four hundred milch-cows, but take care you chuse them with judgment. I have bought your largest sort of runts from Wales for less than fifty shillings a cow, with a good calf by her side, which I always disposed of as soon as I could. You will observe, that I make too good an use of the milk to afford the calf his share of it. I generally keep these cows above twelve months, and then selling them, sometimes for four pounds a piece, I stock myself with such that are new-milched. I observe this rule every year, and the trouble is sufficiently rewarded by the advantage it brings me; for besides the profit I make by selling dearer than I buy, I avoid the inconvenience of having any thing to do with bulls, and the consequences; so that I always preserve my cows in their full milk, and find it no uncommon thing for one of these milch-cows to be milked twice a day, and afford a gallon and a half at a meal. Four hundred of these cows will cost a thousand pounds; and you will find, that coming from a poor pasture to a rich, they will prosper and increase both in milk and size. In eight convenient places about your hundred acres let there be built eight thatched sheds; a little rising in the middle to carry off the water; the height may be ten feet, and the breadth thirty; each of these sheds should be a hundred and twenty-five feet long, and, under the highest part, directly in the middle, you must raise a slight partition, lathed and plastered, which serves to support the ridge of the roof, while the two sides are sustained by square wooden posts, about eight feet high, and placed at proper distances.

"On either side of the partition wall let there be fixed a kind of a rack, like those in stables, which is to run the whole length of the shed, and must be placed as high as a cow can reach her fodder from. The shed must next be divided into stalls, like those for stone-horses, and each stall will be above five feet broad; the length of these stalls must be exactly fitted to that of a cow, that a cross bar, being placed at the outward end, may keep the beast from running backwards: thus every shed will hold fifty cows, five and twenty on each side of the partition: to every one of these sheds you must appoint a man, whose business it will be to clear the place, and carry off the dung; as also to mow the sainfoin every day, and give it to the cows in the rack before-mentioned: this man beginning at one end of his proportion of ground, and going gradually on to the other, the first place will always be fit to mow again by that time he has gone through his whole division. Your cows are thus fed at discretion, with neither too much nor too little; they are not pestered with the scorching heats, nor troubled with the stinging-fly, which, in open pastures, often makes them walk about, and trample down more grass than they eat. At each end of every shed you must build a slight

room of brick, thirty feet square, and ten feet high, which is to be divided, the cross-way of the shed, into two partitions, each fifteen feet broad, and thirty feet long; that which joins the cow-house must be paved with tiles, and is to serve for a dairy; the other must be floored and windowed, and is to be a lodging-room for the dairy-maids. Every shed will require five maids, that is, to every ten cows one dairy-maid; fewer might serve, but it is better to exceed, than fall short in this particular. Thus each dairy will have two or three maids belonging to it, whose lodging will be the room adjoining, and whose care is to extend to the shed on both sides the partition, to the five and twenty cows which are the nearest to their station. All along both sides of the partition, at about a foot above the ground, let there be fixed, close to the wall, a strong pipe of lead, a little less than an inch diameter; both which pipes, being somewhat raised exactly in the middle of the shed, must have a gentle and almost an invisible descent from that rising to the dairies, through the wall of which their nether ends are to be brought, and there wrought into one another, that whatever descends through them, into either of the dairies, may have issue but at one mouth. This mouth of the pipes must be made very small, and neatly fitted into the hollow end of a strong wooden axle-tree; which, whilst it is turning swiftly round the mouth of the pipe, may by no means strain it by the motion, but receive, into its own hollow, the milk which descends through the leaden pipes, without spilling any, and passes so far through a wheel, or vessel like a barrel, only much larger in its circumference. The axle-tree, which this vessel is to turn upon, is bored very full of round holes, through which it delivers the milk into the vessel, as fast as it receives from the pipe.

"The vessel must be capable of containing, at least, three times the quantity of milk which is designed to receive; and there must be six wings, or thin pieces of wood, glued on edge-ways to the wooden axle-tree, whose length and breadth must be so contrived, as to leave a free space of six inches at either end of the axle-tree, and a foot between their edges length-ways, and the smooth inside of the vessel; in the most convenient part of which must be contrived a door, to open and shut down upon occasion, as closely as if there was none. This door will perform its work very neatly, if you line the inside and edges with some kind of cloth, which is commonly used in the pressing of cheese. The other solid end of the axle-tree must extend itself about five feet longer; and the whole length may be supported by square wooden posts, and turn in their tops, which are to be made hollow, and kept greased for that purpose. This end of the axle-tree is to be fastened into a wheel, exactly like those which are used in many places for roasting of meat. The diameter of this last wheel must be within six inches of the height of the dairy, and two or three large dogs being put into it at a time, will turn it with extraordinary swiftness: the dogs are easily taught, and will at last take delight in the exercise. I have brought up a large buck to the practice of this labour, and it is wonderful to see the force with which he runs round an hour or two together, and turns a wheel of ten feet diameter; but you must make your wheel as light as it can possibly hold together. I have but one thing more to say, and I finish this direction; pretty near that side of every stall in your shed, to which the maid must come to milk the cow which belongs to it, let a hole, as small as will serve the occasion, be contrived by your plumber, in the uppermost part of the leaden pipe, to shut and open with a little screw, which screw, for fear of losing it, may be fastened by a little iron chain to the body of the pipe. I have endeavoured, in the description of all this, to make my meaning as plain as possible, and hope the reader will, with a little attention, comprehend the whole."

The ingenious Mr. Lisle observes, that so much cleaning and scalding is necessary, that the dairy farmers spend as much

wood

is danger to be apprehended from the acetous fermentation, something may be useful. Ifinglass is thought, by a most intelligent manager, to be serviceable in this intention, which is in my idea that of fixing the principle of the acetous fermentation, or at least clogging it so far as to lessen its activity.

"The dealers lay up much of their liquor in large casks, containing from four or five to eight or ten hogheads (of 110 gallons) each. In these casks, good cyder will lie many years. In hogheads, it is sometimes kept three or four years. But it is observable, that if cyder be kept too long in cask, it loses much of its richness and flavour, growing what is provincially called stummy, loses its mellowness, and becomes heady. This perhaps is owing to a decay of the richness, which before sheathed part of the spirit; but being now lost, the spirit obtains full power of action.

"The usual place of laying up liquor is a cellar or a vault; or for want of this, a room so situated as not to be liable to sudden change of heat and cold.

"The proper age at which to bottle, depends on the quality of the particular liquor to be bottled. Good cyder is seldom fit for bottling before it be a year old. It is sometimes unfit for this operation until it be two years old; something depending on the size of the cask, as well as on the quality of the liquor: the larger the casks, the longer the liquor may be suffered to lie in them.

"In bottling, as in almost every other step to be taken in the art under notice, there is a critical time, which ought to be observed, and which in this case is not difficult to be ascertained. Whatever degree of richness and flavour the liquor has at the time of bottling, the same, or nearly the same qualities, it will preserve in bottles for many years. Hence the critical time of bottling is, when the liquor has acquired, in cask, its highest degree of perfection, whether that juncture happen in one or two years, or in a longer or shorter time.

"A person, who has paid especial attention to this subject, and whose liquor is become in a manner proverbial throughout the district, has observed, that liquor which has been bottled in the fulness of its richness and flavour, has been friendly to the habit, passing off chiefly by insensible perspiration; while the same liquor, suffered to remain in cask until it has passed this juncture, became armed at all points; distracting to the head, in the first instance, and injurious to the whole frame.

"It is needless to say that the liquor ought to be fine at the time of bottling. If not so at the critical time, the common force of eggs or ifinglass is made use of.

"It ought likewise to be bottled in cool weather, otherwise the bottles are more liable to fly.

"Good cyder should be kept as wine; and as this may be kept to almost any age, the several species of fruit liquor being very similar in their nature.

"Cyder, which has been sweetened with Lisbon sugar, by the London dealers, to suit the palates of their customers, is apt to fly: the bottles therefore in this case should be kept upright. Also when the liquor, though genuine, is bottled at an early age, the bottles, in the first instance at least, ought not to be laid down." See ORCHARD and PERRY.

CYTISUS, the name of a plant much cultivated by the old Romans for the food of cattle, and called by some, shrub trefoil, and by others shrub lucern.

It rises to the height of five, six, or even more feet, with a shrubby stalk, covered with a greyish bark, and divided into many branches, covered with a hoary down while they are young, and garnished at each joint with trifoliate leaves standing upon foot-stalks about an inch in length. There are two or three of these at each joint, so that the branches are closely covered with them. The lobes

are small, spear-shaped, and hoary on their under-side; and these leaves remain all the year. The flowers, which are of a bright yellow, blow on footstalks which arise from the sides of the branches, each footstalk sustaining four or five flowers, and these are succeeded by compressed moon-shaped pods, each containing three or four kidney-shaped seeds.

The cytissus may be raised either from its seed sown about the middle of October, or in the beginning of April; or if greater speed be desired, from cutting slips or layers, planted in the spring or autumn, so as to leave a space of four feet between each plant. Such are the directions of Columella; who adds, that if the ground be well dunged for this planting, and well hoed up round the plant, which should be watered during the first fortnight, if rain does not fall, plentiful crops may be obtained from this excellent vegetable, equally fit for horses, oxen, cows, sheep, hogs, goats, and poultry. It is also singularly profitable for bees, whose honey it increases prodigiously. It has the same effect upon the milk of cows, besides greatly improving its quality. In the kingdom of Naples the goats feed upon it, and great quantities of excellent cheese are made from their milk. In the islands of the Archipelago, the Turks make handles for their sabres of the wood of this shrub, which, when full grown, is as hard as ebony, and of a fine yellow colour. It will bear cutting as often as its shoots are about fifteen or eighteen inches long, which may be several times in the year; for it shoots and flowers during eight months in the countries where it grows well, and continues green during the whole winter, if the season be at all favourable. Its seeds begin to ripen towards the end of August, and continue to do so until the cold stops them. It will be fit for cutting at the end of three years at farthest, and should be carefully kept clear of weeds, and hoed up between each cutting. If given as green fodder, which it affords during eight months of the year, about fifteen pounds weight of it are sufficient for the daily food of a horse, twenty pounds for an ox, and so in proportion for other cattle, according to their size and strength. When made into hay, it should be given more sparingly, because it is then more nourishing. In this state it should be steeped in water, before it is given to cattle, and then be mixed with chaff or straw. The time of cutting it for hay, is when the greater part of its seeds begin to grow large; and the manner of making this hay is, to let the swarths lie some hours in the sun, till they are faded, and then to dry them thoroughly in the shade. *Columella de Rustica, lib. V. cap. 12.*

Mr. Miller allows the cytissus every quality that can recommend it for the feeding of cattle in the countries where it grows naturally, such as the islands of the Archipelago, Sicily, and the warmest parts of Italy; but is persuaded that it will not thrive in England, so as to be of any real advantage for that purpose here, because it cannot bear such hard frosts as we sometimes have; or if it does not bear them so far as not to be absolutely killed, it will be so much damaged thereby, as not to be able to recover its verdure before the middle or latter end of May, nor even then, to put forth shoots that will bear cutting more than once in a summer; besides, their being so woody, if suffered to grow to any considerable length, as to render that cutting very troublesome, and of little service by way of fodder. He therefore thinks, upon the whole, that it can never answer the trouble and expence of cultivation in this country, where we have many other preferable plants; but that in hot, dry, rocky countries, of which we have now several in our colonies, where few other vegetables will thrive, this may be cultivated to great advantage, for it will live there many years, and prosper very well.

D.

DAB-CHICK, a chick newly hatched.

DAG, dew hanging upon the grafs.

DAIRY, the occupation or art of making various kinds of food from milk, particularly butter and cheefe. It also fignifies the place where thefe operations are performed.

The following account of managing a dairy was written by a gentleman who has, for a confiderable number of years, employed himfelf in that bufinefs, and acquired by his induftry a plentiful fortune.

He begins with recommending the cultivation of fainfoin to every perfon concerned in a dairy, as it is obferved to increafe the milk of cows, both in quantity and quality, above any artificial pafture yet known, and therefore he advifes the farmer to keep his cows upon it, and form a five years dairy.

"An acre of the worft land, continues he, will, when improved by this grafs, maintain four cows very well from the firft of April to the end of November, and afford befides a fufficient ftore of hay, to make the greater part of of their fubfiftence the four winter months following. You muft buy then about four hundred milch-cows, but take care you chufe them with judgment. I have bought your largeft fort of runts from Wales for lefs than fifty fhillings a cow, with a good calf by her fide, which I always difpofed of as foon as I could. You will obferve, that I make too good an ufe of the milk to afford the calf his fhare of it. I generally keep thefe cows above twelve months, and then felling them, fometimes for four pounds a piece, I ftack myfelf with fuch that are new-milched. I obferve this rule every year, and the trouble is fufficiently rewarded by the advantage it brings me; for befides the profit I make by felling dearer than I buy, I avoid the inconvenience of having any thing to do with bulls, and the confequences; fo that I always preferve my cows in their full milk, and find it no uncommon thing for one of thefe milch-cows to be milked twice a day, and afford a gallon and a half at a meal. Four hundred of thefe cows will coft a thoufand pounds; and you will find, that coming from a poor pafture to a rich, they will prosper and increafe both in milk and fize. In eight convenient places about your hundred acres let there be built eight thatched fheds; a little rifing in the middle to carry off the water; the height may be ten feet, and the breadth thirty; each of thefe fheds fhould be a hundred and twenty-five feet long, and, under the higheft part, direftly in the middle, you muft raife a flight partition, lathed and plaftered, which ferves to fupport the ridge of the roof, while the two fides are fupported by fquare wooden pofts, about eight feet high, and placed at proper diftances.

"On either fide of the partition wall let there be fixed a kind of a rack, like thofe in ftables, which is to run the whole length of the fhed, and muft be placed as high as a cow can reach her fodder from. The fhed muft next be divided into ftalls, like thofe for ftone-horfes, and each ftall will be above five feet broad; the length of thefe ftalls muft be exactly fitted to that of a cow, that a crofs bar, being placed at the outward end, may keep the beaft from running backwards: thus every fhed will hold fifty cows, five and twenty on each fide of the partition: to every one of thefe fheds you muft appoint a man, whofe bufinefs it will be to clear the place, and carry off the dung; as alfo to mow the fainfoin every day, and give it to the cows in the rack before-mentioned: this man beginning at one end of his proportion of ground, and going gradually on to the other, the firft place will always be fit to mow again by that time he has gone through his whole divifion. Your cows are thus fed at difcretion, with neither too much nor too little; they are not pefttered with the fcorching heats, nor troubled with the flinging-fly, which, in open paftures, often makes them wifk about, and trample down more grafs than they eat. At each end of every fhed you muft build a flight

room of brick, thirty feet fquare, and ten feet high, which is to be divided, the crofs-way of the fhed, into two partitions, each fifteen feet broad, and thirty feet long; that which joins the cow-houfe muft be paved with tiles, and is to ferve for a dairy; the other muft be floored and windowed, and is to be a lodging-room for the dairy-maids. Every fhed will require five maids, that is, to every ten cows one dairy-maid; fewer might ferve, but it is better to exceed, than fall fhort in this particular. Thus each dairy will have two or three maids belonging to it, whofe lodging will be the room adjoining, and whofe care is to extend to the fhed on both fides the partition, to the five and twenty cows which are the neareft to their ftation. All along both fides of the partition, at about a foot above the ground, let there be fixed, clofe to the wall, a ftrong pipe of lead, a little lefs than an inch diameter; both which pipes, being fomewhat raifed exactly in the middle of the fhed, muft have a gentle and almoft an invifible defcent from that rifing to the dairies, through the wall of which their nether ends are to be brought, and there wrought into one another, that whatever defcends through them, into either of the dairies, may have iffue but at one mouth. This mouth of the pipes muft be made very fmall, and neatly fitted into the hollow end of a ftrong wooden axle-tree; which, whilft it is turning fwiftly round the mouth of the pipe, may by no means ftrain it by the motion, but receive, into its own hollow, the milk which defcends through the leaden pipes, without fpillling any, and paffes fo far through a wheel, or vefel like a barrel, only much larger in its circumference. The axle tree, which this vefel is to turn upon, is bored very full of round holes, through which it delivers the milk into the vefel, as faft as it receives from the pipe.

"The vefel muft be capable of containing, at leaft, three times the quantity of milk which is defigned to receive; and there muft be fix wings, or thin pieces of wood, glued on edge-ways to the wooden axle-tree, whofe length and breadth muft be fo contrived, as to leave a free fpace of fix inches at either end of the axle-tree, and a foot between their edges length-ways, and the fmooth infide of the vefel; in the moft convenient part of which muft be contrived a door, to open and fhut down upon occafion, as clofely as if there was none. This door will perform its work very neatly, if you line the infide and edges with fome kind of cloth, which is commonly ufed in the preffing of cheefe. The other folid end of the axle-tree muft extend itfelf about five feet longer; and the whole length may be fupported by fquare wooden pofts, and turn in their tops, which are to be made hollow, and kept greafed for that purpofe. This end of the axle-tree is to be faftened into a wheel, exactly like thofe which are ufed in many places for roafting of meat. The diameter of this laft wheel muft be within fix inches of the height of the dairy, and two or three large dogs being put into it at a time, will turn it with extraordinary fwiftness: the dogs are eafily taught, and will at laft take delight in the exercife. I have brought up a large buck to the practice of this labour, and it is wonderful to fee the force with which he runs round an hour or two together, and turns a wheel of ten feet diameter; but you muft make your wheel as light as it can poffibly hold together. I have but one thing more to fay, and I finifh this direftion; pretty near that fide of every ftall in your fhed, to which the maid muft come to milk the cow which belongs to it, let a hole, as fmall as will ferve the occafion, be contrived by your plumber, in the uppermoft part of the leaden pipe, to fhut and open with a little fcrew, which fcrew, for fear of loofing it, may be faftened by a little iron chain to the body of the pipe. I have endeavoured, in the defcription of all this, to make my meaning as plain as poffible, and hope the reader will, with a little attention, comprehend the whole."

The ingenious Mr. Lifle obferves, that fo much cleaning and fcaiding is neceffary, that the dairy farmers fpend as much wood

wood in fire for that purpose, during the summer, as they burn for other purposes in the winter.

If the milk vessels are not kept clean they will be sour, and the cheese will be sour before it can come, and it will eat sour and choaky. A cold dairy is a great means of preserving cream from turning sour. The milk-houses should also be large, for otherwise the steam arising from the hot milk as brought in from the cows will heat the air of the room.

Care should be taken when cows begin to give off their milk, to milk them clean; for if this be neglected they will soon grow dry. Cows generally begin to give off the height of their milk about the time of the blossoming of the wheat, and continue so till a good aftermath comes on, when their milk will increase; but cold and rainy weather in the autumn will soon abate their milk again. Perhaps the reason why the milk of cows abates about wheat blossoming time is, because about that time the grass of the field blossoms also, and the flush of the sap is come to its height and maturity, and then abates, for the roots of the grass at that time begin to harden and grow dry; nor do they take in the juices of the earth so freely as they did before, and therefore grow drier and drier, till the seed is hardened. The seed being thus brought to maturity, the roots of the grass for some time, till the cold of the winter checks them, strike fresh sap roots, or buds, preparative to the ensuing spring, and which will the next year be the spring roots and increase. On these new efforts the start of the autumn grass depends, till the cold checks it. The grass is called the aftermath, and upon the growth of this the cows milk depends.

It has been observed, that the milk of the hill-country cows do not yield the same proportion of cream as that of the Vale cows; owing, in all probability, to the poverty of the hill-country cows, which are generally poor in case.

Thunder will break the cream, and turn the milk in the milk-pans, so that no cream can be skimmed off for butter; nor will the cheese-curd hold together, but will break asunder.

It is commonly said, that a quart of cream will make a pound of butter; but this must be understood of cream that hath stood two or three days to settle, for three pints of cream just skimmed from the milk, will, in three days, be reduced to nearly a quart. If you bring in the milk and strain it immediately into the pans, without letting it first stand to cool, the cream produced by it will be much less than it would have been if the milk had been suffered to stand and cool before straining.

In some parts of Devon and Dorsetshire, they set the milk over the fire in brass pans to warm, which makes the cream rise, and when a bladder is formed in the middle, they take the pans from the fire, skim off the cream, and put it into a tub. After this the dairy-maid, by only putting her hand, and stirring it about in the tub, brings it presently to butter, without the help of a churn. The butter made by this method is very rich, but the cheese made from the skim-milk very poor. See the article BUTTER, CHEESE.

The hill-country farms are not so well adapted to a dairy as those in the Vale; because the foddering season in the former holds so much longer, occasioned by the rowet-grass falling off a month sooner, and the spring-grass coming a month later than in the Vale. *Lisle's Husbandry*, vol. II. p. 139.

Mr. Marshall, in his *Rural Economy of the Midland Counties*, is copious on the subject of the dairy and says,

"The size of dairies has of course increased with that of farms. A hundred cows are, nevertheless, considered as a very large dairy: there are few so large. Forty or fifty cows are considered as a dairy above the middle size.

"The species of cow, here, as in the Upper Vale, is indeterminate. Gloucestershire, north-country, and a mongrel breed, between the two. Five years ago it was said that the north country cows were losing ground: and that the old stock were coming again into esteem.

"I remember the observation of an experienced dairy-woman in 1783 was, that the north-country cows neither milk so well nor fat so well as the true dark-brown Gloucestershire breed. Nevertheless, I cannot perceive that they have made any progress. On the contrary the long-horned breed appear to have increased since that time.

"A man whose knowledge of the rural affairs of this district, and of the several breeds of cattle of this quarter of the island, is extensive, and whose remarks are seldom superficial, sees this recent increase of the northern breed of

cows in a point of view which seems to have escaped the observation of others. He is of opinion, that it has been effected by other circumstances than the comparative merits of the two breeds of cows; which, he thinks, has had little or no influence in the change that has been taking place. He attributes it to the advanced price of dairy produce, during a succession of years last past. The dairy being found, in this well soiled dairy country, to pay better than breeding; this of course declined: and, as the young stock diminished, the quantity of vacant pasture increased: consequently an increase of alien cows became doubly requisite. This increase was not to be obtained from the Gloucestershire breed; nor could the supply be drawn from the kindred breeds of the neighbouring districts; nor perhaps from any other source than that from which it has been principally drawn: namely the north of Staffordshire; where breeding is the principal object, and where the produce of the dairy is of much less value than it is in the Vales of Gloucestershire.

"Certain it is, that on farms, whose grounds, by soil and situation, are wholly adapted to the dairy, we see the greatest proportion of north country cows; while on those which have rough or distant grounds belonging to them, adapted to breeding, the Gloucestershire cows still hold possession; and, by those who have them, are still in the highest esteem.

"Impressed with these ideas, the ingenious author of these remarks is of opinion, that should the dairy continue, for a length of years in its present declining state; especially if breeding should continue to pay so well as it has lately done; the influx of alien cows will be stopped; their prices will no longer be a temptation to the dealers, and their places in the pastures will be occupied by rearing stock: not of the north-country, but of the Gloucestershire breed.

"Be this as it may, it is, I believe, a well-known fact, that the cheese of this district has been falling off, in point of superior excellency, since about the time of the introduction of north-country cows; and an advocate for the Gloucestershire breed would of course argue, that the north-country cows are unfriendly to cheese. On the contrary, however, it is asserted, by those who are the best authority in this case (the cheese factors) that there are dairies consisting wholly of north-country cows, which make cheese of the first quality. While the advocates for the breed assert, that their milk not only makes cheese of a good quality, but that it affords a greater proportion of curd, than that of the Gloucestershire breed.

"Upon the whole, therefore, we have sufficient evidence I think, to conclude, that the superior excellency of the Berkeley cheese is not, nor ever was, owing to the species of cow.

"The cow management, here, is similar to that of the Upper Vale: except that a smaller proportion are bred in this Vale: the richer lands having been considered, of late years at least, as too good for breeding. On the skirts of the hills, and on the colder lands, there are, nevertheless, many breeding farms. The north country sort are bought of the jobbers at Gloucester. As they fail in their milk, they are put to fattening on the dairy farm, or sold to graziers.

"A defect which has, it seems, lately crept into the management of cows in this Vale is noticeable. The cows, of many dairies, are said to come in too early in the spring: their milk is spent before the autumnal flush of grass sets in. The cool months of autumn are not only favourable to the manufacture of cheese; but the milk, of that season, is thought to yield a greater proportion of curd, than that of the summer months. I mention this as the observation of a man who is singularly entitled to attention; being intimately acquainted with every department of the dairy management of this country. But may not this deficiency of autumnal produce be in some measure owing to the nature of the long-horned cows? which, though they afford a flush of milk presently after calving, are observed, (the higher bred ones at least) to lose it much sooner than those of most other breeds.

"In the choice of cows, dairy farmers are guided by different criterions.

"The Derbyshire cow remains the favourite of the old dairies. They argue, that the grazier and the dairy-man, distinctly considered, require different animals to suit their respective purposes. The dairier's object is milk; the grazier's beef; and it is a trite remark, among dairy-men in different districts, that a cow which runs to beef is unprofitable to the dairy: for notwithstanding the excellency of her

her bag, and the plentifulness of her milk, presently after calving, her natural inclination to fleshiness draws off her milk : while a cow that is by breed, or natural constitution, prone to milk, will supply this, at the expence of her carcase, let her pasture be ever so plentiful.

" These popular opinions, however, though they contain much truth, are not altogether well founded. They hinge on a false principle. Cows are useful, and in a great degree necessary, in a twofold capacity : as dairy-cows, and as grazing stock : the dairy-man and the grazier cannot have distinct animals : one and the same individual must serve both their purposes. And a breed of cows, fit for the grazier only, is, in a general light, not less eligible, than a breed which is fit only for the dairy-man.

" The Derbyshire cows are unprofitable as grazing stock. They have neither beauty nor utility of form ; being loaded with offal of every kind. The head thick, the chap and neck foul, the bone proportionably large, the hide heavy, and the hair long ; even the bag is not unfrequently so overgrown, as to be almost hid in hair ; a point of milking cows to which dairy-women, of most districts, have an objection : this, however, only serves to shew that popular criterions are seldom to be depended upon. Were the flesh and fatting quality of the Derbyshire cows equal to their quality as dairy cows, the hairiness of their bags might well be dispensed with.

" The Staffordshire cows bear a different characteristic. Taking them together, they are rather adapted to grazing, than the dairy ; most of them being tolerably clean. But, in general, they are too gaunt in their carcases to be eligible, either as dairy or grazing stock.

" Nevertheless, there are individuals of this breed ; or rather, perhaps, of a breed between this and the Derbyshire ; that may be said to be at once eligible as dairy cows and grazing stock. At least, they come nearer my idea of what a cow ought to be, than any other breed or variety of the long-horned breed, I have yet had an opportunity of observing.

" Whether the individuals, now under notice, have or have not been produced by a mixture of the Staffordshire and Derbyshire blood, they are the most prevalent on the banks of the Trent, which divides the two counties ; it is, indeed, the breed which is there found, more particularly on the Derbyshire side, from Walton towards Stanton, which falls under this description.

" The following are accurate dimensions of a middle-aged cow of this kind ; somewhat low in flesh, and young in calf.

" Height at the withers, four feet two inches and a quarter.

" ——— of the brisket, nineteen inches.

" Smallest girt, six feet five inches.

" Largest girt, seven feet eight inches and a half.

" Length from forehead to nache, seven feet three inches.

" ——— from shoulder-knob to the center of the hip, three feet eight inches.

" ——— from the center of the hip to the out of the nache, twenty-one inches.

" Width at the shoulders, twenty inches.

" ——— at the hips, twenty-two inches.

" ——— the nache, thirteen inches.

Length of the horns, twenty-four inches ; their width from point to point, three feet four inches.

" The forend fine, long, and standing low.

" The head small, and the neck thin, but deep, according with the depth of her bosom.

" The shoulders fine, the ribs full, and the loin broad.

" The thighs remarkably thin below, as if to give room to her bag, large, clean, and bladder-like ; with long teats, and remarkably large elastic milk veins ; furnishing an ample supply of milk.

" The legs short, with the bone fine (7½ inches girt).

" The flesh good, and the hide of a middle thickness.

" The colour a brindled mottle, with a finch back, and white legs.

" In temper remarkably cadish, gentle ; a quality of considerable value, in a cow intended for the pail.

" The principal distinction observable between the form of what is here spoken of as a dairy cow, and that of a cow of the modern breed, or what is more generally understood by a good grazier's cow, is, the former is more roomy and better let down in the chest ; the latter, better topped ; fuller on the chine and loin ; and, generally, fuller in the thigh. Both of them are clean in the forend and shoulder ;

the bone in both is fine ; the flesh of both good (but that of the modern breed indisputably better) ; and their hides of a middle thickness.

" But the most material difference, and that which determines the dairy-man in his choice, is, the one loses her milk a few months after calving ; the other, if required, will milk the year round.

" In the summer management of dairy cows, I have met with nothing of superior excellence in this district. They are turned to grass, about May-day ; allowing from an acre and half to two acres to a cow : kept generally in one and the same pasture, until aftergrass be ready to receive them ; and have turneps thrown to them (by those who grow turneps) on grassland, in autumn.

" In this district, however, one instance of practice occurred to me which requires to be registered ; namely, that of a dairy of fourteen or fifteen cows being principally dried off together, on one day (the middle of December) ; preserving two or three, only, in milk, for the family, during the winter months ; keeping these at hay ; putting the dried cows to straw ; for which purpose, only, they were dried off in this remarkable manner.

" It is observable, however, that this practice can be eligible only, when cows come well in together : to effect which they are bulled as fast, that is to say as near together, as possible.

" Unnatural as this expedient will no doubt be deemed by many, it may, nevertheless, in some cases, be eligible : all I shall say farther of it is, that if I had not observed it in the practice of one of the oldest and best managers in the district, I should not have registered it.

" In the winter management of dairy cows, one circumstance may be noticed ; that of their being frequently kept (in conformity to a modern practice adopted by some leading men) in sheds, which have been described under the head buildings, continually throughout winter, from the time of their being taken up in autumn, to that of their being turned to grass in the spring, generally four months, without any exercise.

" Some discerning individuals, however, have already discovered the inconveniences of this practice, especially that of their hoofs cracking ; let them loose in a yard, a few hours every day, to moisten their feet, as well as to exercise their legs, and clean their coats.

" In what might be called the natural practice of the district, dairy farmers not only rear but fat their own cows. One of the largest farmers in the district told me that he never bought a cow in his life, he rears fifteen, eighteen, or twenty calves yearly, and fats his own stock ; or, for want of room, sells them to graziers.

" This forms a beautifully simple plan of management ; well adapted to a middle soil farm ; and especially eligible for gentlemen, and others, who are deficient in judgment, and unacquainted with markets. The proportion of grass and arable being determined upon, and the quantity of stock ascertained, the machine is regulated, and nothing but a due attention to the number of heifers, annually reared, is wanted to keep it in continual and uniform motion. A certain number of dairy cows, with a lot of fatting cattle, and another of young stock to follow them, in summer, and to eat straw in winter. No going to market, but with corn, dairy produce, and cullen cows. A plan of general management, beautiful in theory ; and, if one may judge from the comfortable independency which the person above alluded to is possessed of, through a perseverance, by his father and himself, in this course of management, it is eligible in practice.

" Warwickshire, almost throughout, comes under the description of a dairy county ; and, in the district of the station, the dairy forms a considerable branch of the business of almost every farm. The outlines of practice are, therefore, requisite to be traced.

" The sizes of dairies, here, are seldom large : fifty cows form the largest in the district : thirty are considered as a large-sized dairy : twenty a middling size.

" In taking a view of the dairy of this district, it will be necessary to separate the three principal branches :

" Calves ; Butter ; Cheese.

" The male calves, except such as are reared for breeding, are, almost invariably fatted.

" Calves are, here, fatted at the tent ; and, in the early part of the season, are kept to a good age. But cheese-making once begun, they are butchered as they drop : at not more, perhaps, than three or four days old ; nor at more, perhaps, than three or four shillings price. The

market, the manufacturing towns and the collieries, of Staffordshire.

"The only circumstance relative to the management of fattening calves, which requires notice, is an expedient used by some individuals, but not, I believe, in universal practice; to make them lie quiet; more especially during a temporary scarcity of milk; which will sometimes take place. In this case, balls, made of wheat flour, and a sufficient quantity of gin to form it into a paste, are given them; three balls, about the size of walnuts, being given about a quarter of an hour after each meal. The effect is, that instead of wasting themselves by incessant bawling, they lie quiet; sleeping a principal part of their time. By a little custom, the calves get fond of these paste balls; eating them freely out of the hand; a proof of their being acceptable to their stomachs. As an expedient, they are evidently eligible; and may be of service to a restless calf; even when milk is plentiful. This, however, by way of intimation.

"The only idea which I met with respecting milk butter, and which is entitled to a place here, is that of doing away the rancidness of turnep butter, and the bitterness of barley straw butter, by a most simple and very rational means. Instead of putting the cream, immediately as it is skimmed off the milk, into the jar or other retaining vessel, it is first poured upon hot water, and, having stood till cool, is skimmed off the water; a new idea: but, I will venture to repeat, a most rational one; though I have not myself had an opportunity of proving it.

"In the same dairy in which the above expedient is used, a method of improving the quality of whey butter is practised. This improvement is effected by scalding each meal of cream, as it is taken off the whey; by hanging it over the fire until scalding hot; being careful not to let it boil. This too, I register as a simple and rational process, and not as one whose efficacy I have proved by my own experience. I register them, however, on an authority which I have no reason to doubt.

"Cheese is the grand object of the Midland dairy. Very considerable quantities are annually made; particularly, as has been observed, in Warwickshire, and in this neighbourhood, where cheese of a very fine quality is not unfrequently produced.

"It will, therefore, be proper to take a general view of the subject; for, although, after the recital of the practices of Gloucestershire and Wiltshire, much important information cannot be expected; yet it is more than probable, some interesting circumstances will arise.

"The particulars which, in this case, require to be noticed, are, soil, herbage, managers, species of cheese, time of making, quality of milk, colouring, running, curd, cheese.

"Of the soils of the best dairy parts of this district, it appears a cool soil is favourable to cheese.

"Nevertheless, I received an idea, here, from a most experienced and intelligent manager, that a very cold weak soil is improper for the dairy: that is to say, a soil may be too cool for the purpose. The cheese it affords, though good in quality, is found deficient in quantity. His own farm being principally of that description of land, he has, during the latter part of his life, made rearing his principal object; considering his dairy merely as being subordinate to that end.

"It remains to be registered, the circumstance of cheese being, not unfrequently, made from new leys; even of the first or second year; while they consist chiefly of red clover, with, perhaps, a mixture of raygrass; yet, from these cultivated grasses, provided trefoil make no part of them, good cheese is made. A fact which dairy farmers, in some districts, would not readily credit.

"A striking instance of the folly of dairymen being inattentive to the business of cheesemaking occurs in this district; where a dairy farmer declares, that, one year, he lost forty pounds, by the mismanagement of his dairy-woman. This led him to an investigation of the business, himself, and this to a sufficient degree of superintendence, to prevent in future a similar loss.

"The only factor's cheese made in this district, is thin cheese of new milk. The size that of single Gloucestershire, or somewhat thicker.

"The cheese vats of this district are merely hoops of ash, with a board bottom. I do not recollect to have seen one instance of turned vats being in use. The dia-

meter about fifteen inches. The depth two inches, more or less.

"The fillet of this district is of wood: a long shaving or splint of ash; an inch or more wide, and an eighth of an inch or more thick; not formed into a hoop, but left open, with the ends tapering thin, and overlapping several inches. The part of the cheese which rises above the vat being gathered up and pinched in this fillet, its lower edge is entered within the vat, and, a broad cheese board being put upon it, sinks down with the upper part of the cheese into the vat. In 1789, tin fillets became prevalent: an admirable improvement. Some care, however, is requisite, it seems, to prevent their rusting.

"For family cheese, more or less skim milk is used; and sometimes, I understand, all skim milk. But this not being conformable to the prevailing custom of the country, the practice is looked upon as sordid, and waste becomes the necessary consequence.

"Leicestershire is, at present, celebrated for its cream cheese, known by the name of Stilton cheese.

"Cream cheese being an article of luxury merely, and a species of produce which cannot become of general utility to agriculture, the art of making it does not come within the plan of this work; I therefore proceed to the manufacturing of milk cheese, agreeably to the practice of the district of the station.

"Where the family is large, it is customary to begin as soon as the cows afford milk enough for a cheese; continuing to make family cheese, until the cows go out to grass. From the beginning of May to the beginning of August, is the time of making what is termed year's cheese: continuing from that time, to the latter end of October, to make what is called the latter weigh; likewise for the factor; and from that time, until the cows go off their milk, make family cheese.

"It is not so customary, here, as in the other cheese countries, to skim a part of the milk from which factor's cheese is made; nevertheless, in some dairies it is practised; the proportion skimmed, varying in different dairies.

"In the ordinary practice of the district, cheese is not coloured. Nevertheless, some few individuals use colouring; and find their advantage in doing it. The produce of one passes, at market, for Warwickshire, that of the other for Gloucestershire cheese; the factors of course will give more for the latter than the former. To the consumers, therefore, this filthy practice owes its prevalence.

"In this district, an instance is mentioned in which a large lump of alum being kept in the cowl, during the time of coagulation, was believed to be efficacious in preventing the cheese from heaving.

"The ordinary heat of the milk 85° to 90°. The time in coagulating, held out as proper, is about an hour; but, in practice, I have seldom or ever found so slow a coagulation.

"In a considerable dairy, where tolerable cheese was made, the practice was to bring the curd in about a quarter of an hour; but not to break it up in less than three quarters; I mention this to shew how many different ways there are of producing cheese of a moderate quality.

"In some large dairies, more particularly, perhaps, under the practice last mentioned, the breaking is done, not with a knife or the hand, but with the churn dash; an admirable thought, so far as expedition is thereby promoted. But, in a cowl of delicate curd, this coarse tool would no doubt be improper.

"The gathering is done, in the usual manner, with the hands and the dish, the whey poured off through a sieve, and the curd rebroken.

"In the present established practice, the curd is not scalded; except in the practice of a few individuals; but generally the cheese. It is observable, however, and to me is very interesting, that the finest dairy of cheeses I saw in this district, was not scalded, either in the curd, or in the cheese.

"Cheese, in the press, having been vatted hard with the hands (or in some few instances, previously squeezed in the press), and having stood about an hour, it is taken out of the press and scalded; by immersing it in water, heated to about 150°, letting the evening's cheeses remain in the scalding liquor all night; and the morning's cheeses, until the water be cold; when they are placed again in the press, in which having remained a few hours, they are (in common practice) taken out; the cloth finally taken off; the

the cheeflings salted; replaced in the press; and, having stood another meal (in the whole two meals) are finally taken out of the press.

"On the shelves, cheefes, here, remain only a few days, with no peculiarity of treatment.

"On the floor, the year's cheefe, or first weigh, is seldom or ever cleaned. The edges of the latter weigh are sometimes scraped; and sometimes only rubbed with a hair-cloth; an admirable utensil in a cheefe chamber."

Mr. Marshall, in his Rural Economy of Norfolk, says,

"In the course of the summer of 1781, I likewise paid considerable attention to the art of making butter; registering at the time of observation, the minutiae of the different processes,

"In the production of good butter, much no doubt depends on soil and herbage; and something, perhaps, on the species of cow: much, nevertheless, depends upon management.

"The different stages of the art are, milking the cow, —setting the milk, —preserving the cream, —churning, —making up the butter for present use, —putting it down for future use.

"Cleanliness is the basis of the whole art. A dairy-maid should not be suffered to sit down under a cow with a pail which a fine lady would scruple to cool her tea in; nor until she has washed the teat of the cow and her own hands: and for this purpose clean water and a cloth should always be at hand.

"A cow should be milked at regular and stated hours; and, if possible, always by the same person: for cows, in general, will not give down their milk so willingly to a stranger as to one with whom they are intimate. The consequence is, the richest and best part of the milk is left behind in the udder, and the cow which is not clean-milked becomes dry prematurely.

"Much depends on the cleanness of the vessel, the degree of heat of the milk when set, and its depth in the vessel.

"In summer it is difficult to set milk to cool: in winter no time should be lost in getting it as soon as possible into the pan or milk-lead. Should it be set too hot in summer, the cream does not rise so smooth and rich, nor in so large a quantity, as when it has been set of a due degree of warmth: it is apt to come up frothy; and does not in this case, prove well in the churn.

"Judicious dairy-women, therefore, in summer, pour their new milk first into a large earthen jar or other vessel, there letting it remain half an hour; or until it be nearly cool, and the froth be sunk; and then putting it into the lead or pan, in which cold water has, until that time, stood.

"If it be set to cool in winter, the cream will not rise so thick as when set immediately from the teat, or has had a little hot water put into the milk; viz. about a pint of water to a gallon of milk, or as much as will make it new-milk warm: that is, ninety to ninety-five degrees.

"The depth of the milk should not exceed two inches: from one to two is a proper depth. If the milk be set too thick, the cream does not rise so freely; nor consequently, in so large a quantity in a given time. If set too shallow, it is difficult to separate the cream from it.

"The great art here lies in keeping the cream free from rankness to a proper age.

"Fresh cream affords a well-flavoured butter; but yields a less quantity than stale cream; it being a received opinion among dairy-women, that age, and a slight degree of sourness in the cream, increases the quantity, without injuring, sensibly, the quality of the butter; but that the smallest degree of rancidity in the cream spoils the flavour of the butter.

"In winter, cream may be easily kept free from any degree of acidity; but, in summer, it requires some care to keep it entirely free from rankness.

"A quantity of cream, though ever so judiciously taken off the milk, will, when put into a vessel, and suffered to stand some time, let fall a greater or smaller quantity of milk.

"It has been discovered that this milk, or dregs of the cream, which subsides at the bottom of the vessel, becomes rancid much sooner than the cream itself; and that, being suffered to remain at the bottom of the vessel, it presently communicates its rancidity to the cream: and further, that if it be permitted to mix again with the cream in the churn,

the butter takes that marbled half-cheese-like appearance under which we too frequently see it.

"Therefore, a judicious dairy-woman never suffers these dregs to remain any length of time under the cream. She has two means of preventing it; namely, repeatedly stirring them together to prevent them from subsiding too frequently; and, when a proper quantity is subsided, pouring off the cream into a fresh vessel, leaving the dregs behind. In summer, a good dairy-woman stirs her cream-jar every time (generally speaking) she goes into the dairy; and shifts it every morning (and in close muggy weather every evening) into a fresh, clean, well-scalded jar, or other vessel.

"To take off the rankness of cream produced from turneps, the Norfolk dairy-women sometimes scald their cream: this however is allowed to lessen its productiveness of butter; and I was told by a lady, whose attention to her dairy entitles her to credit in this case, that putting a quart of boiling water into each pail of milk before it be set, is a more effectual and less wasteful remedy.

"The principal art in churning lies in keeping the cream of a due degree of warmth in the churn; and in giving it a due and regular agitation. Warmth and a rapid motion makes it come quick: coolness, and a gentle motion, brings it slowly. If butter comes too quickly, it is soft and frothy, and soon turns rancid; nor does it part from the butter-milk so freely, nor yields so large a quantity, as when it has been a proper time in churning. If it come too slowly, there is labour lost; besides the butter losing its flavour and texture. From one to two hours is a proper length of time in churning.

"If the weather be hot, the churn ought to be chilled with cold water before the cream be put into it, and should be placed in a cool situation: if cold, scald the churn with boiling water, and endeavour to churn in a warm room. If in either case these be not sufficient, add hot or cold water to the cream during the time of churning.

"If the cream be inclined to get frothy in the churn, open its mouth for a few minutes, to let in the air, and give the froth time to dissipate; and the butter will generally come sooner than it would have done had the agitation been continued: for, while the cream is in a state of frothiness, the butter will not separate. Reversing the motion has sometimes a good effect.

"If the butter come in small particles which are slow in uniting, strain off part of the butter-milk; and the butter in general will sooner gather. Reversing the motion generally gathers the butter quickest.

"When the butter is sufficiently gathered in the churn, which is known by the largeness of the lumps, and the cleanness of the dashers, it is taken out; kneaded in a bowl, or other shallow vessel, to let out the butter-milk; spread thin over the inside of the bowl, and clean cold water poured over it; kneaded, broken, and re-spread in the water; the water poured off; the butter beaten, in large lumps or handfuls of three or four pounds, against the side of the bowl; respread; salted; the salt worked in; re-washed; and re-beaten, until the water come off unfullied; which it will do after two or three washings. It is then broken into pound-lumps; re-beaten against the bowl; and printed, or otherwise made up.

"But before the dairy woman begins to take the butter out of the churn, she first scalds, and then plunges immediately into cold water, every vessel and thing which she is about to make use of; in order to prevent the butter from sticking to them. In summer, when the butter is very soft, it is sometimes necessary to rub them after scalding with salt, which greatly assists the wood in retaining the moisture.

"She also puts her own hands into the hottest water she can bear them in; rubs them with salt; and immediately plunges them into cold water: this she repeats as often as she finds the butter stick to them.

"There is a finishing operation, which is sometimes given in the neighbourhood of the metropolis, and perhaps in some few provincial districts: in general, however, this excellent finish is omitted; either through want of knowledge, or want of industry, or through policy: for its use being to give not only firmness and a wax-like evenness of texture to the butter, but to extract from it entirely the butter-milk and the water in which it has been washed, the quantity is thereby lessened; for so many ounces of milk and water extracted, so many ounces fewer of butter go to market:

market: this however is the best proof of its utility; and butter cannot strictly be said to be marketable, until it has undergone this operation: which is thus performed.

"The bowl or tray being wetted to prevent the butter from sticking to it; and a cheese-cloth strainer or other cloth being washed in clean cold water and wrung as dry as possible; a pound-lump of butter is placed in the bowl; and, with a stroke of the hand proportioned to the stiffness of the butter, is beaten with the cloth, (by a kind of dexterity which can only be acquired by practice) and again beaten flat; the dairy-woman, every three or four strokes, rolling up either one side or the other of the pat, and moving it about in the bowl to prevent its sticking. As the cloth fills with moisture (which it extracts from the butter, and imbibes in the manner of a sponge) it is wrung and re-washed in clean cold water. Each pound of butter requires in cool weather four or five minutes to be beaten thoroughly, but two minutes are at any time of essential service.

"In warm weather it is well to beat it two or three times over; as the coolness of the cloth assists in given firmness to the butter.

"The more pure the butter is when put down, and the more perfectly it is afterwards kept from a communication with the outward air, the longer it will retain a state of perfect sweetness.

"The purity of butter consists in its being free from internal air, moisture, filth, and a rankness of flavour.

"The preservation of butter therefore depends principally on the pasture and the method of making. If the pasture be rank, whether through soil, manure, or herbage, it is generally injudicious to put down butter from it. But if the pasture be sweet, and the cows be properly milked, the milk judiciously set, the cream carefully kept, and properly churned; and the butter well worked up, with an additional quantity of salt, there is little art necessary in putting it up so as to preserve it sweet for several months: nevertheless, the more judiciously it is put down, the longer it will retain its sweetness.

"There are various vessels used for putting down butter. When a length of carriage is necessary, wooden firkins are the safest: glazed earthen-ware, however, is preferable when it can be made use of with safety and convenience: for, out of this, the external air may be entirely secluded.

"The figure or shape of a butter jar should be that of the lower frustum of a cone; namely, wider at the bottom than the top: resembling the standing or upright churn: the top of it being made sufficiently wide to admit of its being filled conveniently; but not wider.

"This form prevents the butter from rising in the jar, and effectually prevents the air from insinuating itself between the jar and the butter; whose natural elasticity presses it, in this case, still closer to the sides of the containing vessel: but, were the form of this reversed, the same propensity of expansion in the butter would separate it from the sides of the jar, so that towards the top, a knife might (as it frequently may) be drawn round between them, and the air of course have free admission.

"The method of putting it down is this:—The butter having lain in pound-lumps twenty-four hours, the dairy-woman takes two or three of the lumps, joins them together, and kneads them in the manner in which paste is kneaded. This brings out a considerable quantity of watery brine; which being poured out of the bowl, the butter is beaten with a cloth as before; and the jar having been previously boiled, or otherwise scalded, and having stood to be perfectly cool and dry, the butter is thrown into it, and kneaded down as close and firm as possible, with the knuckles and the cloth alternately; being careful not to leave any hollow cell or vacuity for the air to lodge in; more particularly round the outsides, between the butter and the jar: and for this purpose, she repeatedly draws her finger round by the sides of the jar; pressing the butter hard, and thereby uniting intimately the jar and butter.

"It is fortunate when the jar can be filled at one churning; but when this cannot be done conveniently, the top is left level; and, when the next churning of butter is added, the surface is raised into inequalities, and the two churnings united into one mass.

"The jar being filled with butter to within two or three inches of the top, it is filled up with brine; made by boiling salt and water (in the proportion of a handful to a pint) ten minutes or a quarter of an hour; straining it in-

to a cooling vessel; and, when perfectly cool, putting it upon the butter, about one and a half or two inches thick. If a wooden bung be put upon this, and a bladder tied over the mouth of the jar, butter thus preserved, from a good pasture, will remain perfectly sweet for almost any length of time; provided the jars be placed in a dry and cool situation."

Mr. Marshall, when treating of the dairies in the Vale of Gloucestershire, says;

"The management or immediate superintendence of a large dairy, especially one of which cheese is the principal object, is not a light concern. It requires much thought, and much labour. The whole of the former, and much of the latter, necessarily falls on the immediate superintendant; who, though she may have her assistants, sees or ought to see, herself, to every stage of the business; and perform or ought to perform, the more difficult operations.

"This arduous department is generally undertaken by the mistress of the dairy; especially on middle-sized and small farms. In some cases, an experienced dairy maid is the ostensible manager.

"There are three things principally requisite in the management of a dairy.

"Skill,—industry,—cleanliness.

"Without the first, the two latter may be used in vain; and a want of the last implies a deficiency in the other two. Cleanliness may indeed be considered as the first qualification of a dairy-woman; for without it, she cannot have a fair claim to either skill or industry.

"With respect to cleanliness, the Gloucestershire dairy-women stand unimpeachable. Judging from the dairies I have seen, they are much above par, in reality; though not so to common appearance. A cheese dairy is a manufactory, a workshop, and is, in truth, a place of hard work. That studied outward neatness which is to be seen in the show dairies of different districts, and may be in character where butter is the only object, would be superfluous in a cheese dairy. If the room, the utensils, the dairy-woman, and her assistants be sufficiently clean to give perfect sweetness to the produce, no matter for the colour, or the arrangement. The scouring wisp gives an outward fairness; but is frequently an enemy to real cleanliness. The scalding brush, only, can give the requisite sweetness: and I have seen it no where more diligently used than in Gloucestershire.

"Cleanliness implies industry. A Gloucestershire dairy-woman is at hard work from four o'clock in the morning until bed time.

"Her degree of skill requires not to be spoken of here; as it will better appear in the following detail, than in any general observations which can be made upon it.

"The chief peculiarity observable in a Gloucestershire dairy-room, provincially dairy-house, is that of its generally having an outer door, opening into a small yard or garden place; while the dairy of most other districts is cooped up in a corner, with only a small window for the admission of air and light; every thing being dragged, in and out, through a number of inner doors, or perhaps rooms or passages. But an outer door gives a freer and a more general air; and a much better and a more commodious light; besides rendering the business of cleanliness more easy. In the dairy-yard there is, or ought to be, a well; with proper benches and other conveniences, for washing and drying utensils.

"The room, too, is large and commodious: 15 feet by 18 may be considered as a middle-sized dairy. The cheese-making and churning are done in the dairy-house: so that the entire business is collected into as narrow a compass as may be: a circumstance of some importance, in a large dairy; and, in a small one, the advantages are proportional. The floor is generally laid with stone. The shelves are mostly of elm, or ash.

"With respect to aspect, the outer door, when well placed, opens near the north-east or the north-west corner: the window on the north side: the inner door, on the south-side, opening into the kitchen.

"A dairy-room on this plan is, perhaps, as commodious as art can render it.

"A detail of the furniture of a dairy may appear uninteresting; and, by some readers, be thought unnecessary. It would be difficult, however, to give a minute account of the method of carrying on the manufacture, without describing the tools in use: a description of them is little more than a definition of technical terms. Perspicuity requires it."

"A

"A milking pail is in shape nearly that of a bushel, but formed of staves and hoops; with one handle stave rising three or four inches above the rim. (The Yorkshire skeel with one handle.) The diameter about fifteen inches; the depth about ten inches. Staves oak; hoops (broad and close) ash.

"A milk cooler, provincially cheese cowl, is a large strong wooden vessel, proportioned in size to the number of cows. From eighteen inches, to two feet deep; and from two to three feet diameter. Two opposite staves rise above the rest; the head of each having a hole in it, large enough to admit a pole; for the purpose of moving it, or carrying it on men's shoulders; answering the purpose, occasionally, of what in some districts is called a bearing tub; in others a cowl.

"The strainer, or milk sieve, is made twelve or fourteen inches diameter: five or six inches deep: some with hair bottoms: others have cloth bottoms; which are taken out every day to wash. A frond or leaf of fern is frequently placed at the bottom of the sieve to prevent the milk from flying over.

"Sieve holder; provincially cheese ladder. This is laid across the cooler to place the milk sieve or strainer upon. It has here a valuable singularity of construction: at one end are two cross bars about three inches apart. This vacancy admitting one ear or handle of the cooler, the ladder is kept securely in its place. The wood, ash.

"Lading dish. The usual shape, but large; near a foot diameter.

"Pail brushes. Common hard brushes; furnished with bristles at the end, to clean out the angles of the vessels more effectually. Utensils, or rather tools, which no dairy ought to be without. Yet in many districts of the kingdom their uses are unknown.

"Pail-stake. A simple contrivance, or rather a thought, which one would imagine, no person, having dairy utensils to dry, could miss; yet it appears to have been hit upon in this country only. In other districts I see milking pails, &c. placed upon benches, or upon walls, to dry; where they are liable to be blown down by the wind, or thrown down and burst by other means. Here, a bough, furnished with many branchlets, is fixed with its butt-end in the ground, in the dairy yard. The branchlets being lopped, of a due length, each stump becomes a peg to hang a pail upon or other utensil.

"Skeels, are broad shallow vessels; principally for the purpose of setting milk in, to stand for cream: made in the tub manner, with staves and hoops, and two stave handles: of various sizes, from eighteen inches to two feet and a half diameter; and from five to seven inches deep. Staves oak; hoops (broad and close) ash.

"Skimming dishes are of wood, very thin. But chiefly of tin. About eight inches diameter; and five eighths of an inch deep.

"Cream slice, is a wooden knife, somewhat in the shape of a table knife. Length, twelve or fourteen inches.

"Upright and barrel churns are in use. The barrel churn with one fixt and one loose handle. No way excellent in their construction. Butter is here a secondary object. The Yorkshire churn is preferable: but this might be expected: there butter is the primary object of the dairy.

"Butter board, and trowel, is a broad board and a wooden spatula, used in printing the butter.

"Cheese knife, is a wooden handle, four or five inches long, furnished with two, or three iron blades, twelve inches long, and one inch broad, at the handle, down to about three quarters of an inch at the point; with two blunt edges, rounded at the point like an ivory paper-knife. The distance between the blades, which are very thin, and ranged with their flat sides toward each other, about an inch.

"Cheese vats, are from fifteen to fifteen and a half inches diameter; and from one and a half inch to two inches deep. The wood invariably elm. Some with, but many without holes.

"Cheese cloths we made of thin gauze-like linen cloth. The size varies in different dairies.

"The construction of cheese-presses are various. Sometimes single; but, in large dairies, generally double. The pressure is mostly given by a dead weight, raised by a roller, and falling perpendicularly on the cheese. In the Upper Vale, they are chiefly of stone. The dimensions of one of a superior weight are twenty-two inches square, by two

feet two inches long; containing 12,584 cubical inches of freestone; weighing (on the supposition, that its specific gravity is an ounce and a half to an inch) somewhat more than half a ton.

"But, by an accurate experiment, I found, that a cubical inch of similar stone (freestone of the Cotswold cliffs) weighs only 500 grains. Therefore, calculating the pound averdupois at 7000 grains troy, the stone under notice weighs eight hundred weight.

"The dimensions of other three (all of the same size and in the same dairy) are twenty inches wide; by fourteen deep; and two feet four inches long; containing 7,840 cubical inches of Cotswold freestone; consequently, weigh no more than five hundred weight each.

"These are the old construction; which is very simple. In the center is fixt a wooden skrew, rising three or four feet perpendicularly above the stone; passing through a hole in a cross beam, resting on the cheeks of the press. Above this cross-piece is worked a loose nut, made out of a piece of wood, eighteen inches to two feet long, and of a diameter proportioned to the size of the worm. Each end is reduced to the size of a handle; and with this two-handled nut the stone is raised and lowered. The perpendicularly of the skrew keeps the base of the stone horizontal; and to keep it more steady in its place, it is notched at each end about an inch deep, to admit the cheeks, or slips nailed on the inner sides of them, for that purpose.

"The hours of milking are here early: about five in the morning, and four in the evening; in order to give due time for finishing the requisite business of the dairy, before bed-time.

"Where a large dairy of cows are kept, the whole family (excepting those who have the care of the teams) must attend to milking. An in-door servant, by the name of a milking man, is generally kept, in the larger dairies; for the purpose of milking, churning, and otherwise assisting in the business of the dairy: he has the care of the cows and the cow-grounds; and is considered as a principal servant.

"When the cow-ground lies near the house, the cows are generally brought into the yard, or other small inclosure; if the pasture lie at a distance, the pails are always carried to the cows. Also if the ground be very wet, and poach with the cows travelling over it, judicious dairy-men have the pails carried to them. In more than one instance, I have seen a horse and barrel-cart employed, to take the milk from a distant meadow or cow-ground to the dairy-house.

"The practice is to milk the cows unfettered; and to use square-topped, four-lagged stools; resting one edge of the bottom of the large pail, here in use, against two legs of the stool. Hence the convenience of its form.

"In the Upper Vale, milk butter forms a considerable object of the dairy; not only in the spring, while calves are rearing, before cheese-making commences, but during summer: owing to the species of cheese, which is universally made here; and which, is, I believe, peculiar to the Vale of Gloucester. It is called two-meal cheese. The evening's meal is set for cream; and, being skimmed in the morning, is added to the morning's meal, neat from the cow.

"The method of making butter in this district, therefore, merits a description in detail; especially as Gloucester butter, which is distributed, by hucksters, to distant parts of the country, bears a superior character. The stages of the art are, setting the milk,—preserving the cream—churning,—making up the butter.

"Setting the milk, I have seen done in different ways: every district exhibits good and bad management; in almost every department of rural affairs. The best method of setting milk in this country, which I have seen, and which may, I believe, be called the best practice of the district, is this:

"The milk having remained in the cooler, a time proportioned to the heat of the weather, so as to lower it to about 80 of Fahrenheit's thermometer, it is parcelled out in skeels, or, if these are not sufficiently numerous to receive it, in any other dairy vessel; leaving, perhaps, a part of it in the cooler; dividing it in such a manner, as to leave it about an inch deep, in each vessel: the dairy-woman measuring the depth, by the joint of her finger; and carefully placing the vessel level, so that one side be not left deeper than the other. The prevailing rule is to set it as shallow as it can be conveniently skimmed; under a conviction, that one side be not left deeper than the other;

and that the shallower it is set, the more cream will rise, from a given quantity of milk. An inch and a half is the ordinary depth; but, in the practice I am more particularly registering the dairy-woman has dexterity of finger sufficient to skim it at an inch deep. This, however, could not be done without the assistance of a tin skimming-dish, which being thinner, gathers up the cream cleaner than a wooden one, but requires a more steady hand to guide it.

"Earthen jars are the common receptacles of cream. In these it is stirred several times a day, with the cream slice; but seems to be shifted less frequently here than in some other dairy countries. Cream here has a peculiar propensity to become curdy; losing its liquid state; requiring some strength of hand to stir it; arising probably, from its superior richness.

"In autumn, when butter generally becomes pale and tallow-like, the cream is not unfrequently coloured before it be put into the churn. The material of colouring is the same as that used in the colouring of cheese; which will be spoken of in that article. The method of using it, however, is somewhat different.

"In the practice, which I more particularly attended to, the business of churning is conducted in this manner: if the weather be hot, the churn is previously cooled with cold water; and, if wanted, cold water is likewise put into the churn among the cream. On the contrary, if the weather be cold, the churn is warmed with scalding water; and, if wanted, hot water is put into the churn; which, perhaps, in severe weather, is placed near the fire, during the operation.

"The cream of the Vale is very liable to rise in the churn; owing, probably, to its peculiar richness. Under this circumstance, part of it is taken out; and, when that which is left in the churn is gone down again, the part taken out is re-added.

"The mouth of the churn is secured with butter, pressed plaster-wise into the joints. This is thought to be less troublesome than a cloth.

"The breaking is here carefully attended to. It is considered as very injurious to heat the butter in the churn.

"In making up butter, the first business is to prepare the several utensils employed in the operation. Here they consist of the butter skeel, the butter board, the print, and trowell. The preparation required is to prevent the butter from hanging to the wood. It is here done with scalding water and salt, brushed into the wood while moist and hot, with a soft thick-set brush: either putting the salt upon the brush, or dusting it over the utensil; which, being salted, is immediately plunged into cold water. The dairy-woman's hands are prepared in a similar manner.

"I will give the minutiae of this operation as performed by a most excellent dairy-woman, whose butter seldom fails of being of the first quality. They differ from those which I have already given; and are, probably, the best which I may have an opportunity of observing; and probably the last upon which I may bestow the tediousness of registering.

"The butter being taken out of the churn, and placed in the skeel, with a quantity of cold clear water, the dairy-woman breaks off a lump, (somewhat more than a pound), and, with one hand, kneads it in the water, with the fingers spread widely abroad; closing them at intervals; thereby breaking the butter most effectually; consequently, giving the contained milk an opportunity of escaping. Every time the fingers are closed, the lump is rolled on the bottom of the skeel; the hand shifted, taking the lump the contrary way, and worked as before. This being several times repeated, the first roll is placed upon the butter board, and a fresh lump broken off.

"The whole being gone over in this manner, the milky water is poured out (into the tub of butter-milk), the skeel washed, and somewhat more than half the butter spread thinly and evenly, but roughly, over the bottom of it. Salt is then dusted upon this rough surface; the remaining lumps of butter spread over the salt; and over the whole another portion of salt is strewed.

"The dairy-woman now rolls the whole into one lump; which she immediately breaks down with the palm of her hand; the fingers expanded as before; forcing the butter from her; closing the fingers partially at every stroke; thereby leaving it at the bottom of the skeel exceedingly rough.

"Over this rugged surface fresh water is poured; the

butter rolled up again into one large lump; again broken down in the manner last-described: and again formed into one large roll. This is at length broken into pound lumps; and kneaded in the water, as in the first instance.

"The butter is spread a second time upon the butter board (over which water is always thrown before the lumps be placed upon it), and the skeel being emptied of the briney water, the lumps are separately kneaded (with one hand) on the bottom of it, dry; and set in short rolls, against the side of the skeel.

"The butter scales are then taken out of the salt water, which was poured out of the skeel, and in which they have been immersed during the last operation, and evenly balanced with butter; the lumps divided; and weighed in half-pound pieces; which are again returned into the skeel; or, for want of room, are placed upon the board.

"This being effected, the lumps are prepared for printing; by kneading them, dry, at the bottom of the skeel; and moulding each into a conical form, with the palm of the hand; and with the fingers joined, and set at right angle to the palm. The point of the cone-like lump thus formed, being placed in the center of the print, the base is pressed down, until the surface of the print be covered. What presses over, at the edges, is collected, (by running the finger round the print,) and put upon the intended bottom of the pat. The sides are finally smoothed with the trowel; the pat with the print set upon the butter board; and the print taken off: leaving the pat about four inches diameter, and about one and a half inch thick.

"If the print does not loose freely, the hand is placed carefully and firmly, against the side of the pat; thereby gaining a degree of purchase to pull against. If the butter be found to adhere in any degree to the wood, the print is scalded, salted and brushed, until it loosen freely; without the indelicacy of blowing in the manner practised in most places. The pats remain some length of time, generally one night, upon the board to stiffen; and, in the morning, are placed in cold water, previous to their being put into the baskets, in which they are carried to market.

"The dairy-rooms of North Wiltshire are spacious and commodious. Set round with presses and whey leads: no shelves: the area being left free for the cows, churns, &c. The floors of stone.

"One for forty cows, measured 20 by 16. One for a hundred, 30 by 40; besides a back lean-to for whey leads, &c.

"Whey leads here, have a peculiarity which is noticeable. Instead of a pin or plug being made use of to stop the outlet pipe in the bottom of the lead, the pipe is furnished with a common turn-cock; and in some cases, I was told, the pipes are continued from the leads to the cistern or general reservoir; thereby saving the labour of carrying out the whey in pails. But quere, may not the whey in this case corrode the pipes and be injurious to the hogs?

"Cleanliness is seen in every dairy: a degree of neatness is observable in some. Every thing is conducted in a superior style. There are men of independency and spirit who set the example. Mr. Iles' dairy-room and cheese-lofts form an exhibition worth going some miles to see.

"The North Wiltshire dairy-rooms, in general, have outer doors, frequently opening under a penthouse or open lean-to shed: a good convenience, affording shade and shelter, and giving a degree of coolness to the dairy-room. In one instance, I observed two doors: a common close-boarded door on the inside; and an open-paled gate-like door on the outside: giving a free admission of air, in close warm weather; and, at the same time, being a guard against dogs and poultry. A convenience, which would be an improvement to any dairy-room in the summer season.

"The utensils are similar to those of Gloucestershire. The weight of the press is a box filled with sand or gravel. The dimensions of one, filled with sand, was 18 inches square, by two feet two inches long, on the inside (measuring the depth of sand only). A cubical inch of the sand, when dry, weighs 368 grains; consequently, the whole weight of sand is not quite four hundred weight.

"The broad vats the same dimension as those of Gloucestershire: namely, 15½ diameter. The loaf vats 10 to 12 inches diameter, by four to six inches deep. The vats are mostly without holes in their bottoms, that they may retain the brine the longer.

"It is observable, that the pail of the Avon quarter is the large one-handled pail of Gloucestershire; while, about Swindon,

Darnel Grabs



Fig. 1.

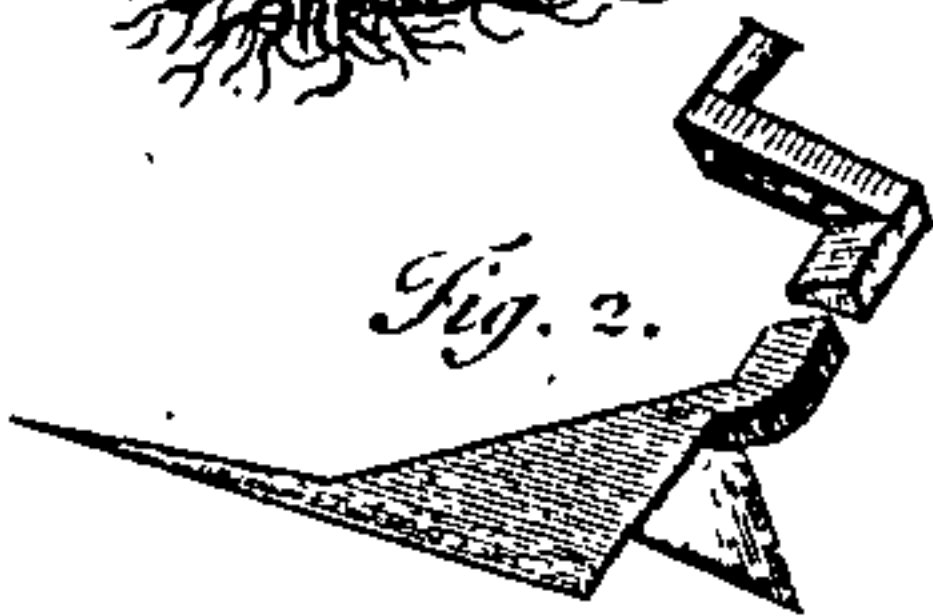
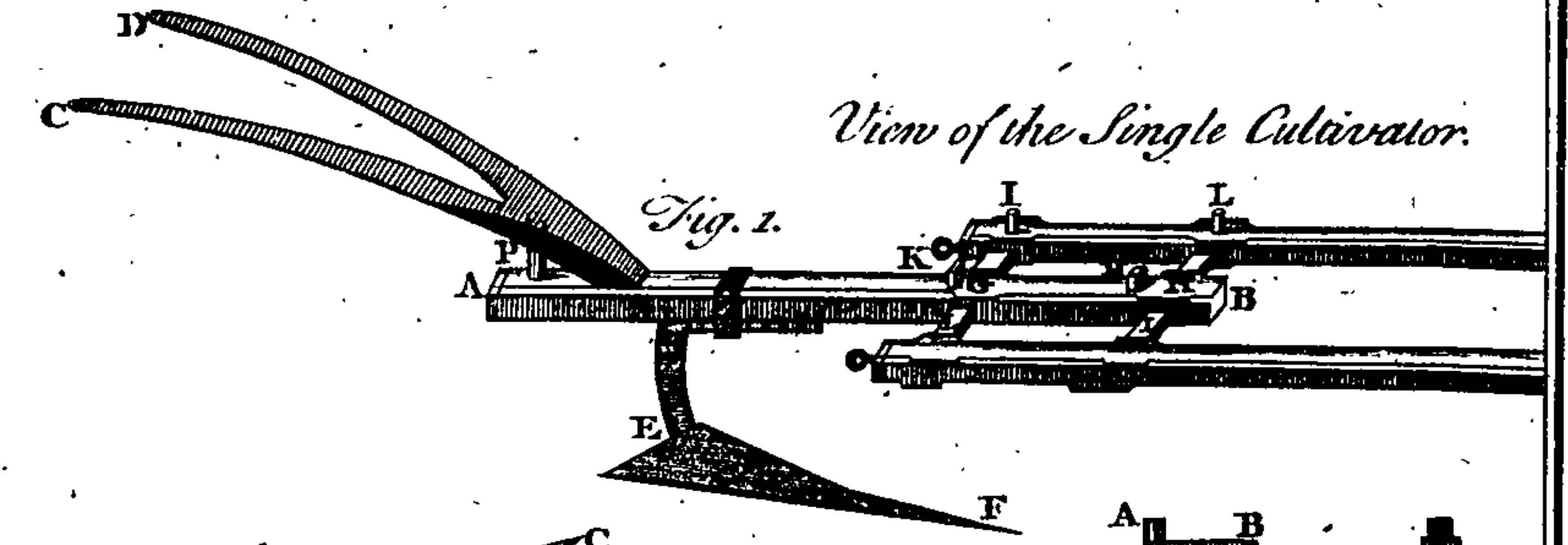


Fig. 2.



View of the Single Cultivator.

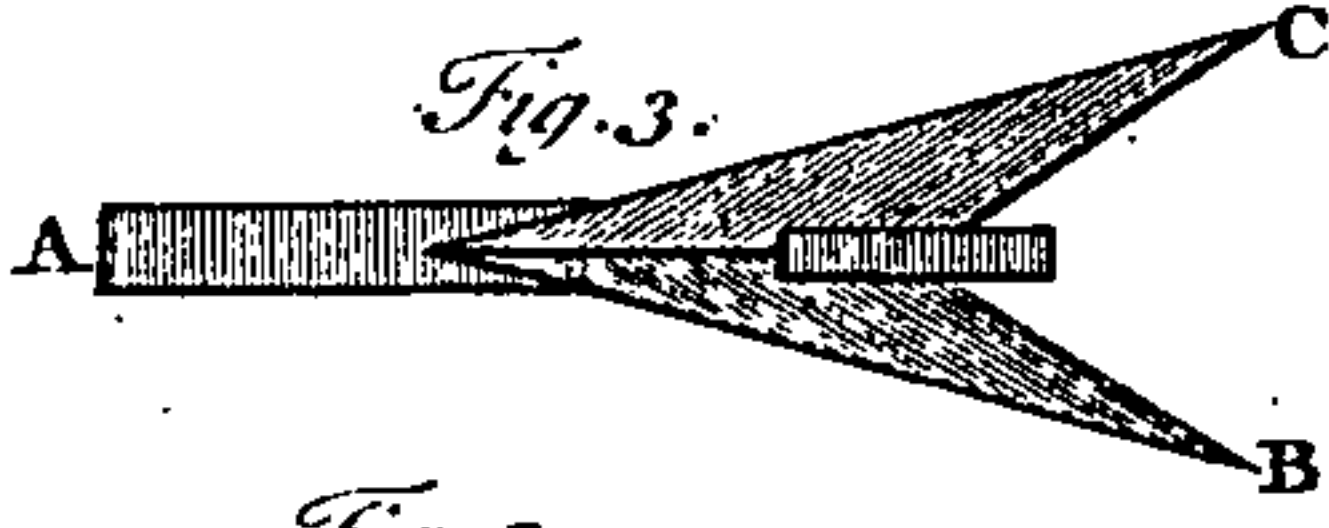


Fig. 3.

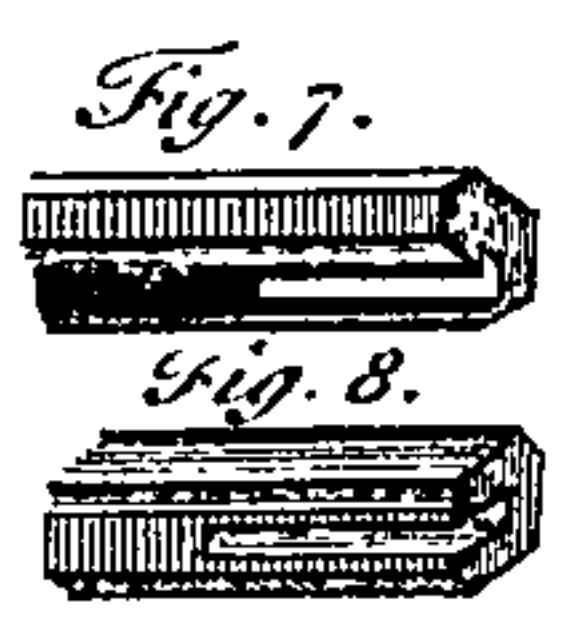


Fig. 7.



Fig. 8.



Fig. 9.



Fig. 10.



Fig. 11.

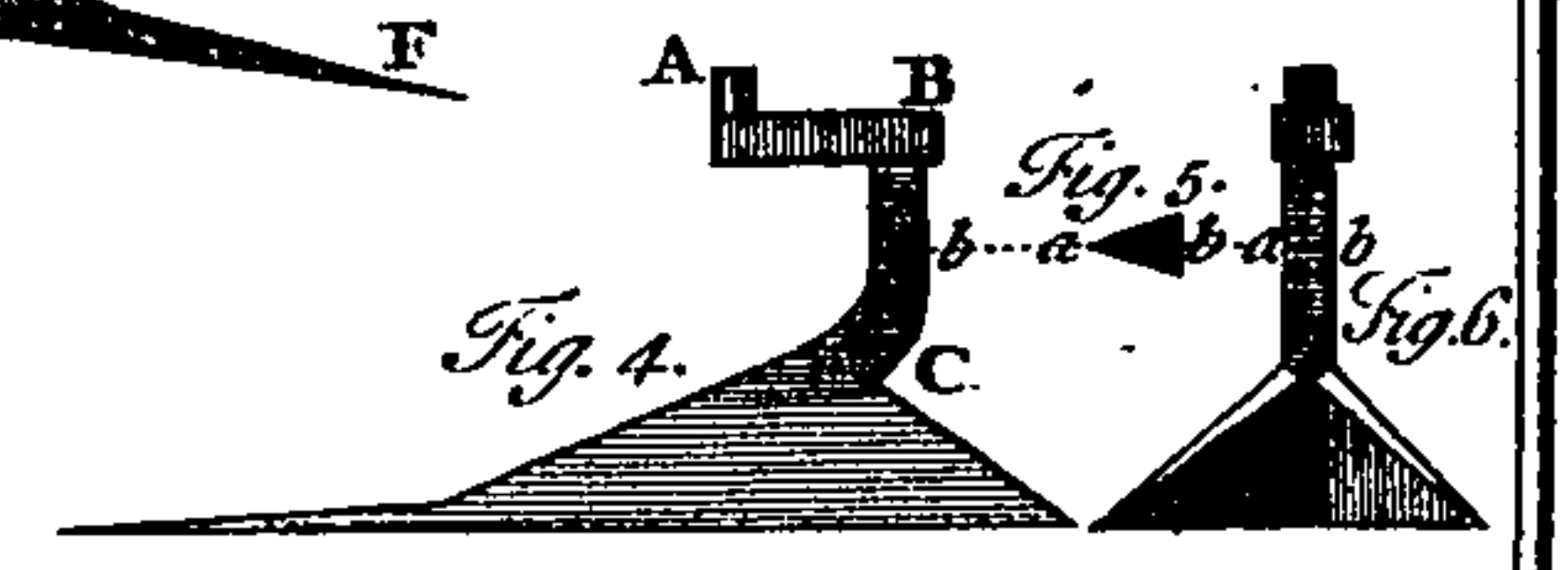


Fig. 4.



Fig. 5.



Fig. 6.

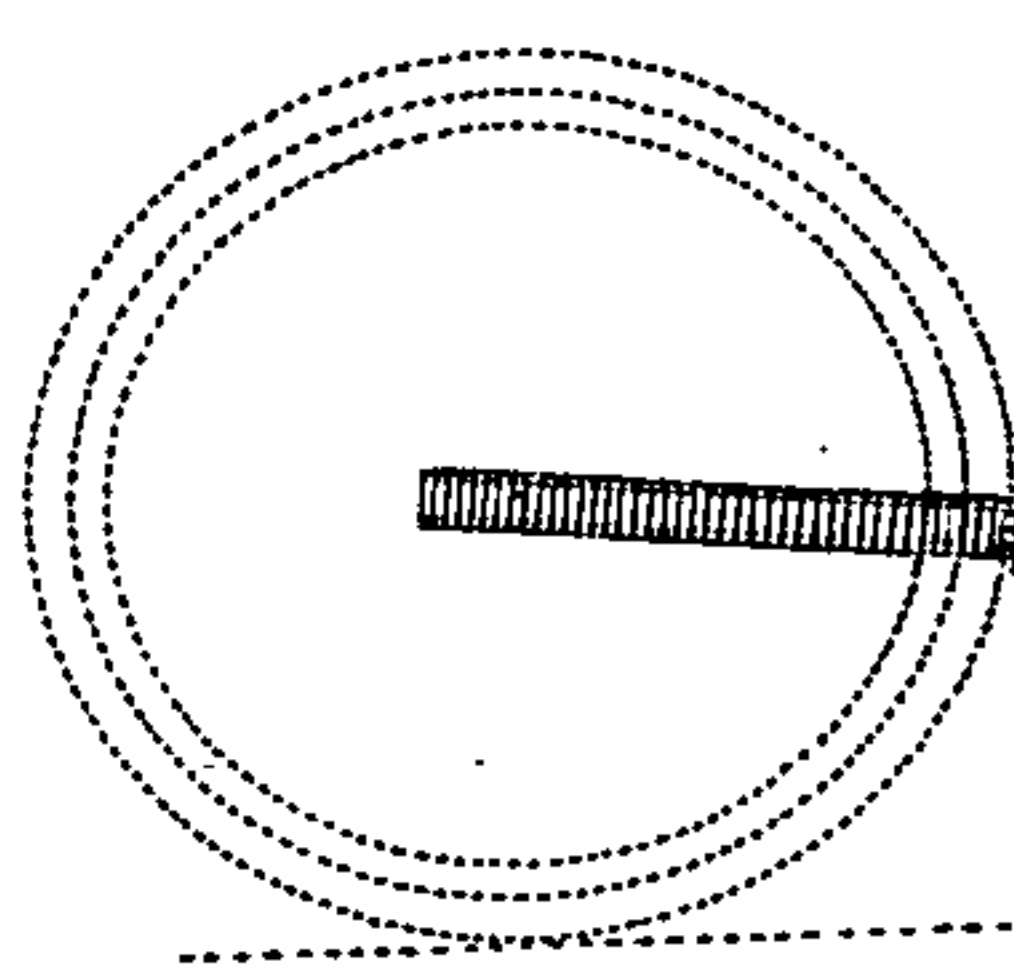


Fig. 12. Profile of the Double Cultivator.

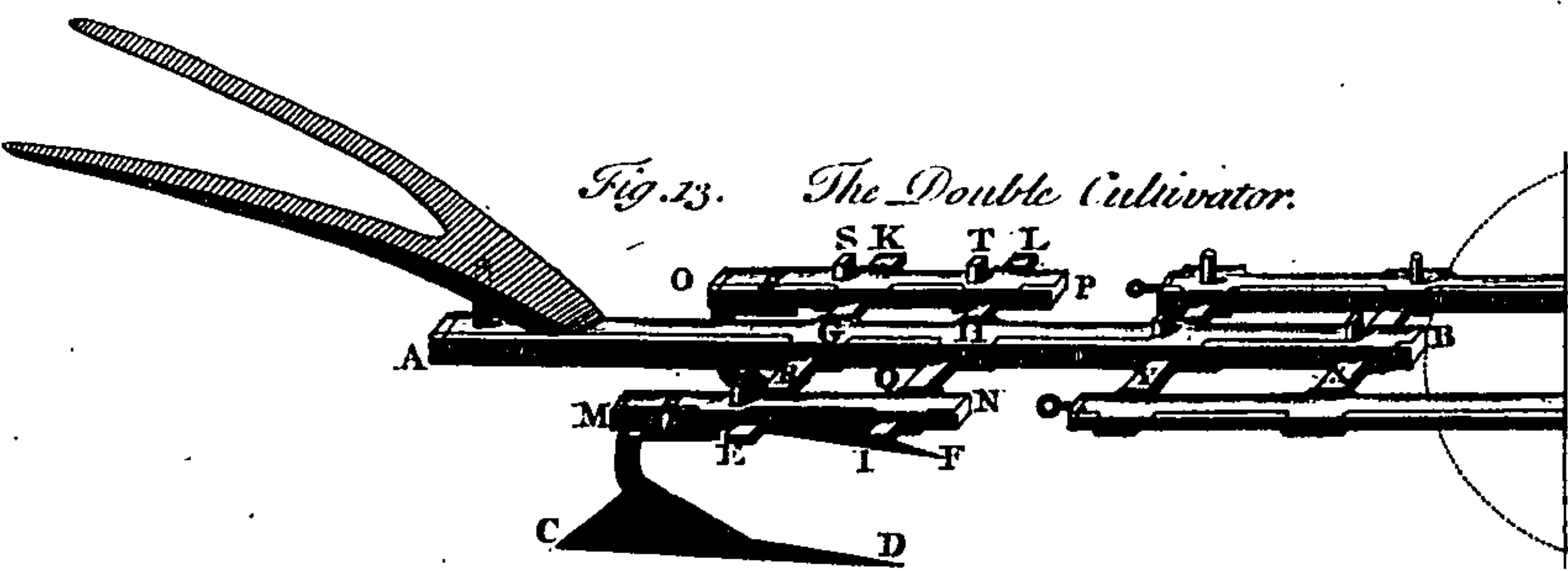


Fig. 13. The Double Cultivator.

Scale of 3 Feet for Fig. 4, 5, 6 & 7.
The others being seen in Perspective, require none.

Scale of 6 Feet for Fig. 5.

Fig. 14. Geometrical plan of the Double Cultivator

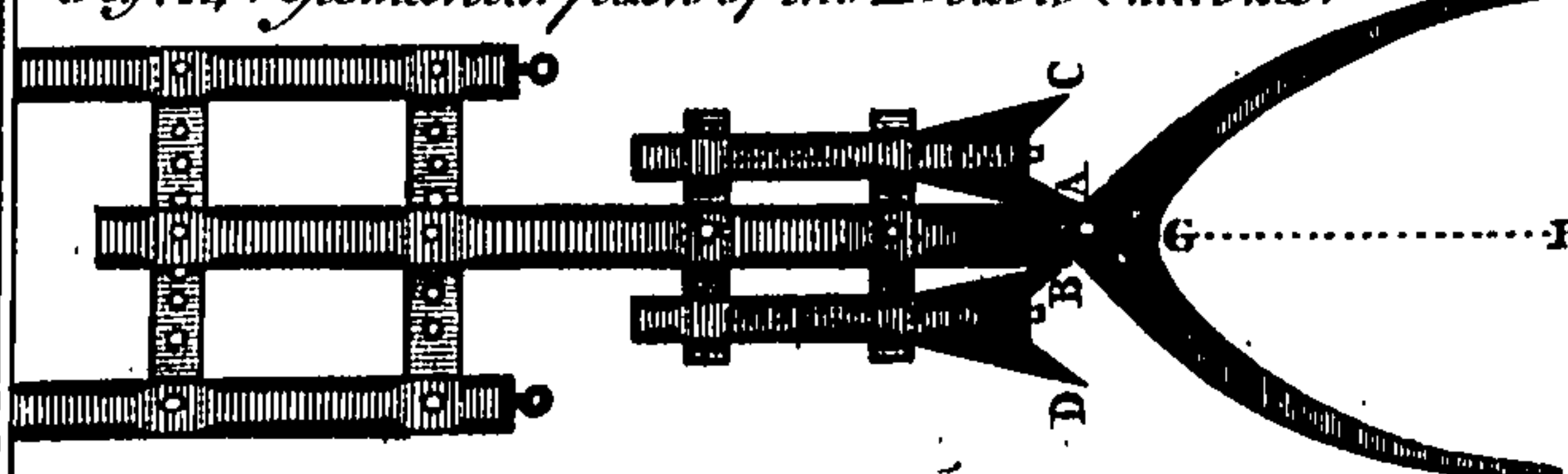


Fig. 18.



Fig. 19.

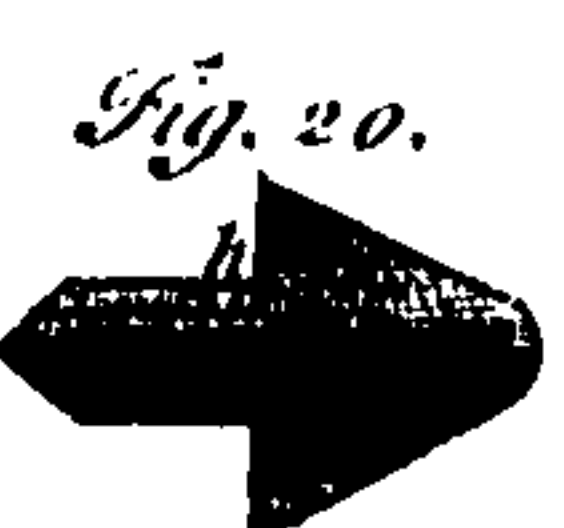


Fig. 20.



Fig. 21.

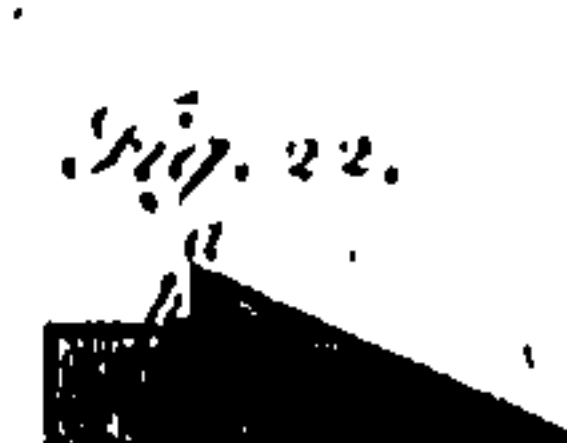


Fig. 22.

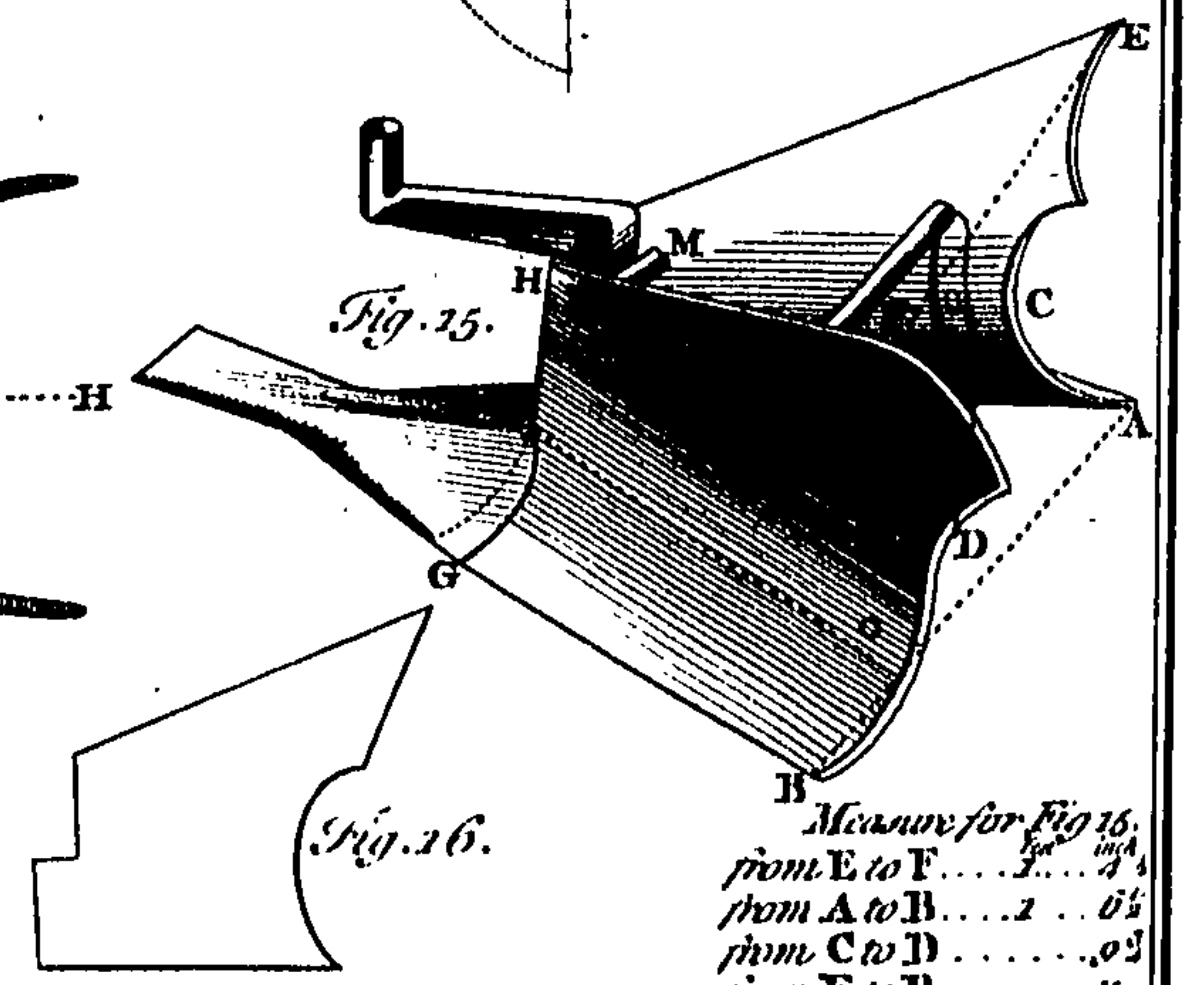


Fig. 15.

Fig. 16.

Measure for Fig. 16.
from E to F... 1 1/2
from A to B... 2 1/2
from C to D... 1 1/2
from F to B... 1 1/2
from G to H... 1 1/2
from I to H... 1 1/2

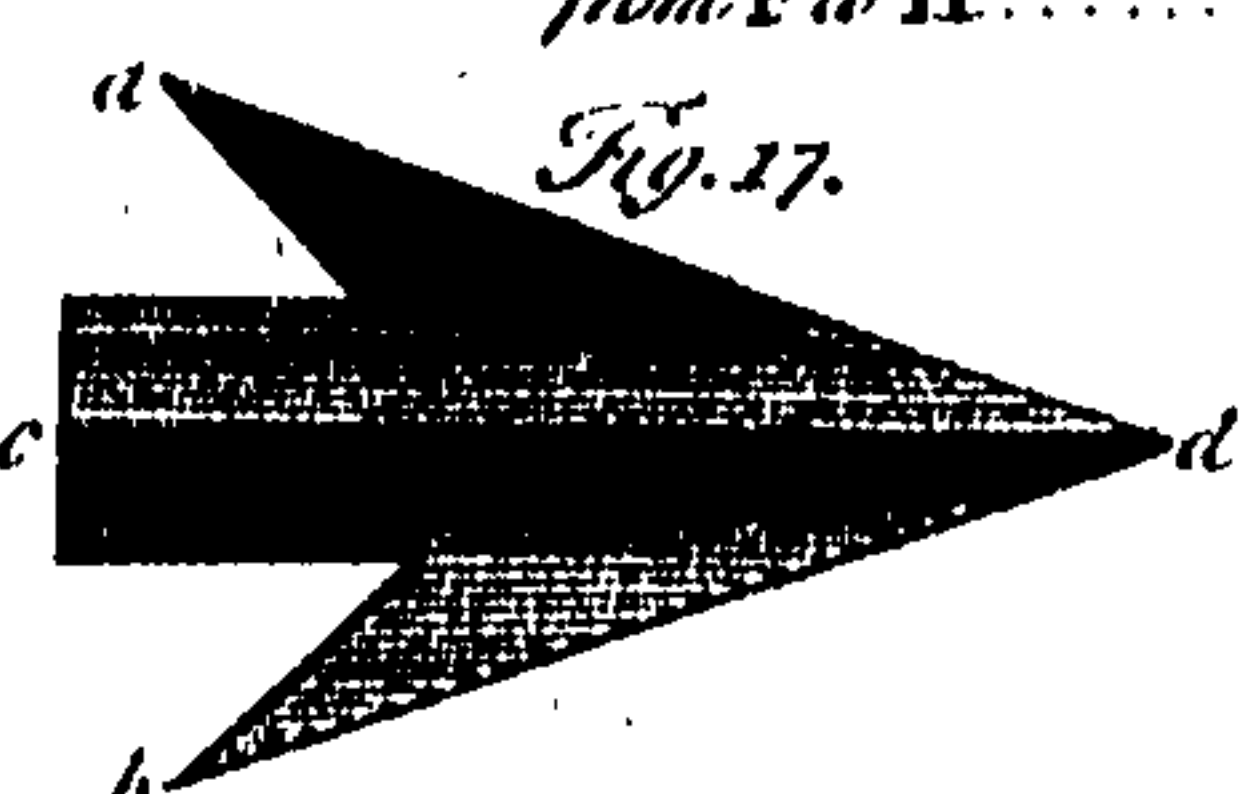


Fig. 17.

Swindon, the common pail of the southern counties (iron hooped, with an iron bow) is universally in use; carried on yokes, in the London manner.

"The cowl is proportioned to the size of the dairy. I measured one near four feet diameter: yet this is sometimes too small to contain the milk of the dairy. In this case, two cowls are used; and, when part of the whey is laded off, the two parcels of curd are mixt and broken together.

"The hours of milking are very early. In the morning, the cows are generally in the yards by four o'clock; in the afternoon, by three. In some dairies, and in the middle of summer, the cows are in the yard, and the whole family up, by three in the morning: thus dividing the two meals equally.

"The number of milkers are proportioned to the number of cows; ten cows to a milker is the general allowance. In large dairies, the principal part of the milkers are labourers, or their wives, or daughters.

"The cows are milked promiscuously, and only once over at a meal; not stroked or drawn a second time, as they are in many districts: a practice which I have not observed either in Gloucestershire or Wiltshire.

"Whey-butter. It is the invariable practice in the district of the Vale of Gloucester to set whey for cream. The lower class of people eat scarcely any other than whey butter. With proper cleanliness and management it may be made perfectly palatable, and in every respect preferable (while quite fresh) to some lean-soiled districts. The whey is, here, generally set in one large tub; not parcelled out, thin, like milk. The management of whey-butter is similar to that of milk-butter. The price about two thirds of that of milk-butter in the same market."

DAISY, the greater, or *ox-eye*, by some called *maudlin-wort*, is the name of a perennial weed common in pastures. The leaves are jagged, and embrace the stalk. The flowers are large and radiated. The ray is white, and the disk yellow: the seeds have no down.

DALLOP, a tuft, or clump.

DAM, a mole, or bank to confine water.

DAMSON, a small black plum, brought originally from Damascus; whence the name.

DANDELION, the name of a very troublesome and well-known weed in the meadows; and which will spread greatly, if the flowers are suffered to perfect their seeds, which are light, downy, and of course easily blown about by the wind.

DANERWORK, a name given in some counties to that species of elder, generally called dwarf-elder, or wall-wort.

DANK, damp, humid, moist, wet.

DAPPLE, marked with various colours.

DARNEL. See COCKLE.

Annual DARNEL-GRASS, called *white darnel* by Gerrard, and, in the southern counties, *crap*. This plant is so much like the red darnel-grass, that it has been greatly cultivated under the name of *ray-grass*, or vulgarly *rye-grass*; but the spike is much longer and paler, and has beards, which the ray-grass is entirely without. It is likewise annual; whereas the ray-grass has an abiding root. Its seeds ripen with the corn. See Plate VII. fig. 1.

DAY-BREAK, the dawn, the first appearance of light.

DAY-WORK, work imposed by the day. Day labour.

DEARTH, scarcity; a time when food is dear.

DECEMBER, the last month of the year.

The earth is now commonly locked up under its frozen coat, so that the husbandman has leisure to fit and spend what store he has before-hand provided.

Now is the time to house old cattle, to sell all sorts of timber, and other trees for building, or utensils, to cut coppices, &c.

Let horses blood, fatten swine, and kill them. Destroy ant-hills.

Plough up your land that you design for beans, provided it be not frozen too hard; drain corn-fields where the water stagnates and overflow, or water your meadows.

Put your sheep and swine to the pease-rick, and fatten them for the market. Cut hedges, and lop trees. Mortimer's Husbandry, vol. II. p. 448.

DECIDUOUS, falling, not perennial; an epithet applied to such trees and shrubs as shed their leaves in the autumn. Thus the oak, the elm, the beech, &c. are called deciduous trees.

DECLIVITY, inclination or declivity, reckoned downwards; gradual descent.

DEFECATION, the act of purifying any liquor from its lees or foulness.

DELVING, digging, or the act of turning up the earth with a spade.

DEMAIN, or DEMESNE, the land which a man holds originally of himself. It is also sometimes used as a distinction between those lands which the lord of the manor hath in his own hands, or in the hands of his lessee, and such other lands appertaining to the said manor as belong to free or copyholders.

DENSHIRING. See the article BURN-BAKING.

DEVIL in a bush, or fennel-flower, a very troublesome weed among the corn, especially in Italy, France, and Germany, where it abounds much more than in this country. It rises with slender stalks, near a foot high, which sometimes branch out at the bottom, and sometimes are single, garnished with a very few fine cut leaves, somewhat like those of dill. Its flower is generally blue, and its seeds are rough and black. This, together with their being nearly of the same size as the grains of wheat, renders it difficult to separate them from the corn, when the plant has been cut and housed with it; they blacken the meal, and debase its value. The plant is annual, and therefore may be extirpated by rooting it out before it can seed, which is commonly in August.

DEVIL'S-BIT, the name of a weed often found among the corn, but more frequently in meadows. It has a strong, thick, fibrous, perennial root, which runs deep into the ground, and sends out several branching stalks, which rise near three feet high. The lower leaves are sometimes almost entire, and at others they are cut into many segments almost to the mid-rib: they are seven or eight inches long, and from three or four broad in the middle, hairy, and sit close to the root. The stalks are covered with stiff, prickly hairs, and garnished with smaller leaves at each joint. The flowers, are of a pale purple colour, and have a faint odour, appear in June upon naked foot-stalks at the end of the branches, which decay to the root every autumn.

DEVIL'S-GUTS, the same with the lesser bind-weed. See the article BIND-WEED.

DEVONSHIRING. See the article BURN-BAKING.

DEW, the moisture perceived on the ground, and on the leaves of plants, blades of grass, &c. in the morning.

Those who have made no other reflections on dew than such as present themselves naturally, think that all the moisture one finds in the morning on plants and upon the ground, comes in reality from above; but when the affair is examined with more attention, one sees that at least a great part of the dew arises from the earth itself, and the plants, and keeps hanging to their surface. Mr. Gersten, who hath made a dissertation on this subject in particular, hath even thought that there fell no dew from above on the ground, and that all which we see under the form of dew arose from the earth or plants, on which it keeps hanging in pearls, till the heat of the day hath dispersed it.

For the nature and properties of dew, with regard to vegetation, see the article ATMOSPHERE.

DEWLAP, the flesh that hangs down from the throat of oxen.

DIABETES, a morbid copiousness of urine, or the making water in too great quantities. This disorder is very common in horses, and often terminates in death.

Horses subject to a diabetes, or profuse staling, if old, or of a weak constitution, are seldom cured; they soon lose their flesh and appetite, grow feeble, their coat staling, and they die rotten. Of a young horse there are more hopes; but he must not be indulged with too much water or moist food. At the same time give him the following drink:

Take jesuit's bark, four ounces; bistort and tormentil root, of each two ounces: boil them in two gallons of lime-water to the consumption of half; and give a pint three times a day.

Let the horse drink two or three quarts a day of lime-water; and if these medicines should not succeed, give a quart of strong alum posset, three or four times a day.

This method is proper also for a horse who stales blood; or the following balls may be given for that purpose, if the bleeding is profuse:

Take bole ammoniac one ounce, Japan earth half an ounce, roach alum two drams, elixir of vitriol one dram; make them into a ball with conserve of roses, and give it every six hours.

As this disorder generally proceeds from too violent exercise, over-straining, &c. repeated bleedings in small quantities are absolutely necessary, till the mouths of the vessels close up. *Bartlett's Farriery, p. 165.*

DIAPHRAGM, midriff, or skirt, as some call it, in a horse or bullock, is a muscular substance that divides the upper cavity or chest from the lower belly.

DIBBLE, a setting stick, or instrument to make holes in the ground for setting plants, &c. See **ROLLER** for **DIBBLING ROLLER**.

DIG, a mattock. See **MATTOCK**.

DIGGING, the act of turning up the earth with a spade.

Were labour considerably cheaper in England than it is at present, and a sufficient number of hands could be found, it would doubtless be the best way to dig by hand all the ground destined for potatoes, carrots, lucern, &c. many advantages would accrue from this method of tillage; the earth would be loosened to a greater depth, and much better pulverised; nor would the weeds and grass be so apt to grow as in ploughed lands.

DIGITATED, branched out into divisions like fingers.

DIKE, a ditch. It also signifies a dam or mound to hinder inundations.

DILLS, a species of large vetch, the Yorkshire fitches. See **BEANS**.

DINGLE, a small clough or valley between two steep hills.

DITCH, a trench cut in the ground, usually round the fences of a field.

The mud of ditches affords an excellent manure, as it consists of the putrid particles of animals and vegetables, mixed with the finest and richest mould; and therefore is of great improvement to any soil, particularly the light and dry. But this mud should be exposed to the air for some time, that the seeds of the weeds generally contained in it may have time to vegetate or putrefy, before it be laid on the land.

Ditches on hill sides should be made to face up-hill, especially where the subsoil is springy: for if the springs work through under the bank, they soon undermine and let down the face, together with the layer into the ditch. The outside of the ditch is of much less consequence. The ditches, in every part of the Vale of Gloucestershire, are shamefully neglected. A Vale district, without deep, clean ditches, reflects disgrace on the owners, as well as the occupiers of the lands. In a district, that, by natural situation, is too cold and moist, every possible means ought to be used to free it from surface water; which, if it stand only an hour upon the soil, or in immediate contact with it, adds more or less to its natural coldness. *Marshall's Rural Economy of Gloucestershire.*

DOCK, the name of a weed, of which there are several species, and all of them remarkable for the largeness of their leaves; so that he must be a very slovenly farmer who suffers any of these plants to grow large. They should be plucked up by the roots as soon as they appear, which may easily be done, as the roots are of the tap, or carrot kind.

Mr. Marshall, in his *Rural Economy of Yorkshire*, (vol. I. p. 366.) says of this weed as follows: "It matures its seeds quickly, and in great abundance; but they have no wings to scatter them at a distance; they fall at the foot of the plant. This renders a creeping root unnecessary. Nature's chief care seems to have been to establish the parent plant firmly in the soil, and to guard against its destruction.

"To this end it is furnished with a very strong perennial tap-root of singular properties. If divided below the crown, the part left in the ground sends forth sappling shoots; and this from almost any depth, provided it have head-room, or the soil be loose. The upper part too, if cut off a few inches deep, will survive the amputation. Even when inverted with the plow, it will recoil, and find its way to the surface again.

"In this case, therefore, the plow alone is an improper implement of destruction. On the contrary, it may, and frequently does, increase the number of plants; the part cut off, and the part left below the plough, both of them surviving the separation.

"Hence it is evident, that land which is infected with docks should be gone over with the drawing-iron or the spade, some time before the plough be put into it, that the

tops may be removed, and the rootlets left in the ground may have time to rot before the land be ploughed.

"With this precaution, and with a person to follow the plough with a spadlet to grub up the bottoms, and to disengage the tops of such as may have escaped the previous weeding, the roots of docks may with great certainty be got rid of.

"The seeds of docks are to be destroyed in the same manner as those of other weeds; namely, with the plough, the harrow, and the roller; with this difference, however, that in destroying the seedlings of the docks, or any other strong-rooted perennial plant, the intervals between the ploughings should be short; for if they once get themselves established in the soil, it is, without a favourable season, out of the power of tillage to extirpate them.

"Another precaution with respect to the seeds of docks is necessary: they are sometimes sown upon the land with corn, and very frequently with clover.

"From corn and pulse they may be separated with the skreen, and still more effectually with the sieve; and no man can, in common prudence, sow any species of these until the seeds of weeds have been separated with the utmost care.

"But from clover seed, the seeds of docks cannot easily be separated: they are nearly of the same size and the same weight: neither the sieve nor the fan can part them. Singular caution therefore ought to be had in the purchasing of this seed.

"If every man would be cautious in this matter, the grower of that article would be assiduous in weeding their feed-clover from this pernicious and disgraceful weed. To suffer one dock which has matured its seed, to be threshed with feed-clover, is a crime which ought, among farmers, to be deemed unpardonable."

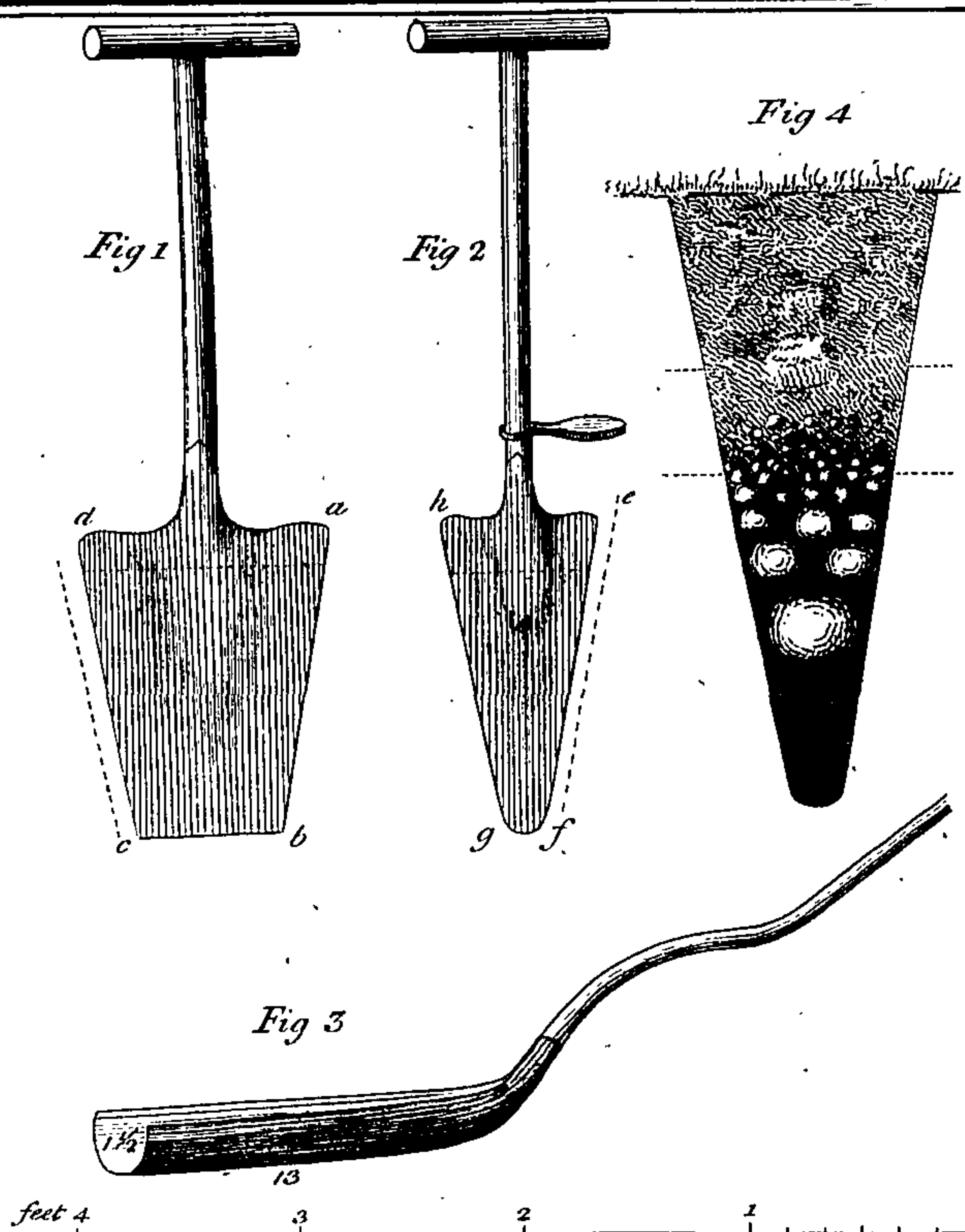
DOCKING, the act of cutting off the tails of horses.

This operation is in general very successfully executed, by the common methods, which are known to every farrier. But sometimes a miscarriage ensues by an inflammation and gangrene succeeding. These accidents probably arises from the tendons of the tails suffering by an injudicious application of the knife or searing iron, or in an improper season for the operation. Neither the very hot or cold months are proper, for reasons sufficiently obvious. The operation should always be performed by incision, or the chopping engine; the knife being passed through the tail from above, whilst it lays on the block; for when the cutting instrument is applied underneath, the blow is given on the tail, which, by bruising the tendons, may be naturally suspected to occasion bad symptoms. The searing iron should be smooth, and better polished than those generally used, and ought to be rubbed clean with a woollen-cloth, before it be applied to the stump; otherwise the sparks, which fly from the iron, are apt to occasion great pain, attended with the swelling both of the sheath and fundament: nor should it ever be applied flaming hot, for then it brings the burnt part away with it, and requires a re-application, in order to form a fresh eschar on the vessels; by which means, the bone is frequently left too much exposed, so that it is often a considerable time before it is covered.

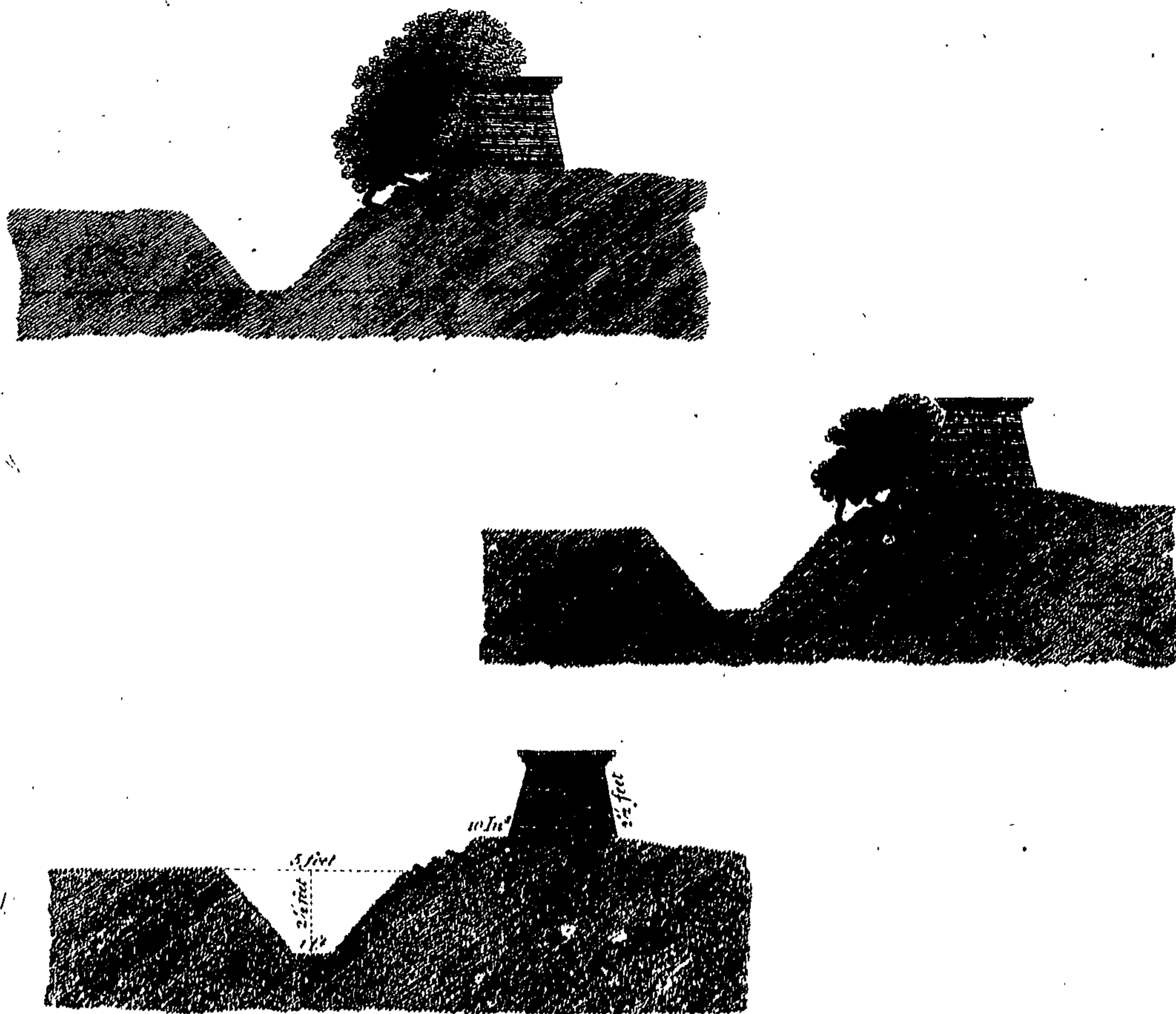
Farriers seldom apply any thing to the stump; which need only be anointed with the wound ointment, and when the eschar is digested off, may be washed with alum or lime-water: but if an inflammation ensues, with a discharge of thin matter, a proper digestive, composed of Venice-turpentine, rubbed with the yolk of an egg and tincture of myrrh, should be applied, with a poultice of bread and milk over it. The rump should be frequently bathed with oil of roses and vinegar, and a large quantity of blood taken away. If the fundament be at all swelled, and the inflammation at all suspected to be communicated to the bowels, let cooling emollient clysters be injected two or three times a day. Should a gangrene ensue, add *Ægyptiacum* to your dressings, and spirits to the fomentation; and apply over all, the strong-beer poultice, with London treacle, twice a day. *Bartlett's Farriery, p. 323.*

DODDED SHEEP, sheep without horns.

DODDER, the name of so remarkable a plant, that it cannot easily be mistaken. It is entirely without leaves, and does not depend upon the ground for nourishment; but when it is grown up, rots at the bottom, and lives upon the juices of other plants which it entwines itself, by means of threads of a red colour, which it throws out. The slow-



FENCES



ers are small, and come out in roundish heads or bunches, many of them together, here and there, from the stem. *See* BIND-WEED.

DODMAN, a name given in some of the northern counties to the shell-snail.

DODRED *Wheat*, red wheat without beards.

DOG's-Grass. *See* COUCH-GRASS.

DOKE, a deep furrow.

DOLE, or *Dool*, a long narrow green in an arable field, left unploughed.

DOLPHIN-Fly, the name of an insect very destructive to beans. *See* the article BEANS.

DOOL, the same with dole. *See* DOLE.

DOSOME, an epithet applied to such beasts as improve apace. Thus a thriving beast is called, in the northern counties, a dosome beast.

DRAGS, a name given in some counties to the heaviest pair of ox-harrows.

DRAFFE, the grains of malt.

DRAIN, a channel, or trench, cut in the earth, in order to carry or drain off the water. *See* the articles BOG, MARSH, and MOOR.

When coarse grass is produced, the ground is evidently overcharged with moisture, proceeding either from cold, hungry springs, loaded with some mineral or acid, which want vent; or else from external floods, which, being confined by a stiff clay, impervious to water, remain upon it, and corrupt the natural nourishment proper for producing the sweet and richer grasses. When this last is the case, the remedy is easy, by making proper drains to carry off the superfluous moisture. But if the land be spouty or spewy, as it is commonly termed, and the moisture arises from springs, a deep drain must be cut in the lowest part, and smaller drains from that principal ditch to such places as appear to be the heads of the springs, which will be known by their being wetter and looser than other parts. The drains must be cut deep enough to reach the bed, whether gravel or sand, through which the water flows; and upon the first touching of this, the water will be found to run off more freely, and in greater quantity.

The smaller drains, communicating with the main ditch, should be left open for some time, until the quantity of moisture abates. After this, to make them covered drains, by which the surface is rendered level, and no part of it is lost, they should be filled up with small stones to within about a foot and a half of the surface, and then covered with turf, the green side downwards, or with heath, broom, straw, or any other thing that can most conveniently be had, proper to keep the earth from falling in among the chinks of the stones, through which, if no such accident happen, the water will pass easily, the drains will prove effectual, and the plough, after the earth that was turned out is laid above all, will go freely over, without being opposed by the stones. A foot depth of mould over the drain will be sufficient in pasture-ground; but this covering should be at least a foot and a half thick in ploughed lands. Where stones are scarce, faggots made of the branches of any kind of trees are substituted in their place: but they do not answer the purpose so well, because they decay and rot, the earth falls in, and the drains are stopped; though it is highly proper, where these are used, to line the sides of the drains with brick or stone, without mortar, to keep the earth from falling in there, and at the same time give free admittance to the water. It must be observed, that, where a great quantity of water is to be discharged, the main drain into which the smaller drains are to empty themselves, should not by any means be filled up, even with stones, unless it be both very deep and very wide, and there be a great quantity of stones to throw into it, lest it should not be able to discharge all the water; in which case the whole work will prove worse than useless; a remedy being very difficult, on account of the stones.

The best time of covering these drains is about Michaelmas, because the earth is driest at that season, before the winter rains begin to fall. The digging of them indeed is very laborious work, particularly in marshes, the soil of which is always of a tough strong quality. It is therefore of great importance, that every means be used to lessen that fatiguing labour. The shovels and spades universally used are certainly too short. Their length should be such as to give the labourer every advantage arising from his own strength. In order to have this, he should stand as erect as possible; for otherwise, he has not only the weight of the earth on the spade or shovel to raise, but

also that of his own body; whereas, if the shovel be of a due length, an easy shifting of the lowermost hand becomes a prop, or point, on which the weight at the end is raised, almost without bending the body.

Where the ground in which the springs are, lies on a gentle declivity, Mr. Tull very properly advises ploughing it nearly horizontally, by which means each furrow carries off the water, which would otherwise sink into the next ridge. If the clay underneath be at so small a depth that the plough can reach it, this will have a very good effect: and as the nearly horizontal direction of the furrow gives the water but a slow motion, it will not be so apt to wash away the richer mould, as it would if the furrows were more perpendicular to the declivity. These furrows should, however, have slope enough to give the water a current sufficient to prevent its soaking into the ridge underneath.

If the springs rise only at the bottom of a sloping ground, one large drain, reaching the whole length of the declivity, and cut down to the bed of clay underneath, may be sufficient, with the help of a channel, to carry off the water.

If there is any mineral in the earth, especially a chalybeate, which Dr. Home has experienced to be very prejudicial to vegetation, such mineral, being washed out by the springs, is lodged in the soil, towards the surface.

DRAINING of Land, the operation of carrying off the water from wet lands. *See* the articles BOG, MARSH-MOOR.

A correspondent of the editors of the *Museum Rusticum* has obliged the public with the following observations on the uses of draining:

"The first experiment," says he, "I made, was upon a piece of ground of about four or five acres, in the front of my house, of the springy kind; where the waters, collected from the rains and dews in a large plain of dry land above, broke out upon the declivity of the hill, and not having proper drains and channels to carry them away, had, by long overflowing, rendered the ground so soft and boggy, as not to allow the tread of any sort of cattle, (unless in very severe frosts,) and thereby made it entirely useless, and also very disagreeable to the eye. I took the opportunity of a very hard and lasting frost, to carry on a large quantity of stones for making the intended drains, which were laid out in the following manner: A main drain, or trench, was made through the middle of the ground from a small rivulet (into which it was to empty itself) to a little above where the springs made their first appearance: from thence two drains (one on each side) were carried along the side of a hill to the two extreme parts of the ground, emptying themselves into the head of the first mentioned drain, which was only made about three feet deep, till near the top of it. The branches or side drains were better than six feet, as I hoped thereby to have cut off all the springs: but the declivity of the land being considerable, I was obliged to add two drains more below, as some of the springs had escaped under the bottoms of the highest branches. I made the drains in the following manner: the bottoms were flagged with a thin tender stone (of no other use); the sides walled with rubbish stone (the walls being about five inches asunder, and five inches high); and the tops covered with a stronger kind of rubbish stone. Upon the covers I laid rushes and reeds (the then only produce of the ground) to prevent any dirt or soil from getting through the openings of them into the drains; and, lastly, I filled them up with the most porous substances, dug out to near the height of the surface.

"I began this work about the end of March, and had finished it about the end of August. I very soon found the good effects of my labour, the ground being grown so hard and solid before the middle of October, that I was able to carry on, with carts, a very large heap of compost, which I had prepared ready for that purpose; consisting of fresh litter from the stables, virgin earth, street dirt, coal-ashes, and lime, well incorporated together by frequent turnings. The next summer most agreeably surprised me with as fine a crop of hay, both in respect of quantity and quality, as any of the neighbouring grounds could boast, (above three loads to the acre); and the aftermath or second crop was full as extraordinary as the first. In order to know the profit of the latter exactly, I hurdled it off in small parcels: and, having taken in cattle by the week, found the profit better than twenty shillings a statute acre. This ground has kept improving ever since; and now affords me three crops every year; viz. spring pasture for my milch cows

and early feeders, a most plentiful crop of good hay, and an excellent aftermath; without having had any superinduction bestowed upon it since the first, which is eleven years ago. When stones cannot be conveniently had, the common flat tiles for the bottoms, and the common brick for the sides and covers of the drains, will do very well; and, as bricks are more expeditiously laid than the rubbish-stones, I think they will be full as cheap, if proper clay, and fuel for burning them, can be procured upon easy terms. The expence of draining this piece of ground was about five pounds per acre. I have drained many acres of the same kind of land since, with equal success; and at a much less expence. Another kind of land, which has fallen within my practice of draining, is what I call the four spongy land; where there is upon the surface a tolerable good mould, for six or seven inches deep, and below that a stiff clay, that will not permit any water to pass through it; by which means, the soil above is so soaked and chilled, with a constant surcharge of water, that it is not able to produce any thing but rushes, and all the worst species of aquatic weeds. As this kind of land is often nearly level, or but gently declining, the first step I take, is (by levelling) to find the greatest fall I can get within any reasonable distance. Then, by the means of iron-rods, (such as are used in boring for coals) with a bitt or iron scoop at the bottom, I try in several places the depth of the clayey stratum, which so obstructs the passage of the water; and also what the natures of the several strata below it are, till I come as low as the level, where I propose to begin my drain. If I find, in such search, gravel, sand, soft-rock, pinnel, or other porous substance, I begin the good work immediately, and with full assurance of success; making a good stone or brick drain (as before described) through the lowest part of the ground intended to be drained; and then filling it up with the light porous substances, that arise at the digging of it, or any rubbish that can be conveniently procured; taking great care that none of the clay or hard substances be thrown in again; and that the top and sides of the drain be left lower than the rest of the land; that the winter rains may easily descend to it, and so pass (as through a sieve) into the channel prepared to receive them. If there be any low parts in this piece of ground, from whence the rain-water cannot descend to the main drain, small pebble, or wood drains, should be made from those low parts into it; taking care to fill them up with some rubbish or light mould. The clay, which is dug out, may be converted (either by burning or laying up in heaps with quicklime) into a most excellent tillage, either for corn or grass land, for the improvement of the same ground, or any other where it is more wanted. For the fertility of such land, after such draining, is greater than can be well imagined by those who have not tried it, even without any farther improvement. I (generally indeed) set on lime immediately afterwards, if the season of the year be proper for it; which, I say (from experience) is from the middle of April to the middle of July; being certain, (notwithstanding some great authorities, and the common practice are against me), that twenty bushels set upon grass-land, during that season, are more than equal to thirty laid on in the autumn, or winter seasons. About an hundred and sixty bushels to an acre are a proper dressing. The last kind of land, of which I shall now treat, is the black peat or moorish land, many thousand acres of which, in this kingdom, are now entirely useless, though capable of being improved to great advantage. Nay, I will venture to affirm, that there is scarcely any so bad, but that it might, by proper means and due industry, be converted to some useful purpose. For which assertion, I have a happy authority, in that beautiful testimonial of industry, given by Virgil, in his fourth Georgic, to the old Corycian farmer. If these kinds of lands be nearly upon a level, I use the precautions mentioned in the last article; and, if I find my level will carry me below, or to the bottom of this black moorish or peat-earth, I do not regard the depth of my drains, as the digging is very easy, and what is thrown out will nearly pay the expence, by being either dried into peat for fuel, or burnt into ashes; which, if properly managed, are an excellent dressing, either for spring-corn, or grass-land. In the draining of this kind of ground, I make one principal drain through the middle of the piece, (of stone or bricks, as before mentioned), and, at about every eighty or a hundred yards, branches from it. These I make rather better than two feet wide at the top; and continue them nearly of the same width, till within eight or nine inches of the bottom. Then, with a spade

(about nine inches broad at the top, and narrowing down to three inches) I make a lower drain; and, upon the sides or ledges (formed by the narrowing of it), lay large heath-sods, cut square, and exactly to the width of the upper part: by which means, a cavity is left for the water to run in. Upon those sods or covers, I throw brush-wood, or any kind of light trumpery: and lastly, I fill it up with the smallest of the black soil thrown out. Such is the preserving nature of this black peat or earth, to all vegetables buried in it, that there is no doubt but drains of this kind will endure for ever, if they be laid deep enough. After the ground is drained and levelled, marl (if to be had near) should be laid on; if not, sand, gravel, or any kind of light earth. If the first, no other superinduction will be required; but if any of the latter over it should be spread, a cover of some of the finest black mould, that is pretty free from any strings or fibres; and then a compost made of horse-dung, coal-ashes, earth, or clay, and lime; and, lastly, it should be laid down either with grass-seeds alone, or with barley (or oats) and grass-seeds. I laid down a piece (drained and managed as above mentioned) about the beginning of August last, with white clover, yellow clover, and common hay seeds; and though the season was so remarkably dry and hot, yet the young plants came up very well, and very thick, and, in this present severe frost, it affords a verdure not to be seen any where else in the neighbourhood; and the piece is constantly covered by my cattle, tempted by the look, and the sweet food it affords them. I am now preparing about five acres of the same kind of land, to be laid down with barley and grass-seeds in the spring; and hope (if the season proves favourable) to have a good crop of both. I had no marl (or even clay) near, so was obliged to make use of sand and gravel for my first stratum."

DRAINING-PLOUGH, a plough for cutting drains, in order to carry off the water from wet soils.

Several instruments have been invented for performing this necessary operation; but as none were found sufficient to answer the intention of the husbandmen, the Society for the Encouragement of Arts, Manufactures, and Commerce, proposed a premium of fifty guineas for the best plough or machine, of the simplest construction, that should, with the least force, cut a new drain, one foot in depth perpendicular, one foot eight inches wide at the top, and ten inches at bottom; both sides of the drain equally sloping, and the earth to be equally thrown out on both sides. In consequence of this premium, several instruments for effecting this purpose were sent in to the Society; but upon trial one was found much superior to the rest, and answerable to the society's advertisement: and in consequence of which the premium was adjudged to the author.

This plough, of which we have given four figures on Plate VIII. was made by Mr. Cuthbert Clarke, at Belford, in Northumberland; and answered exceedingly well in meadow-ground; but could not be drawn in a stiff clay with the force of eight horses. Fig. 1. is a perspective view of the whole instrument seen on one side. Fig. 2. another view seen in front. Fig. 3. a third view seen at the tail. Fig. 4. a section of the plough, to shew the disposition of the three coulters.

Note. The same letters refer to the same parts in all the four figures; so that where any of the parts cannot be seen in that figure, the letters will not be found.

A, B, C, are the three coulters.

D, E, F, the nuts and screws that fasten the coulters to the beams.

G, H, I, a wheel, or rather roll, which prevents the plough from going deeper in the earth. This roll is divided into three parts, by circular pieces of iron, which project beyond the roll, and cut the turf into three parts. The coulters follow in the same tract, and finish that part of the work.

K, K, the centers on which the roll turns.

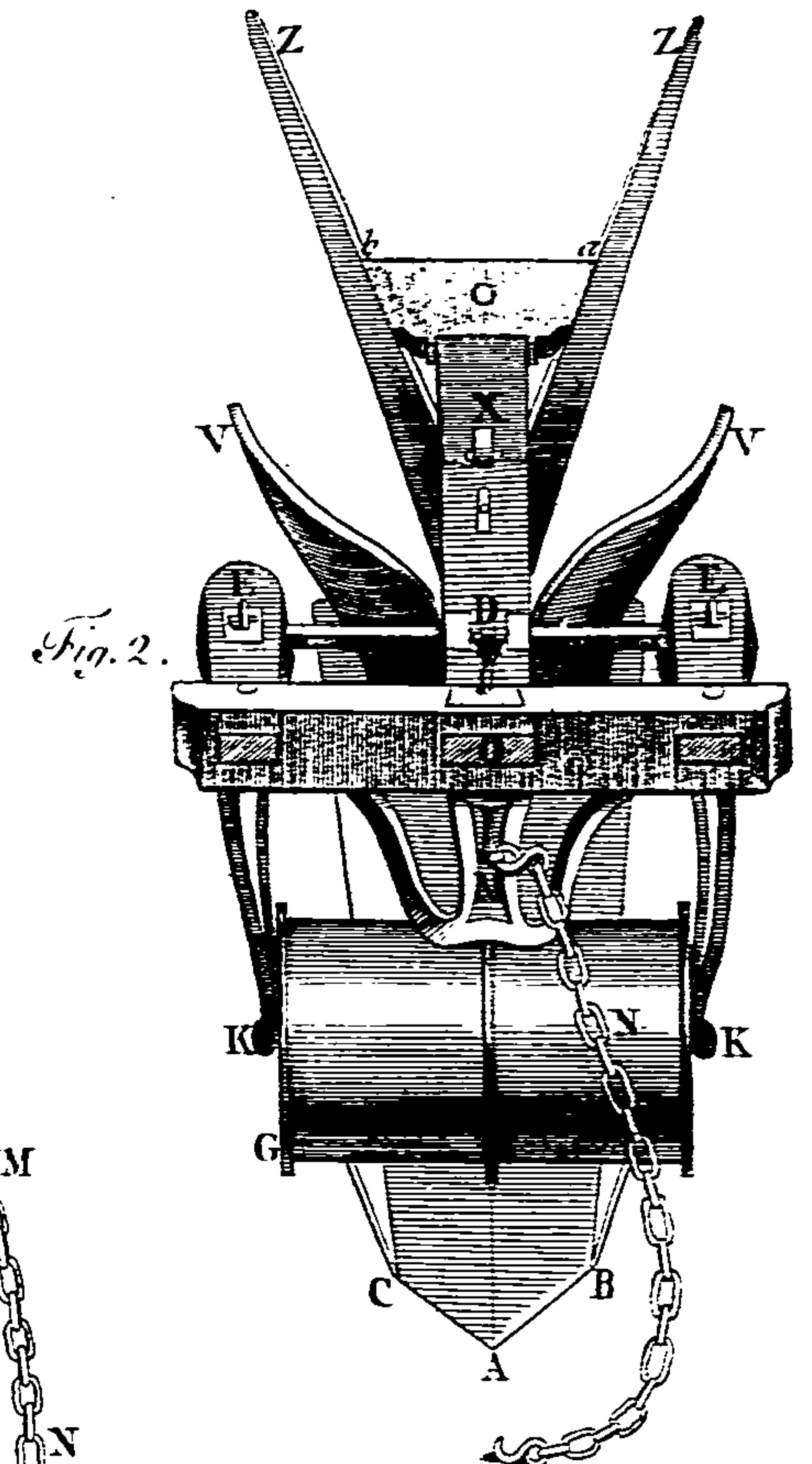
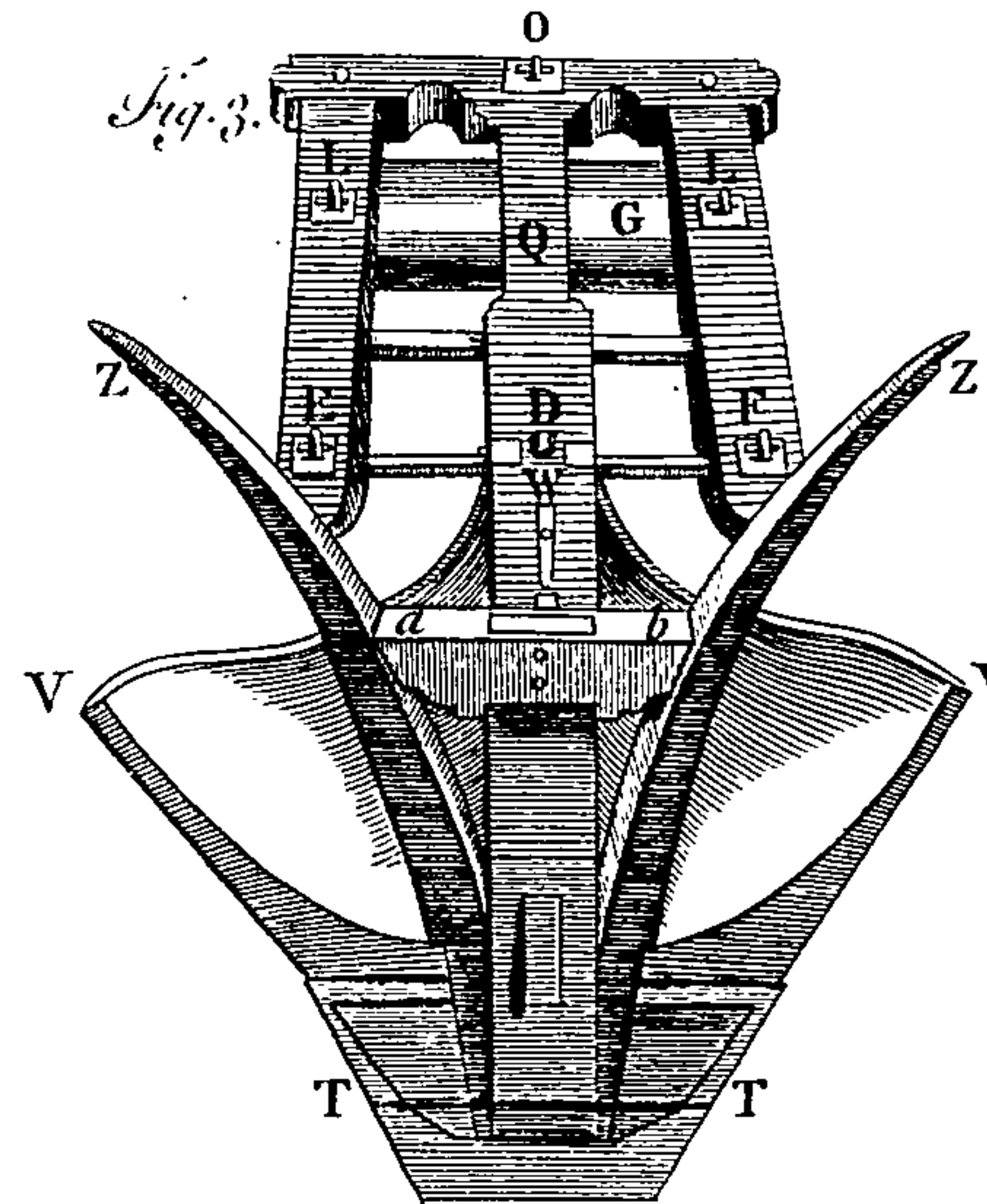
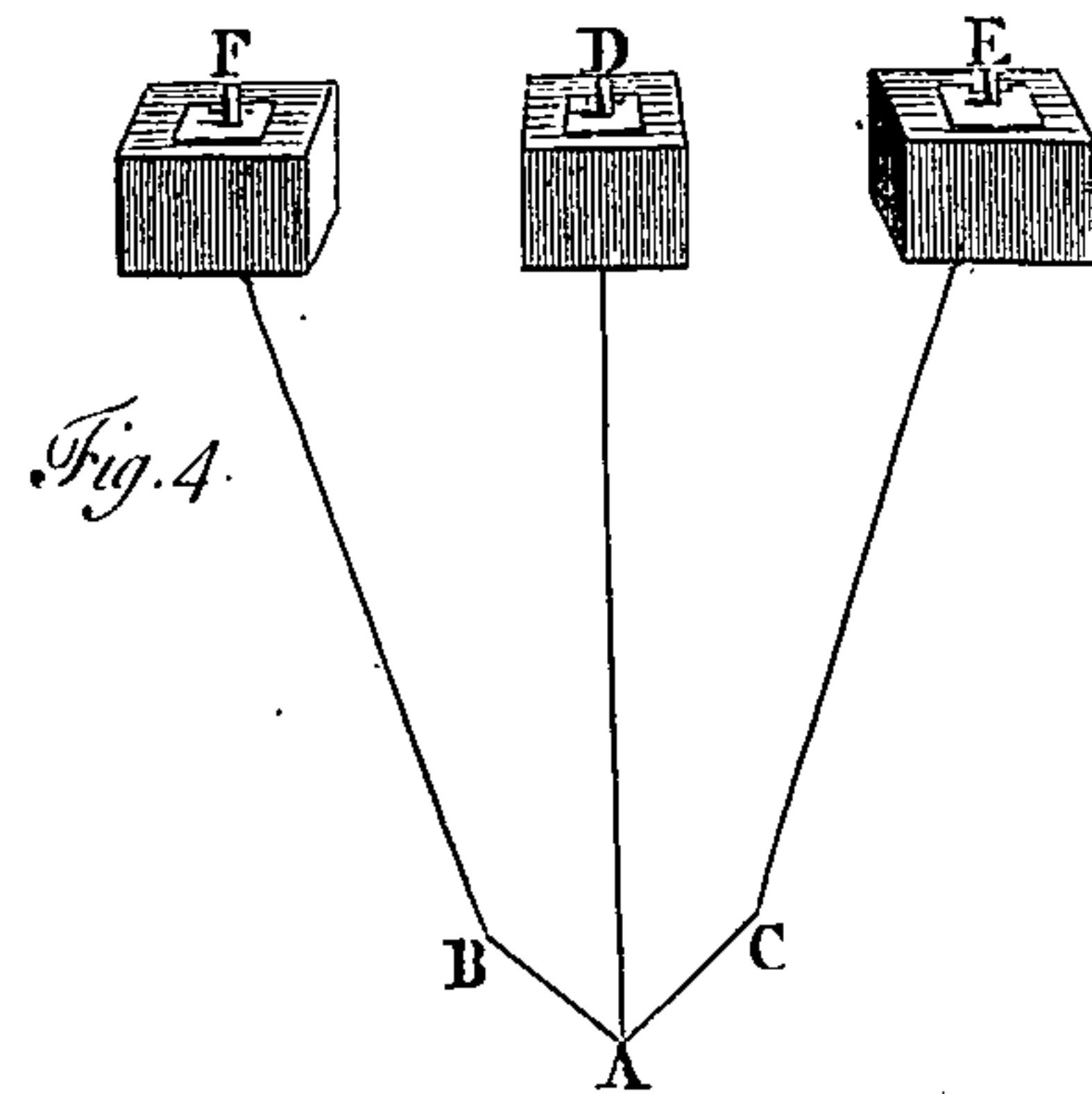
L, L, the nut and screws which fasten the iron arbour, in which the pivots of the rolls turn to the beams. These arbours are kept in their proper places by means of the two iron braces f, f.

M, a large iron hook, to which the chain by which the instrument to draw is fastened.

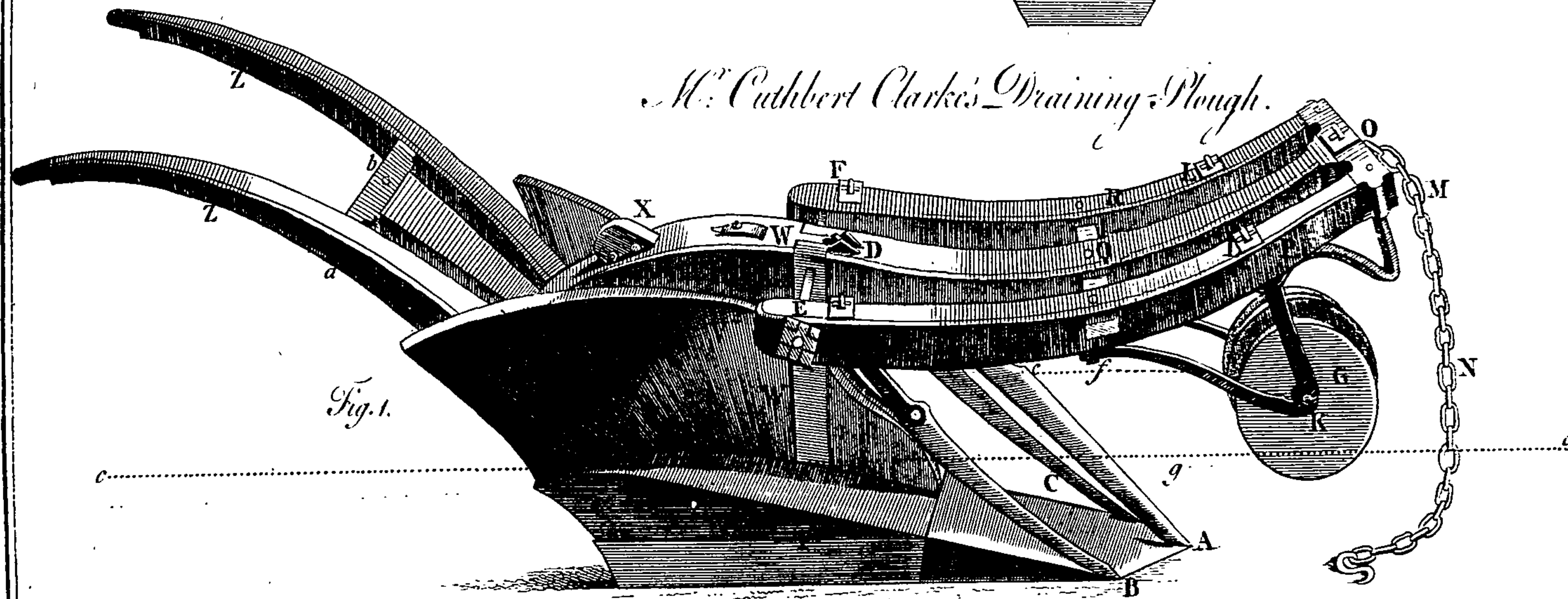
N, the tow chain, or that by which the plough is drawn.

O, the head of the plough into which the beams are mortised.

P, Q, R, the three beams.



M^r Cathbert Clarke's Draining Plough.



I. Barrow delin.

I. Hildett sculp.

S, a shoe of iron, (the whole part from S to A being of that metal) and into which the hoof of the plough is inserted.

T, a shelf on which the mould rises after it is cut up by the coulter and fore-part of the share, till it is thrown out of the trench by the mould-boards.

V, V, the mould-boards, which throw the earth out on each side the trench.

W, W, a band of iron, which fastens the after-part of the plough to the main or middle beam.

X, the head of a tenon, which fastens the mould-boards and hoof of the plough to the main beam.

Z, Z, the two handles, like those of a common plough.

a, b, a piece of board tenoned into the handles, in order to keep the handles in their proper position.

c, d, represents the surface of the ground when the plough is at work. Therefore all the parts below that dotted line are under the ground when the drain is cutting.

f, e, g, shews the angle which the coulters make with a line drawn parallel to the horizontal plane; and is nearly equal to forty-five degrees.

The figures are drawn on a scale of an inch to a foot; but many of the parts, being drawn in perspective, cannot be measured.

We imagine it will be unnecessary to say any thing farther with regard to the manner of working this plough, as the operation is the same as that with the common plough. But it may not be amiss to observe, that the angle f, e, g, being greater than that by which the horses draw upwards, the plough has too great a tendency to get into the earth; the consequence of which is, that, when the soil is very stiff, and consequently requires a very great force to draw the plough, the instrument cannot be held properly by the handles, the force of six men not being sufficient to do this, but the plough will turn entirely over. This was sufficiently apparent to the committee of the Society, at the first experiment, when the ploughs were tried in a stiff clay; for the tail of this very plough could not be kept down by six men at the handles. If therefore the angle f, e, g, were lessened to about thirty-three degrees, this difficulty would, in a great measure, be improved. However, in marshy, boggy, and moory soils, it will answer the intention extremely well, and make a clean trench of the dimensions required by the Society; and therefore cannot fail of being a very valuable acquisition in the practice of agriculture.

DRAINING-UNDER, or *foughing*, is of infinite service in cold and rushy lands. Mr. Marshall in his Rural Economy gives the following method of forming under-drains:

"This trench he sunk six diggings," of about five inches each; making it thirty inches deep, and contracting it to four inches and a half at the bottom: in this instance, hitting the springs, lancing the veins of subterraneous water with great judgment. In filling in this trench, with stones (pebbles picked off ploughed lands—provincially boulders) he began, at the upper end, with a course, about 5 or 6 inches thick; in order that the water, which kept trickling along the bottom, might be stopped and fouled, beginning at the top, bringing down clean water; and having reached the lower end, returned with another course; making the two about eighteen inches deep; each foot in length taking about a cubical foot of stones. The mouth he formed with four bricks, laid in clay, and backed by the largest of the pebbles; leaving a pipe four inches and a half square. The surface of the stones being levelled, they were covered with whole spits or clods of the stiffest of the clay, or strong clayey loam which rose out of the trench; chopping and treading them down close and tight upon the stones; next, filling up the trench, level, with loose mould, and on this placing the first spits, or turf of young grasses; finally spreading the remaining mould thin over the adjoining surface.

Mr. Marshall adds that "under-draining" properly conducted, and in situations where the subsoil is partially too retentive, ranks among the first of rural improvements: it being a fact incontrovertible, that, in the productiveness of lands, more depends on the nature of the subsoil, than on the intrinsic quality of the surface mould.

Land-Ditching, or Hollow Draining, is little attended to out of the counties of Hertford and Essex, where it is practised not only to carry off the water from springy spewy soils, but as a meliorator of stiff loamy clays, such as are so tenacious of rain as to render the land porchy in winter,

and water-bound in spring; those of the first description, it is pretty universally acknowledged, received great improvement by the draining off the water; but those of the latter are not so generally known to receive benefit from the operation of land-ditching. Therefore, would it not be highly beneficial to publish the expence, method, and effects of that great and valuable improvement, when so many rich, though wet counties, are totally ignorant of that operation in husbandry?

The expence and general method is pretty accurately ascertained in the inclosed letter from Mr. Mason.

The engravings of the implements might be published according to the inclosed drawings.

"Drains filled with wood, and covered as usual with straw or rushes, are preferable to stones, or any other kind of material; the reason is, that as the wood decays, the water continues to pass. When filled with stones, and the drain stopp'd up, which must be expected to take place in time, the earth becomes quite solid round the stones, and as they do not decay, the filtering of the water is for ever obstructed; not so when bushes or wood are used; continual filtering and draining are then for ever to be perceived; and by repeating the operation a second time, cutting the drains transversely of the old ones, the benefit of the filterings through the rotten wood is secured, and the spewing up of old, broken, and damaged drains corrected and carried off. Moreover, as bushes form a much greater number of cavities than either stones or poles, they are less able to stop up, and encourages filtering more than larger and more solid bodies.

The general effects are, that the land, after draining, not being so much chilled by the long continuance of the winter-water on the surface, produces earlier vegetation in the spring; the grass is rendered of a better kind; the white clover is encouraged, which seldom fails in Essex and Hertfordshire to chequer the land-ditched fields with its sweet appearance. Tillage-land is rendered much more manageable, it dries gradually and early in the spring; the bad effects of land being catch'd full of water when the parching winds in March suddenly harden the surface of wet grounds, is prevented, and the earth breaks kindly. This in a short time alters the very nature of the soil: the weeds and grasses change their colour; every plant that grows, loses the appearance of rankness; the corn increases in quantity and weight; and every benefit a farmer can wish, is more or less the consequence of this first of all improvements, in proportion as the soil draws well or ill.

See Plate VII*, fig. 1. The spade for digging the first spit.

From a to b	—	13 inches.
b to c	—	4
a to d	—	7

Fig. 2. The spade for the second spit.

From e to f	—	13 inches.
f to g	—	1½
e to h	—	4

Fig. 3. The scoop for cleaning the moulds after the second spade. The scoop part 13 inches long and 1½ wide.

Fig. 4. A section of the drain, as filled with wood; the largest at bottom, and smaller as it rises.

DRAPE, a farrow cow, or one whose milk is just dried up.

DRAUGHT horse. A horse destined for the cart, plough, &c. in the choice of which for either of these purposes, being that which they call the slow draught, one is to be chosen of an ordinary height: for horses in a cart, unequally sorted, never draw at ease, but the tail hangs upon the low horse. Our English authors say, he should be big, large-bodied and strong-limbed by nature, rather inclined to crave the whip, than to draw more than is needful; and for this purpose, mares are most profitable, if you have cheap keeping for them; for they will not only do the work, but also bring yearly increase: but care must be taken to have them well forehanded, that is, to have a good head, neck, breast, and shoulders; but for the rest it is not to be regarded, only let her body be large; for the more room a young foal has in its dam's belly, the better: and be sure never to put the draught horses to the saddle, for that alters their pace, and hurts them in their labour. See **PACK-HORSE**.

Some say, that a horse designed for draught or labour, ought

ought to have a head with large bones, and not fleshy, that so he may not be subject to diseased eyes; that his ears ought to be small, straight, and upright, and his nostrils should be large and open, that he may breathe with the more ease and freedom; that those horses that have their foreheads sunk a little downwards about the eyes, are generally good for labour: whereas those who are designed for the saddle, ought to have them even and pretty large; that the forehead should be always marked with a star, unless the horse be of a grey or white colour.

You must see that he has a bright and lively eye, full of fire, and pretty large and forward in his head, having large balls, and raised pits, and never sunk, which shews that the horse is old, or begot by an old stallion; and if he has a bold look it is always a good sign; sunk eyes or elevated brows are indeed signs of some malignity in a horse; but these sort of horses will generally undergo much fatigue.

His mouth should be pretty wide, being a quality very essential to it, the palate not fleshy, and the lips thin: the mouth also should be cool, and full of foam, by which you may discover the good temperament of a horse, and that he is less subject to be heated than another; not that the mouth should be that which must be most regarded in a draught horse; for if he has a bad one he often draws well.

We do not require fine chests in draught-horses, that not being essential; all that is to be said on this occasion is, that such animals ought to be pretty thick and fleshy ones, but his breast should be large and open, his shoulders should be thick, that he may draw the easier, and that his harness may not so soon hurt him: if he be somewhat heavy he is the better for draught; for the more he is nearer to the ground, the more he is valued for that purpose. He ought to have double loins which may be seen by their being a little raised up towards both sides of the back-bone; he ought also to have large and round sides, to the end that he may have the more guts, and a better flank: you need not be afraid of his having a great belly, provided it be not cow-bellied, which will make him appear deformed; he should have full, but not broad flanks, that he may not sway in the back at his labour.

That horse is esteemed which has a large and round buttock, that neither sinks down or cuts: care should be taken that he should have a firm and strong tail, that the dock should be thick, well furnished with hair, and placed neither too high nor too low, both which contribute much to the deformity of the buttocks. The legs are parts of the body of a horse which are most to be considered, as being those which are to support the burthen of the whole body, to which they ought to suit; therefore his legs should be rather flat and broad than round, the roundness of the leg being a defect in a horse destined to labour, which will soon ruin him; as for the hinder legs, the thighs should be long and fleshy, and the muscle that is on the outside of the thighs should be fleshy, large, and very thick: it is a fault to find them fall down plump when the horse steps; it is also a sign of weakness in the loins or hams: however you are not to consider the hind legs so much as the others, they being not so subject to be faulty; the fore ones being very often bad when the others are good. Those horses whose legs are too long and too large for their height, are faulty, and you ought not to buy them. You must always observe that he stands well and plump, when he stops in any place; and if he does not, you may conclude he is not good.

The usual way to know the age of a horse, is by his teeth, eyes, &c. for which the reader is referred to the article of *AGE of a HORSE, EYES of a HORSE, &c.*

The nether jaw of the horse should be examined very well, to see that it be incommoded with no gland, which may occasion the strangles, and be a means to kill him.

Something may be said concerning the feeding of a draught-horse; but for the servant who looks after him, he ought to be up very early, and see that the harness be in good order; and take away the old hay out of the rack, lay fresh in, and clean the manger, ridding it of all ordure, earth, or foul dung; and while the horses are eating their hay, he ought to take them one after another out of the stable, to curry them; for if he should do this work within, the dust will fly to the other horses.

If persons would be persuaded of the necessity there is to dress horses well, they would not be so often surprised at the loss of them, for want of this care, though they feed them ever so well.

It is from the filth that is upon and about them, that ma-

ny of the distempers which befall them have their rise, and prove their destruction; and it may be held for an inviolable maxim, that a horse with less food, methodically dispensed, and well dressed and curried, shall be fatter, and more lightly, than another who has more provender given him, and whose dressing is neglected; and therefore the master of a family ought to be on the watch, and see that his servants (if they are of themselves careless) be not wanting in this particular.

Such sort of servants ought to be good humoured, handy, tractable, nervous, and hardy; and in order to dress a horse well, they should hold the curry-comb in the right hand, and the horse in the left, near the buttock, and lightly move the comb backwards and forwards along his body, and continue so to do till no more filth or dust come off, and then they must, with a dust-cloth, wipe off all the dust that lies on the horse, taking care to do it all over his body.

They should daily, after they have dusted their horses, take a whisp of straw, and twisting the same hard, wet it in water, with which they should rub them all over, more especially the legs: by this means they will remove obstructions, and facilitate the passage of the animal spirits, which cause motion: indeed it cannot be expected this second dressing should be practised every day, but it ought to be done as often as servants have any leisure for it, particularly when the weather does not permit them to labour abroad; and if they are defective therein, the master of the family ought to make them do it. When the horses are thus dressed, the next thing is to take the comb, and gently to comb their manes and tails; and then they are to be led out of the stables to water, and to cheer and divert them as much as possible.

Most part of the diseases to which horses are subject, proceed from their drinking bad waters; such as those that are too vivid, or too raw, muddy, and too cold. To prevent these inconveniences, you must observe, that if you are near a river, you should in summer-time, by all means, lead your horses thither; but as little as may be in the winter, if you have a well near home; for well-water fresh drawn, during the season, is warm and consequently good for the horses: if you are remote from any river, and that in summer-time you have no other than spring-water to give your horses to drink, you must draw the same a good while before it is given them, and expose it to the sun in tubs, or very clean stone-troughs, that you may by that means correct the great crudity of the water, which is extremely injurious to them: you must seldom or never carry them to drink marshy water, which has very bad qualities, and will not agree with them.

When your labouring horses have drank their water, you must give them their oats in a manger, that has been first of all cleaned: the oats should be well sifted and cleared from dust, before you give them; you ought to take care to smell to them, and see if they smell of rats, or are musty, which will make the horses loath them. You must, likewise, above all things, observe whether there are any small feathers among the oats, which may, if left therein, do the horse a great deal of injury: the quantity of oats allowed to each horse is sometimes more and sometimes less, but ever enough to make them keep up their flesh; and while the horses are eating their oats, the servants are to take their breakfasts, and afterwards go to harness them for the plough or cart, as their occasion requires.

But before they do this, they must examine whether any thing hurts them, either at the breast, shoulders or hams; and they must see that the collars about their necks be supplied with every thing that is requisite for them: if they are to draw in a cart, you must see that the pad upon the back does no way hurt them, that the same fits every way even, and that it be well stuffed with hair in the pannels, for fear it should be too hard upon the horse's back.

The horse being thus managed, and every thing in good order for the work, whether with plough or cart, those servants who do understand their business well, do not work them at first too hard, but every turn let them gently breathe; whereas if they do otherwise, they will very often find them decline their food, after their return from labour; by which ill management they sometimes run the danger of foundering, or having their grease melted; and therefore to work them gradually is the best and safest way. When the horses are returned from the plough, &c. as towards noon-tide, or the like, they are usually all in a sweat, and then the men must not fail to rub them with a

Fig. 1.

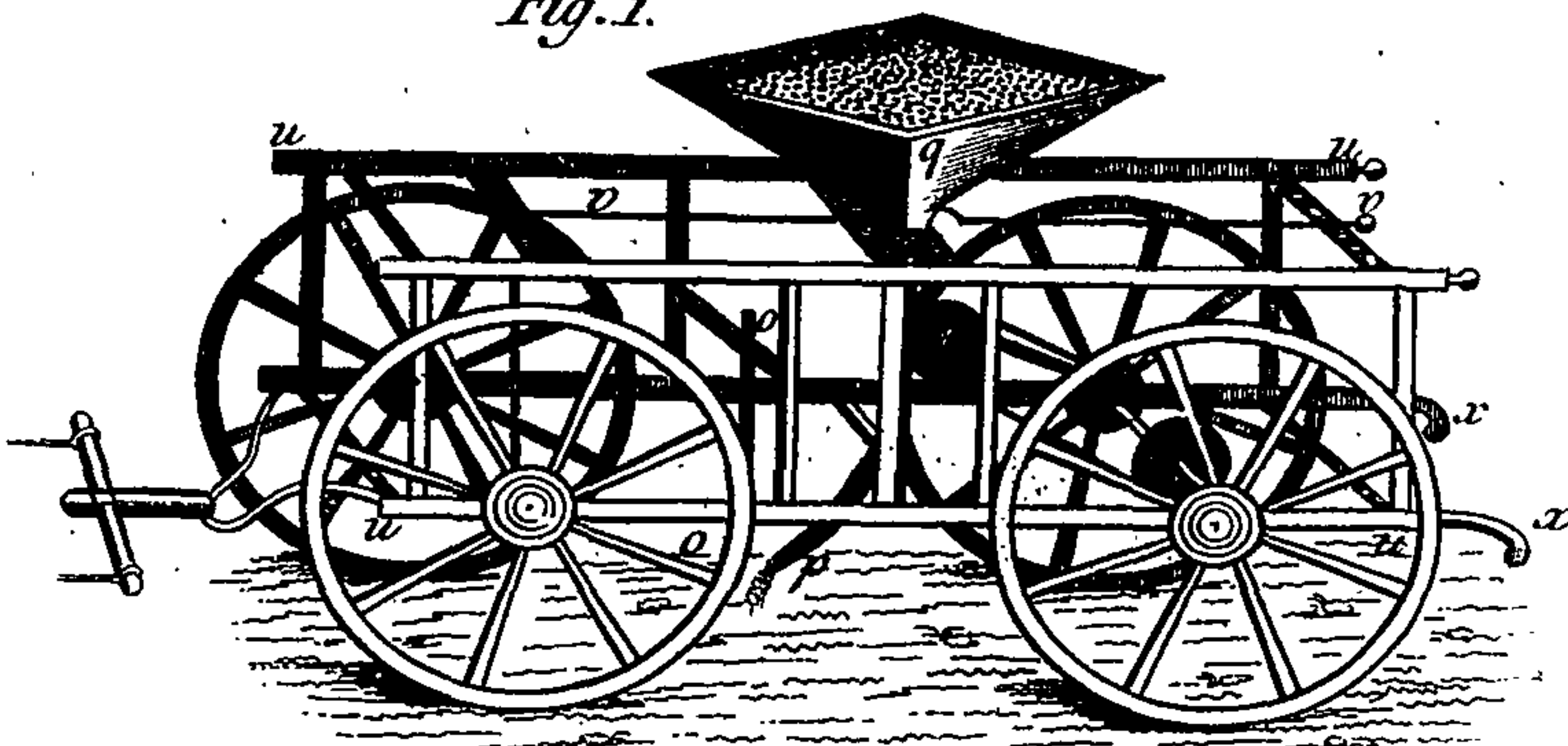


Fig. 2.

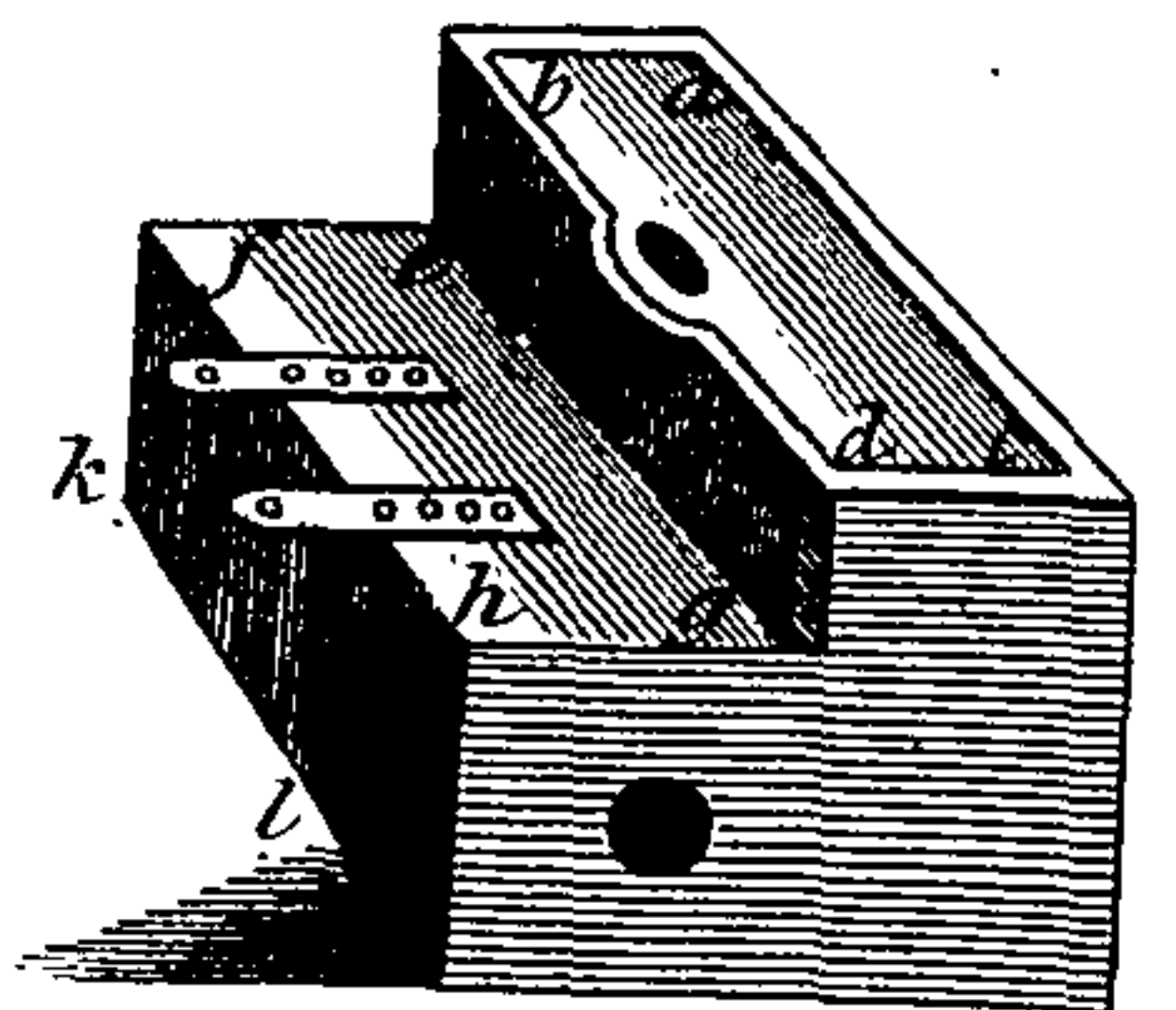


Fig. 3.

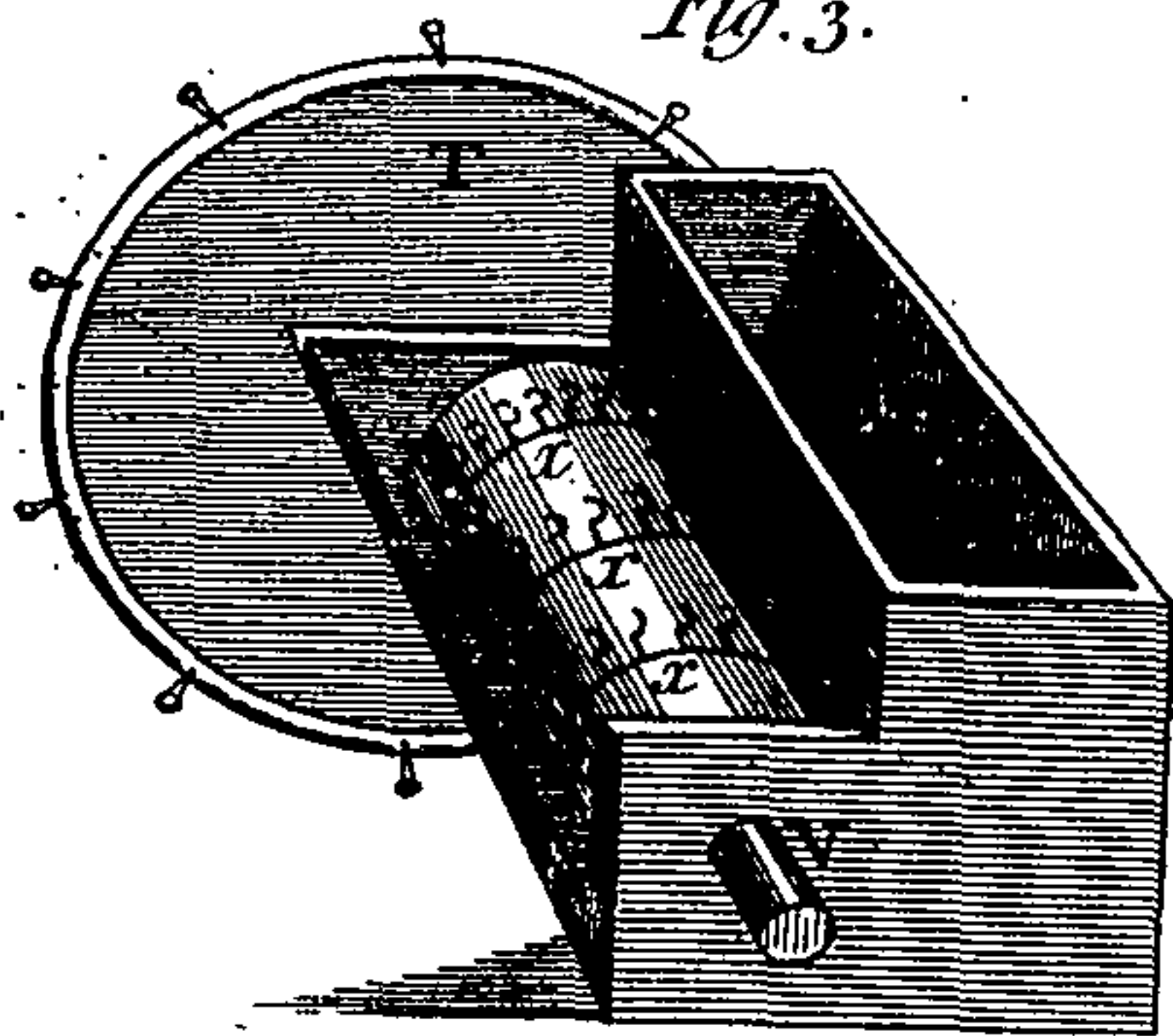


Fig. 4.

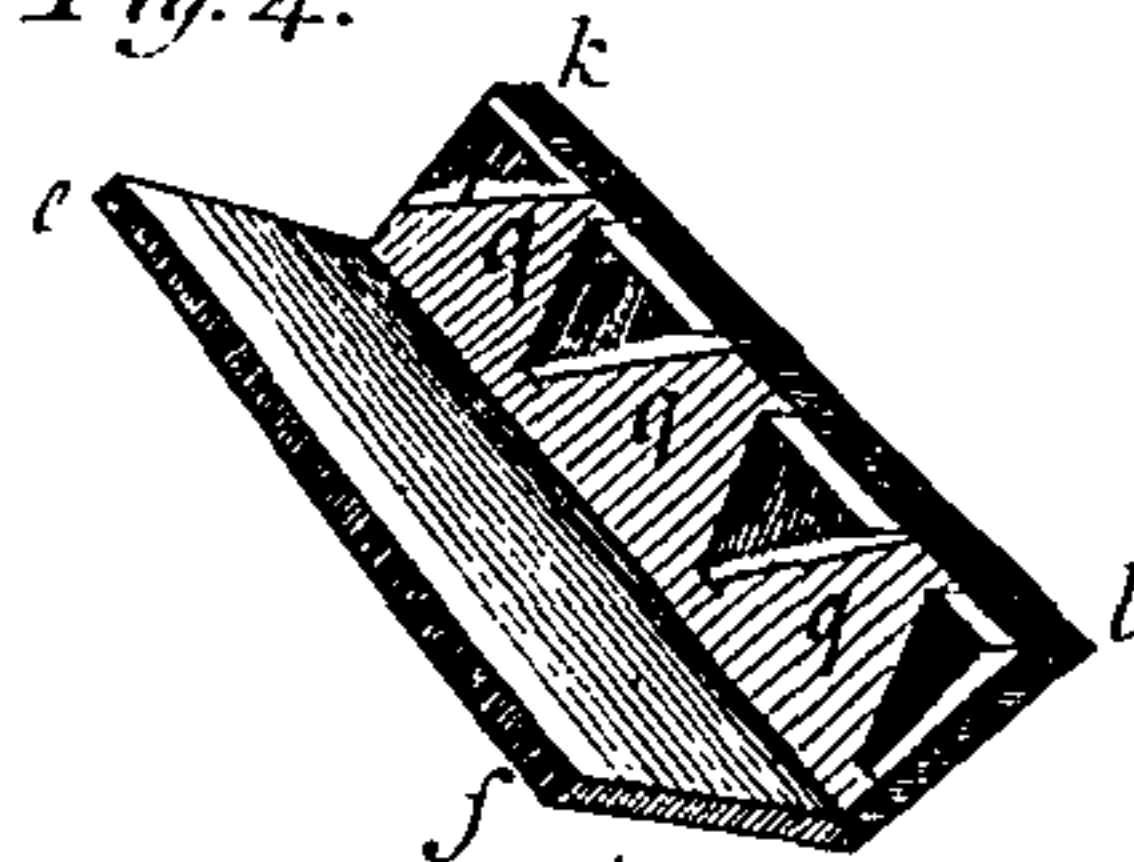


Fig. 6.

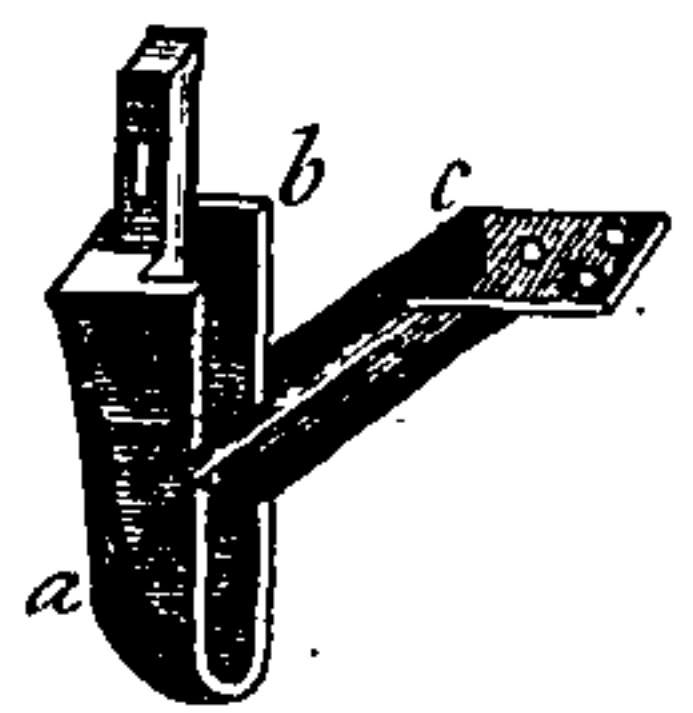


Fig. 5.

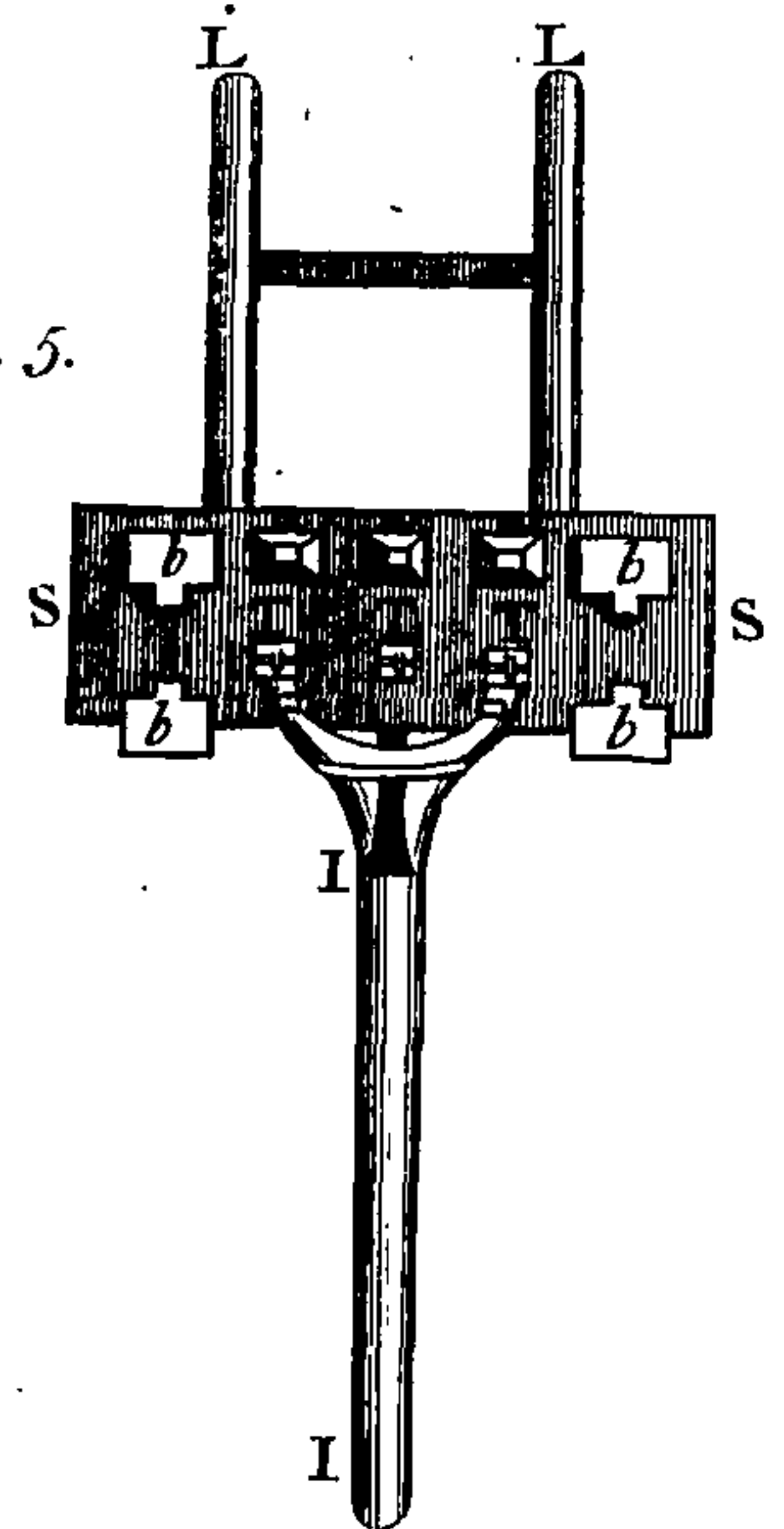


Fig. 8.

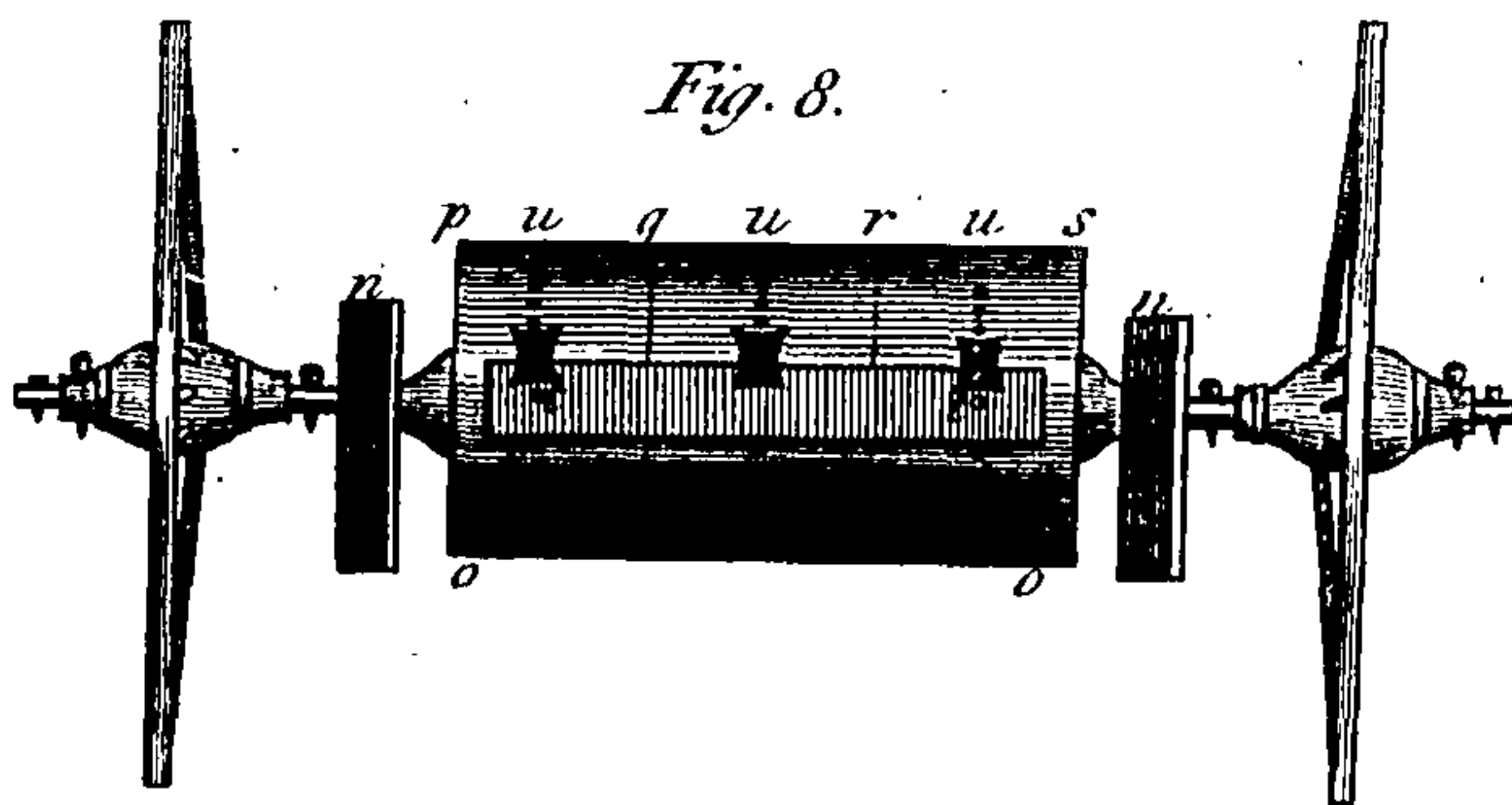
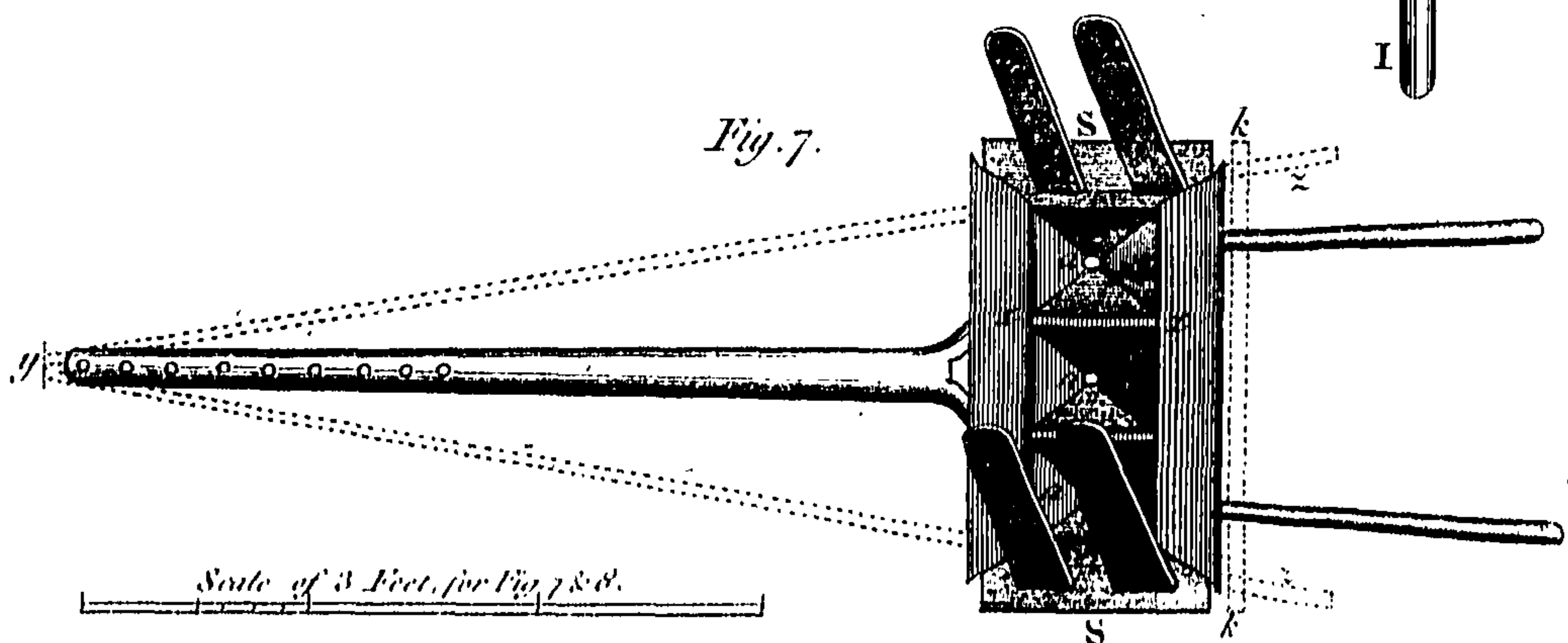


Fig. 7.



Scale of 3 Feet. for Fig 7 & 8.

whisp of straw ; this is the first thing they are to do after they are brought into the stables ; then let them prepare some bran which is very well moistened, which put before them in the manger, to make them mumble the same, and this will make them eat the hay with a greater appetite ; the bran being ordered as before, will cool their mouths, which are dried, through the heat occasioned within by their drawing ; and notwithstanding the horses are thus hot, it is very rarely that any inconvenience happens to them, especially if the water wherein the bran has been steeped, be used rather hot than cold : when such precautions are not taken, it is no wonder the owners and their servants, very often find their horses loath their food ; the dryness of their tongues rendering all the food insipid to them ; and therefore those persons who love their horses, ought carefully to observe this method, and they will find their account in it.

We daily see persons who pretend to be well skilled in the management of horses, as soon after hard labour as they are brought back to the stables, never fail to rub their legs with wisps of straw, alledging that this is the way to refresh them very much ; but they are much mistaken in the point, for the horses after hard labour, must not have their humours much agitated ; and by this action they must needs fall upon their legs, which will tend to make them very stiff and useless. The author adds, that he was willing to give them this information and caution, judging it very necessary for the avoiding those inconveniences which happen daily by that ill method, which cannot be followed after such admonition, but by those who are obstinate in their way, and will ruin their horses : not that our author disapproves the rubbing of their legs, which he says is very wholesome ; but it must not be done when they are too hot ; and they should confine themselves only to the rubbing of their bodies when they are in a sweat, and let their legs alone.

Their racks being well supplied with hay, you must suffer your horses to rest two hours, or thereabouts, or otherwise as above directed ; and then in a little time after they have eaten their oats, to work again with them : in the evening, when your ploughing or other work is over, the first thing to be done after they are tied to the rack, is to lift up their feet, and see if there is any defect in the shoes, and at the same time take out with a knife, the earth and gravel which is lodged in the foot between the shoe, and the sole, and put in some cow-dung : this your servants often neglect, and therefore the master ought to see them do it.

A thing very essential for the preservation of all sorts of horses, is good litter, which to these animals, is comparatively the same as clean sheets to men. There are many who suffer the dung to rot a great while under their horses ; some through laziness, will not clean their stables, and others say they leave the dung there that it may receive more juice, and be the better manure for the ground ; but it is very wrong reasoning, to say we do this to save five shillings, and lose ten : but you are to understand, that the dung being heaped up for a considerable time, does so over-heat the horse's feet, that this alone is enough to ruin them entirely.

Hence also arise so many inconveniencies to the owners of them, that they are often obliged to keep them in the stable without doing any work, which embarrasses either the master to whom they belong, or the servant who has the care to dress them ; and this inconvenience proceeds only from their ignorance of the cause ; and therefore it is of the highest importance, that the stable should be cleansed as often as possible, and the horses have fresh litters given them ; besides, it is natural to believe, that all animals hate their own ordure ; and it is absurd to think, that a horse, which is one of the cleanest among them, should not do the same.

Fresh litter has a virtue to make horses stale as soon as they come into the stable, whereas when they find no such therein, they decline staling ; and if the people were sensible what refreshment it is to a horse to stale at his return from labour, they would be both more curious and careful to let him have that which would promote it, than they are.

This staling after much fatigue, will prevent obstructions in the neck of the bladder, or passage of the urine : but if otherwise, and that this same urine comes to lodge in the bladder, it will cause some inflammations there ; which are very dangerous evils for horses, and of which they very often die, without present relief : hence you may judge of the

necessity there is to let your horses frequently have fresh litter.

As to the remaining care you ought to have of your horses, so that they may pass the night as they ought, there needs no more after you have well rubbed them, than to supply their racks with hay enough, which they may feed upon after they have eaten their oats : and continuing thus daily to manage them, it will be the means to keep them in a condition to do you good service.

DRENCH, physic, &c. given to a brute by means of a horn cut properly for that purpose.

DRESSING meadows. See **MEADOWS**.

DRILL-PLOUGH, an instrument for sowing corn in drills, or rows, which is an essential part of the New Husbandry.

The two first inventions for sowing in this manner, were Mr. Worlidge's drill-plough, and Don Joseph de Lucatello's sembrador, both of which may claim the merit of inventions, and therefore must not be omitted in this work.

" Besides the usual method of sowing corn, there are, says Mr. Worlidge, several other ways of dispersing it, as by setting, and hoeing of it in, &c. This art of setting corn seems to be very ancient, as appears by Virgil, *Unguibus infodiunt et ipsis fruges*. And hath been a long time attempted to be brought into practice again, as appears by Mr. Platt's Adam's Tool revived. Mr. Worlidge then points out the defects in Mr. Platt's instruments, and proceeds thus :

" But to remedy and remove all manner of errors and inconveniencies that can be found in setting of corn, I shall here give you a plain and perfect description of an easy and feasible instrument that shall disperse your corn, grain, or pulse, of what kind soever, at what distance, and in what proportion, you please to design, and that with very great expedition, and very little extraordinary charge, expence, or hazard.

" First make a frame of timber, of about two or three inches square, the breadth of the frame about two feet, the height about eighteen inches, the length about four feet, more or less as you please, as at *u u u u*, fig. 1, Plate IX. Place this frame on two pair of ordinary wheels, like plow-wheels. The axle-tree of the two foremost wheels is to lock on either side, as doth the fore axle-tree of a waggon, for reasons hereafter shewn. The hindermost axle-tree, being of iron, and square in the middle, must be fixed to the center of the wheels, that the axis and wheels may move together : then about the middle of the frame, in the bottom, let there be fixed an iron instrument, or of wood pointed with iron, like unto a coulter, made a little spreading at the bottom, in the nature of a share, made to pass through two mortises on the top, for its greater strength ; and made also to be wedged higher or lower, according as you will have your furrow in depth, as at *o o* ; the use whereof is only to make the furrows : so that you must make the point thereof, of breadth only to move the earth, and cast it, or force it, on either side, that the corn may fall to the bottom of the furrow. Then over this share or coulter, a little behind it, may a wooden pipe be made, to come from the top of the frame to the lower end of the share, tapering downward, as at *p*, and as near as you can to the share ; to deliver the corn immediately, as the ground is opened, and before any earth falls in ; that what earth does afterwards fall in, may fall on the corn. This pipe is to proceed out of a large hopper fixed on the top of the frame, that may contain about a bushel as at *q* : but so that the corn may gradually descend, according to the quantity you intend to bestow on an acre. At the very neck of the hopper, underneath, in the square hollow thereof, must be fitted in the edge of the wheel wood, about half an inch thick, and proportioned to the cavity of the neck, as behind the letter *r*. The wheel need not be above two or three inches diameter, and fixed on an axis extending to one side of the frame to the other : on which axis is also to be another wheel with a groove on the circumference thereof, like the wheel of a spit or jack, as at *s* ; which must answer to another wheel of the like nature and form, fixed on the axis of the hinder most of the wheels, as at *t* : then fit a line (of silk as best, because it will not be so apt to shrink and stretch as hemp) about these two wheels, that when the instrument moves on the hindermost wheels, by the means of the line, the small wheel at the neck of the hopper may also move ; which lesser wheel in the neck of

the hopper, may have short pieces of thick leather fixed in the circumference thereof, like unto the teeth of a jack-wheel, that upon its motion, it may deduce the corn out of the hopper, in what proportion you please: for in case it comes too fast, then you may by a wedge at the tenon of the piece whereupon the hopper rests, as at *t*, or at the end of the axis of the lesser wheel, force the wheel and hopper together; as, in case it feeds too slow, then may you remove them by the same wedges to a farther distance; also in case your line be too slack or too hard, you may prevent either extreme by a wedge in the place where the axis of the wheel moves; or by a third wheel, about the middle of the line, made to move farther or nearer, as you may see cause.

"Also by means of the iron-rod *u v*, fixed to the foremost axis that is made to lock, may you guide your engine at pleasure; which rod is made crooked at the end of the hopper, lest that should injure its motion.

"And at the turning you may lift up your engine by the handles at *x*: for whilst you lift it up, the corn feeds not until you set the same down again.

"One horse and one man may work with this instrument, and sow land as fast or faster than six horses can plough; so that you may with ease compute the expence, in case your instrument be single: but you may in the same frame have two shares at twelve inches distance, more or less, as you will have the rows of corn distant the one from the other; and two pipes out of the same hopper, and two small wheels on the same axis, with other wheels answerable, every whit as easy to be performed as one; and then you may double your proportion of land in a day.

"This instrument will always keep the same proportion you first set to, which you must thus contrive.—First, know the length of the furrow you sow: then call up how many of these furrows at such distance your instrument is made for (whether a foot, more or less) will amount to an acre: then conclude how much to sow on an acre; suppose a bushel: then divide that bushel into so many parts as you have furrows or distances in that acre; then take one or two of those parts, and put into your hopper, and observe whether it will hold out, or super-abound at the end of one or two furrows, and accordingly proceed and rectify the feeder: or you may judge by your own reason, whether it feeds too fast or too slow.

"In case it feeds too fast, notwithstanding they be close placed together, you may make that wheel at the lowest axis, wherein the line moves, to be less than the upper; then will the motion be slower: and thus may you make it move as slow as you will, by augmenting the upper, and diminishing the lower wheels wherein the line is; and make it move faster by the contrary rule.

"In case you drive apace, it feeds apace; in case you drive but slow, it feeds but slowly: here is no error.

"When you come to any turning at the land's end by lifting up the hindermost part of the instrument, that those wheels touch not the ground, the feeding of the corn immediately ceaseth, until you set it down again.

"Also all the corn you sow lies at a certain depth, none too deep, nor any too shallow.

"You may place a kind of harrow to follow; but the best way is to have on each side of each furrow a peice of wood, a little broad at the end, set aslope to force the earth rounding on the corn. This may be well placed and fitted to the bottom of this instrument, just behind the share and feeding pipe.

"By this method of sowing any sort of grain or pulse, may be saved the one half, and in some places more, which by the other way, is either buried so deep under the clods, that it cannot come up, or else it is so shallow, that the cold in the winter, or drought in the summer killeth it, or else lies on the surface as a prey to the fowls of the air: much also therefore falls in clusters, twenty or thirty grains where one or two might suffice, which are common inconveniences, and usually happening to the vulgar way of sowing corn: the greater half by far is lost, which in all probability may be saved by the use of this very instrument, which will doubly requite the extraordinary charge and trouble thereof: for here is no corn sowed under clods, but in rows, as the earth is stirred and moved: it is all at one certain depth, and at one certain distance, and equally covered; below the injury of frost, and heat, and rapine of birds. Also by this way corn may be sown in the very

middle or convenient depth of the mould, that it may have the strength of the land, both below and above the roots; whilst in the other more usual way, the corn falls to the bottom of the furrow on the gravel, clay, or such like hard ground, where it seldom thrives so well as what happens to be in the midst. This way also exceeds the way of setting corn, where the pins thrust into the ground harden and fasten the mould, so that, unless the land be very light, it confines the roots to too narrow a place, which in this way is prevented; as I have observed in garden beans, that those hoed-in proved better than those set with a stick.

"By the use of this instrument also may you cover your grain or pulse with any rich compost you shall prepare for that purpose, either with pigeon-dung dry or granulated, or any other saline or lixivial substance, made dispersible, which may drop after the corn, and prove an excellent improvement: for we find experimentally, that pigeon's-dung sown by the hand on wheat or barley, mightily advantageth it in the common way of husbandry: much more then might we expect this way, where the dung, or such like substance, is all in the same furrow with the corn; whereas, in the other vulgar way, a great part thereof comes not near it.

"It may either be done by having another hopper on the same frame behind that for the corn, wherein the compost may be put, and made to drop successively after the corn: or it may be sown by another instrument to follow the former, which is the better way, and may both disperse the soil, and cover both soil and seed.

"The corn also thus sown in ranges, you may with much more conveniency go between, and either weed it or hoe it and earth it up as you think good, and at harvest it will easily repay the charges.

"Also the fore-wheels being made to lock too and fro on either side, you may have an upright iron pin fixed to the middle of the axis, extended to the top of the frame: and from thence a small rod of iron to come to your hand, with a crooked neck just against the neck of the hopper; by means of which iron rod, you may lock or turn the wheels either way, and guide your instrument, and rectify it, if it deviate out of its right course.

"The hopper must be broad and shallow, that the seed press not much harder when it is full, than when it is near empty, lest it sow not proportionably.

"Though this instrument may at first seem mysterious and intricate to the ignorant, yet I am confident it will answer to every particular of what I have written. Any ingenious wheelwright, joiner, or carpenter, may easily make it, with very little instruction, and any ordinary ploughman may use it."

The chief inconveniences in this instrument seems to be, that the seed is liable to be bruised as it drops from the hopper, by the wheel in the neck of that hopper.

In the account which is given of the sembrador, in the Philosophical Transactions, it is justly observed, that the perfection of agriculture consists in setting the plants at proper distances, in ground well loosened to a sufficient depth, that their roots may be able to spread, in order to collect the nourishment which is necessary to produce and ripen their fruit. But this is so little observed, that almost all sorts of seed are commonly sown by handfuls at random; whence it happens, that corn is sowed too thick in some places, too thin in others, and, frequently, the greater part of it is either not covered at all, or not deep enough; by which means it is not only exposed to be eaten by birds, but also in cold countries to be spoiled by frost, and in hot climates, by the sun. To remedy these inconveniences, Don Joseph de Lucatello invented an instrument, which, being fastened to the tail of the plough, drops the seed regularly in the furrows, saves four parts in five of the quantity which is generally used, and becomes the means of procuring a considerable increase, without employing a person purposely to sow.

As a few words will explain the mechanism of this instrument, which has its merit, though it has not been found to answer in common practice, we shall venture to give the following short description of it; because some of the principles of this may possibly suggest an useful hint to an ingenious artist.

Fig. 2, Plate IX. is a box of wood: *a, b, c, d*, the cover of that part into which the corn is put, and which is open in fig. 3. at *W*: *e, f, g, h, i, k, l*, fig. 2. are the two sides which cover that part of the box where the cylinder, which is fluck round with three rows of little spoons

to throw out the grains, is turned round. These sides are taken off in fig. 3, to shew the cylinder R S, and the spoons *x, x, x*. The internal shape of these sides is expressed in fig. 4, where may be seen the four triangular pieces *p, p, p, p*, and the triangular interstices *q, q, q*, which let it out at the bottom of the box. T, is one of the wheels which turn the cylinder; and V the other end of the cylinder, on which the other wheel is to be fixed. The furrow in which the grain has been dropt is to be covered by the next turn of the plough; to which end the mould board must project considerably.

In using this instrument, according to Don Lucatello's method, it must be fastened to the beam of the plough, at such a height, that the long projecting nails in the wheels may touch the ground sufficiently to make them turn round, but not enough for the wheels to rest upon it, and drag along without turning.

This way of turning the wheels, and consequently the cylinder, must occasion an unequal distribution of the seed, wherever the ground is rough and stony. For this reason, and on account of some other inconveniencies attending the use of it, this sembrador is not an instrument to be recommended to farmers: but we would here refer to the consideration of such as are better skilled in these matters, whether an instrument less liable to this objection, or to the fault which is found in Mr. Worlidge's drill, may not be formed, by placing the seed-box of the sembrador in a frame like that of Mr. Worlidge, with (instead of the wheels of the sembrador, which turn upon the ground) two wheels, grooved like pulleys, fixed upon the axis of the cylinder, to be turned with cords, like the small wheel at the neck of Mr. Worlidge's hopper. A square frame, like that, will keep the box more steady, and therefore render the discharge of the seed more regular, than it can be in Don Lucatello's manner.

Husbandmen have been long sensible, that sowing corn by handfulls, or broad cast, was a waste of seed, and some attempts were made to construct instruments for sowing more regularly; but though the sembrador and Mr. Worlidge's drill were ingenious instruments, it does not appear, that they or any other, answered in practice, till Mr. Tull contrived his drill-plough, which does perform very well. Mr. du Chateaux indeed says, he thought Mr. Tull's too complex, and invented another, which is very ingeniously constructed, but if we may judge from his description of it, it appears to be more complicated than Mr. Tull's, or any other; and being very expensive, is not likely to be introduced into England. It is also too limited in its use, being constructed to drill only three rows, at one certain distance. M. Duhamel's drill, called a barrel drill, is more simple and cheaper, and may be more easily altered to sow more rows, and at different distances, and will probably be offered to the public in a short time, with these improvements.

Mr. Young, in his Essay on the Culture of Cole-seed, complains much of the drill ploughs, on account of their being so weakly constructed. "I used," says he, "Mr. Randall's drill-plough, and in this charge (of expences of the crops) do not include the repairs, which in all my trials have been so great, that it would be absolutely unfair to insert them; and yet it is not altogether the thing, to make no charge of this sort, and especially as I have seen no drill-plough (not excepting those in the society's room) but what would fall in pieces presently, under the rough hands of ploughmen. Common ploughs are every where of a strength proportioned to the hands they go through, and till a drill is discovered that will bear such treatment, it is impossible to promote the new husbandry: nor is it possible that any method should be worth promoting, while the instruments with which it is executed, remain in the predicament of all drill-ploughs at present."

There is indeed some ground for this complaint, but will be removed in a drill-plough now constructing.

M. Duhamel observes, that the drill-plough invented by M. de Chateaux delivers the grain with the greatest exactness, and therefore deserves much commendation; but that the price of it is too great for most farmers. His own, which we shall now describe, has, for that reason, been the most generally used.

M. Duhamel's drill is fastened to the fore-carriage of a common plough. The hind part consists of a plank S S, fig. 5, Plate IX. at least three inches thick, which is called the table. Underneath this table, and to the bottom part of it, are strongly fixed, as at T, T, T, three shares. The beam I, I, is fastened to the fore-part of the

table: and the handles L, L, are let into mortises in the back part of the table, in which they are fixed. *a, a, a*, are these sloped cavities cut in the table, to receive the seed from the cylinder, and convey it through a hole, about an inch in diameter, in the center of each of them, into the hollow *c*, at the back of the share, fig. 6. The form of these cavities is more clearly expressed by *a, a, a*, fig. 7. At *b, b, b, b*, fig. 5, are fixed four strong standards, to hold the drill-box steady.

The shares fig. 6, are made of wood, and terminate at the bottom of their fore-part *a*, in a circular form, covered with iron. In their hind-part *b*, is a groove, through which the seed drops to the bottom of the furrow. The seed is conveyed from the cavities *a, a, a*, fig. 7, to this groove *b*, fig. 6, by means of a thin plate of iron *c*, rounded and fixed to the share, at *d*. These shares are about an inch and a half thick, and their height from *a* to *b* is at least a foot.

As these shares terminate in a curve at bottom, if they meet with any roots, dung not thoroughly rotted, or any other substance which they cannot easily divide, they force it down to the bottom of the furrow, and by that means are never liable to be choaked: and to prevent this still more effectually, the middle share is placed somewhat more shorter, when used in land laid out in ridges, in proportion to the greater height of the middle of the ridges. The shares are generally seven inches asunder.

The four standards *b, b, b, b*, fig. 5 and 7, are placed in such a manner, that the blocks *n, n*, fig. 8, in which a groove is cut, answer to the middle of this table. On an iron axle-tree which answers to the wheels, and which passes through the centre of the blocks, is fixed the cylinder, or barrel *o, o*, which is closed at its end, *p, s*, and is likewise divided by two partitions *q, r*. This barrel is made of thin split deal, as are also the ends and partitions. *t, t*, is a thin board, or plate of tin or thin iron, fastened with hinges, that it may be opened to put the seeds into the three partitions *p, q, q, r, r, s*. In the middle of each of these partitions, the barrel is pierced with holes three or four inches asunder, and about a quarter of an inch in diameter. The barrel and the wheels are fixed on the iron axle-tree, that they all turn together.

To know whether the holes *u, u, u*, in the three partitions of the barrel are of a proper size and number to distribute the seed in the manner this is desired, let some, suppose half a bushel, be put into each partitions. The blocks *n, n*, being placed on each side, between the two standards, whose inner sides are rounded so as to fit the groove in the block, and the table S, S, being raised so that the wheels do not touch the ground, any one may easily see, by giving the wheels a turn or two round with the hand, whether the proper quantity of seed drops behind the share; and alter it accordingly.

The barrel being properly fitted, the beam is fastened to the fore-carriage of this drill. As it moves, the barrel turns with the hind wheels, and the seed drops out of the holes *u, u, u*, fig. 8, into the cavities *a, a, a*, fig. 7, and from thence into the hollow *c*, fig. 6, in the hind part of the share.

When the plow man comes to the end of the field, he lifts up the hind carriage, which is light, and carries it till the horses are turned for the next furrow.

M. Duhamel does not fix the diameter of the hind wheels, but leaves that to be determined by the length of the shares. His were so proportioned that where the shares touched the ground, the wheels did not touch it by two inches. He observes, that this drill answered extremely well, where the ground was ploughed into an even or level surface: but that the wheels were too small, when the middle of the ridges was raised high; because the shares were then on the higher part of the ridge, while the wheels were in the furrows.

In fig. 7, are two thin boards *x, x*, somewhat bending, which rise up to about half the height of the barrel. The use of these is to catch the seeds that may chance to drop from the oblique holes, and guide them into the cavities *a, a, a*.

It is well known, that when the fore-part of the share terminates in a point, it pierces the deeper into the earth, the farther back the beam is placed on the fore-carriage: but as the bottom of these shares is round, they pierce neither more nor less when the beam is placed more forward. It is therefore advisable to place the fore and hind

carriage as near as possible to each other, because the plough then goes easier, and the draught is lighter to the cattle.

The instrument is easily transported from place to place by means of two poles *y, z, z*, fig. 7. The ends *y*, are placed on the fore carriage, together with the beam, and from thence pass under the table, so as to raise the whole from the ground, on which the other ends *z, z*, rest. The cross bar *k, k*, secures those ends, and keeps them at a proper distance.

M. Duhamel took the first hint of his seed box from an invention of Mr. Grenville, a gentleman belonging to the king of France's stables. This was a hollow ball, fixed upon the axle-tree of two wheels, and pierced round the middle with a row of holes, through which the seed dropt as the wheels turned round. Upon a similar principle, another gentleman, instead of sowing under furrow in the common way, contrived a box to turn behind his plough; and that no more than the due quantity of seed should be dropped; the lower half of the box moved upon a belt of leather, in the middle of which was fixed a piece of brass, pierced with a hole suited to the size of the seed intended to be sown. By this means, the holes in the box could not drop any seed, but when they came opposite to the hole in the belt. A few grains were indeed sometimes bruised in their passage; but, upon the whole, there was a great saving of seed.

According to the above construction of M. Duhamel's drill, the shares must always pierce to the same depth, because the whole weight of the hind part of the drill rests continually upon them: consequently, it would be necessary to have shares of as many different lengths, as there are depths, at which each kind of seed should be sown.

We likewise apprehend, that when the shares have pierced to the depth intended, the weight of the drill may be made to rest on the wheels, by preventing the axle-tree from rising between the standards, beyond such a height as shall exactly regulate the depth to which the shares are to pierce. This may be effected, by bringing the standards *b, b*, fig. 7, nearer to each other; and placing between them, instead to the blocks *n, n*, fig. 8, two thick pieces of wood, made to slide up and down, with grooves, as in the blocks. These pieces of wood may be fixed between the standards, by means of two strong iron pins run through the standards into them: and to take off the friction of the axle-tree against these pieces of wood, may be made to turn on two friction wheels, placed in the lower part of them; or rather on four or six small iron rollers turning on their axis in a box inserted in each of these pieces, which may be raised or lowered, by means of a row of holes in the standards, through which the iron pins are put so as to give the axle-tree room to rise to the height that shall be thought necessary to make the shares pierce to the intended depth, before the weight of the drill shall rest upon the axle-tree.

That the axle tree, moving on such roller, will have less friction, or require less strength to make the wheels turn round, even when the weight of the whole instrument lies upon it, than it has in the blocks, with only the weight of the grain, is evident from the following fact. The gentleman who first thought of this invention, applied to it a roller of four tons weight, which is now drawn with ease by two ordinary horses, even across his ploughed grounds.

It appears from this easy motion of the roller, that there can be no danger of the axle-trees turning, though loaded with the weight of the whole instrument. Other considerable advantages will also arise from the drill's resting thus upon the wheels; for the labour of the ploughman will be greatly lessened, the instrument will move steadier and more uniformly, and the draught will be much easier for the horses.

Description of M. de Chateaucieux's DRILL-Plough, and of its manner of working. Written by himself.

"When I first set about constructing this drill-plough, my design was to make an instrument which should distribute the grains of corn one by one, at the distance of six inches from each other. I attained this precision; but soon perceived that it was not the only thing requisite, or even so necessary as I had imagined.

"I could, indeed, make my drill distribute some grains more than it did in its first state: but I plainly found that

the quantity of seed would not yet be sufficient to produce a proper number of plants; especially as it must not be expected that every seed will grow; 1. because, whatever care be taken in chusing the seeds, there will always be among them many which will not sprout at all; 2. because a great number of them will be destroyed by insects, either before they vegetate, or soon after they spring up; and 3. because the winter's cold will frequently destroy several of the young plants, and greatly weaken others. Experience taught me, that, to guard against the effect of these casualties, it was necessary to sow more seed than I did at first.

"To this end, and that I might be enabled to increase the quantity to whatever degree should be found most proper, I enlarged the cavities of my cylinder, so that I can now sow either more or less seed, with equal ease, by means which shall be explained in the description of this instrument.

"Each of these cavities, in the cylinder of my first drill plough, could contain but one grain of corn; but in the present, they are large enough to hold three or four, which, through they touch one another there, are so separated when they fall from thence, and in their passage through the pipes, that they drop at distances from each other in the furrow; for they are not all turned out of the cavities in the cylinder at the same time: besides which, I have observed, that the ground upon which they fall is always more or less uneven, and that this circumstance consequently contributes effectually to separate them.

"I confess that the description which I am going to give is very long, and that this, together with the sight of so many figures as are here represented, may, at first, make people think that my drill is a very complicated machine, and that this complication must render it very defective: but I beg of them not to give way to this prejudice, and to suspend their judgment till they have studied the instrument thoroughly; after which, I hope they will be sensible that all its mechanism is employed only to procure the movement of the axis, and the play of the valves. I even flatter myself that it will be deemed a simple instrument, by those who rightly consider how few of its parts are moved; a circumstance which prevents its being put out of order in working. The great quantities of land which were sowed in the autumn, with perfect success, ought to remove the diffidence of those who may still incline to doubt whether this drill will always and regularly perform equally well.

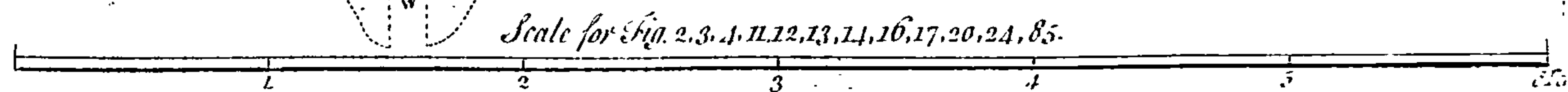
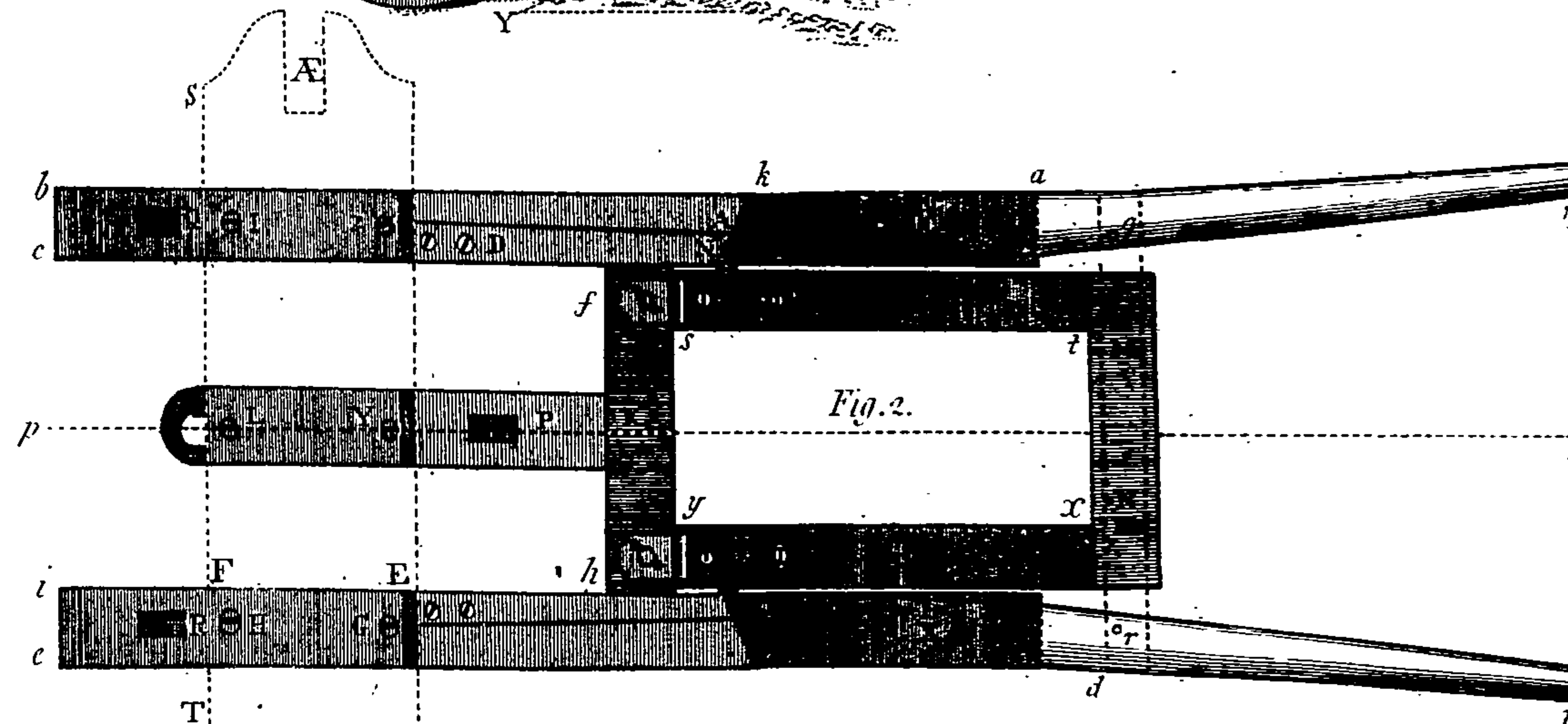
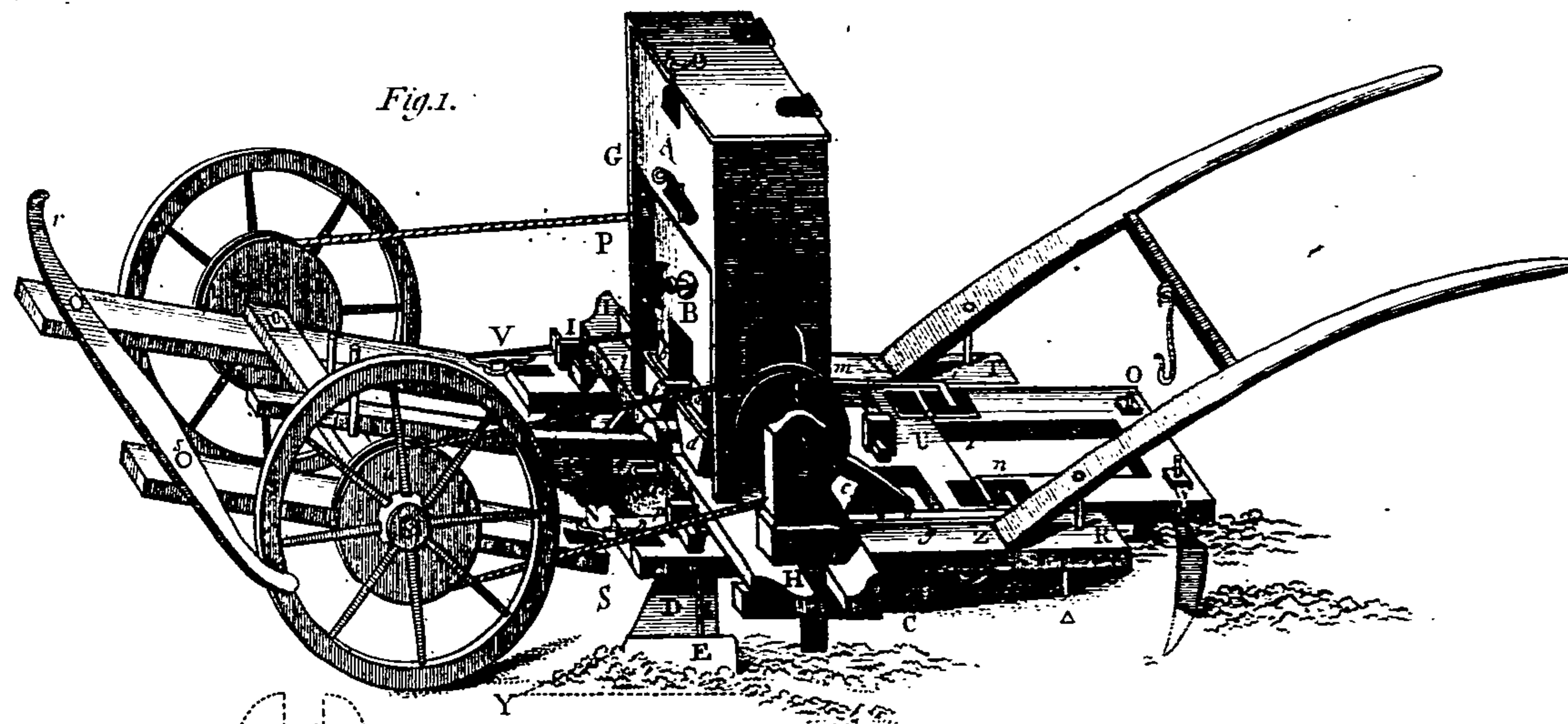
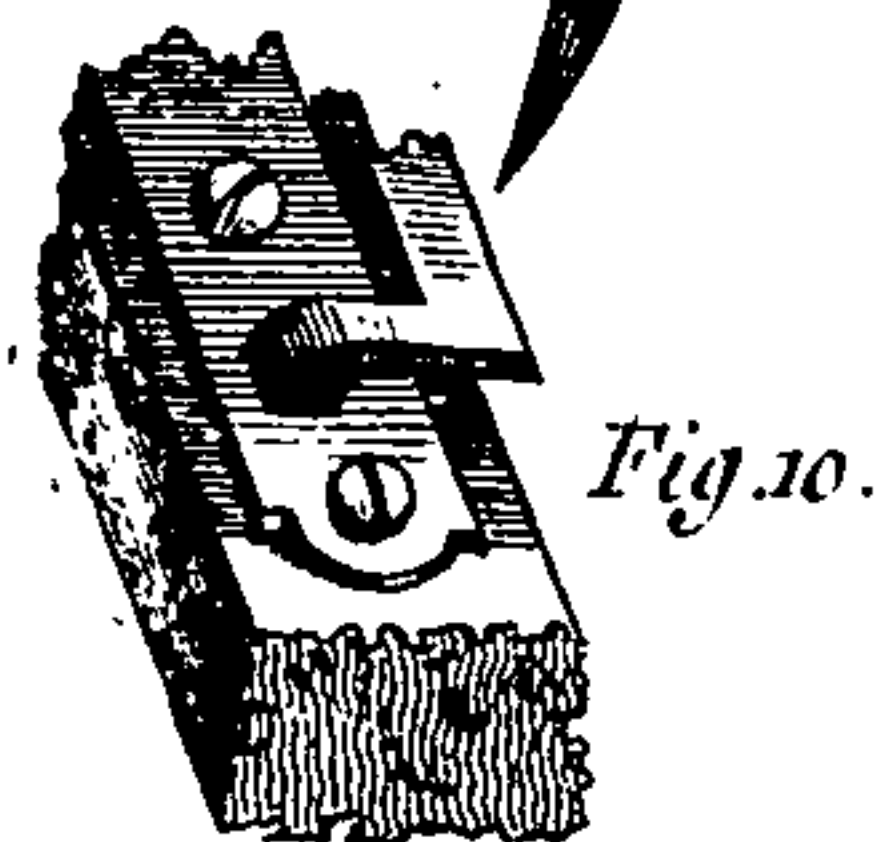
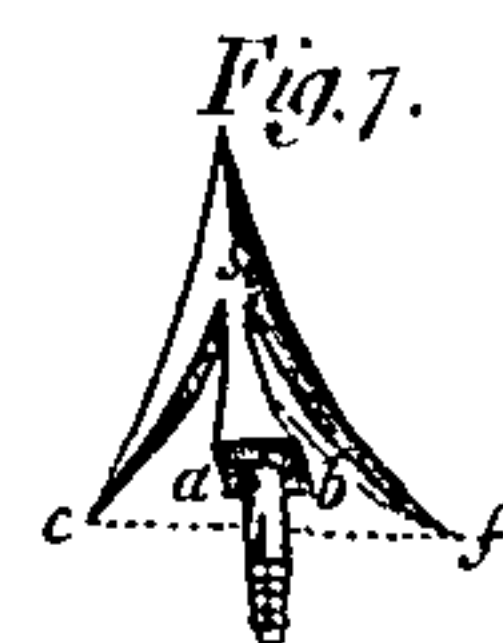
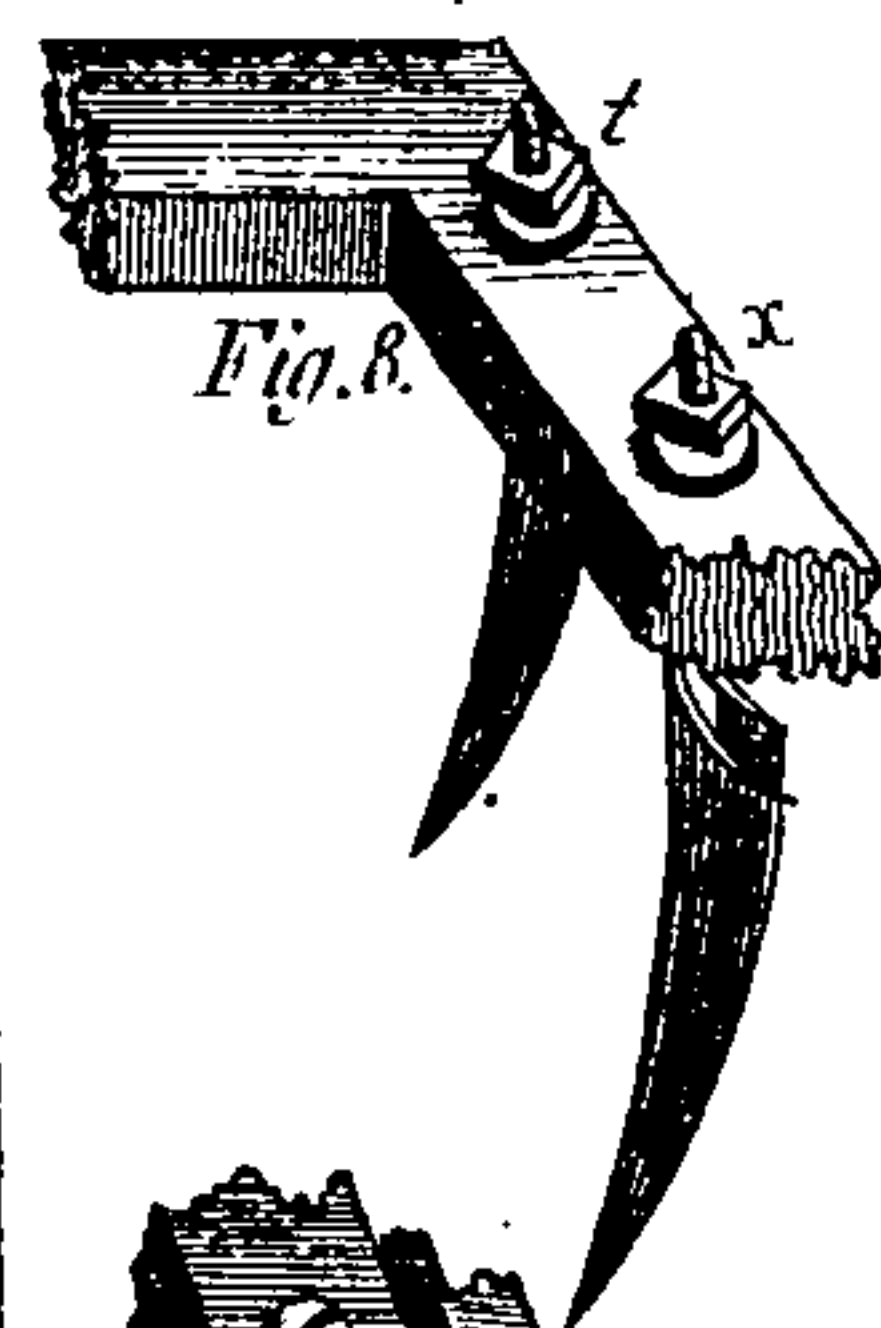
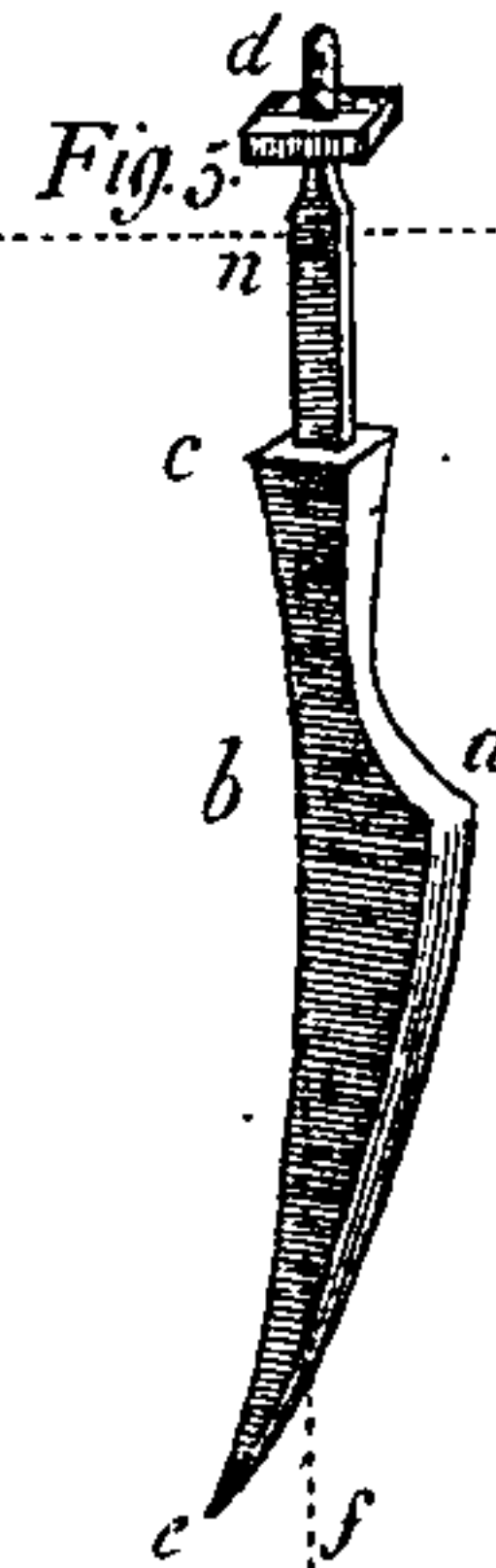
"It will perhaps be objected, that the expence of making this drill plough is too great, and that numbers of farmers, who have not much land, may not be able conveniently to purchase it.

"It is very true that if this instrument could be constructed for a small price, the benefits resulting from it would be the more extensive: but it must also be allowed that this objection does not hold good with respect to all farmers, or to gentlemen who keep ground in their own hands. These will soon be repaid the expence of such a drill, by the saving of seed; and as to the poorer sort who have, for example, but ten or twelve acres of arable land, the expence will be but trifling, if four or five neighbours, in that case, join to purchase such a drill, which will be more than sufficient to sow all their ground. Or, each parish may come to an agreement, that he who can afford to buy such a drill, may let it out for so much an acre; a method which would be advantageous to all; but particularly to those who, by using it, would sow their land with very little charge.

"But I think, and hope, that when the great advantage of using this instrument is known, no husbandman will be without it merely because of the price; as this consideration can never out-weight the benefits which will accrue from it in all respects, by lessening the expence of every article in the operation of sowing, and by the farther emoluments which will be reaped at harvest.

"I therefore, in constructing this instrument, paid less regard to the price which it might cost, than to the means of rendering it very solid, by a firm assemblage of all its parts; which was essential, in order to prevent the frequent accidents it would otherwise have been exposed to, in the hands of ignorant peasants, who have no idea of handling things gently, and are still less capable of repairing any mischief done to a very nice machine.

"At the same time I studied strength and solidity in the



the construction of this instrument, it was not less necessary to take particular care that it should execute well and regularly the purposes for which it is intended, both with respect to the manner of its distributing each grain, and to the movement of the axis, which is always in motion from the moment the horse stirs, so that the seed runs incessantly.

In describing this instrument, I have first given a general idea of its make and manner of working, that the reader may be thereby enabled the more easily to understand the subsequent minute description of all its parts, with their relation to, and connection with, each other. The method of using it will then follow.

General Idea of M. de Chateauxvieux's DRILL-PLOUGH, Plate X.

A (fig. 1.) is a wooden-box, or hopper, whose bottom is at the height of the line F G. This hopper has four feet, two of which are seen at *k* and *l*. These four feet, which may be called tenons, are fitted into four mortises in the table H L. The bottom F G of this hopper rests immediately upon the feed-box B, which is made of thin plates of brass, and is placed between the bottom of that upper box or hopper, its two sides which have the four feet, and the table H L. B is the front of this feed-box. The corn drops through a hole in the middle of the bottom of the hopper A, into the feed-box B. This feed-box B contains a brass cylinder, which traverses it, and is pierced by and fixed to an iron axis M P, at the two ends of which are firmly fastened two pulleys Q and P. The two pivots of the axis are supported by two standards, one of which is seen at M H, and a part of the foot of the other at L. These two standards are fixed to the two ends of the table by two keys, like those of a turner's lathe.

The table upon which all these pieces rest, is itself, at its two ends, supported by, and fastened to the two beams T V, R S. These two beams are fixed in parallel lines, by a traverse X Z. In the middle, U, of this traverse, is pinned the end of another piece of wood, which passes from thence under the table, in a parallel direction with the two beams, and upon which also this table is fastened by two screws.

This instrument has three exactly similar shares, D K, *e*. Two of these shares, K and D, are fastened to the two beams, at I and *p*, by a tenon and a peg, and the third is fastened in the same manner, towards U, to the piece which runs parallel to the beams. Each of these shares is covered at the bottom with a plate of iron, N, E, C, and the point of one of them, supposed to be in the earth, is seen at Y.

The harrow is composed of three pieces of wood *q* O, O W, W *n*, jointed together by mortises and tenons at O and W, and of two similar iron teeth W *z*, O R. These two teeth are fastened to the harrows by the screws W and O, and the harrow is fastened to the traverse X Z by two hinges near *q* and *n*. Upon the two beams are fastened by two screws, at *m* and *e*, two square springs *m i q* and *e Z n*, of which the two ends, *q* and *n*, press upon the harrow, to make its own teeth enter into the earth.

The fore-carriage is composed of two similar and parallel pieces, V *r*, S *s*, upon which is fastened the spring-tree bar *r s*, and the axle-tree *u t* of the two wheels. The drill (of which the manner of working will be explained hereafter) rests upon this fore-carriage, whenever there is occasion for its so doing, by means of a wooden bar *d s*, one of the ends of which, towards *a*, passes through two belts which are fastened to the table, and of which only one is seen here. The other end *s* of this bar, rests upon the middle of the axle-tree of the fore-carriage, between two pins driven into the upper part of that axle-tree. The fore-carriage is likewise fastened to the drill by hooks and rings, as at *v* and S.

At *t* and *u* are two pulleys, which are fastened to the spokes of the wheels by three or four screws. The pulleys Q and *u* are encircled by a thong of leather, of the same breadth as the grooves of the pulleys, and of which the two ends are buckled together, like a garter. The two other pulleys P and *t* are encircled in the same manner by another similar thong.

Manner in which the DRILL works, Plate X.

The seed being put into the hopper A (fig. 1.) the whole machine being drawn by the horse harnessed to

the spring-tree bar *r s*, and guided by the seedsmán, who holds the two handles; then the three shares, D K *e* C, open each of them a furrow, and at the same time the pulleys, *u t*, by their turning, turn by means of the thongs, the two other pulleys, Q P, and consequently likewise the cylinder, which is in the box B, and which, in turning, distributes the seeds equally into three pipes which come out at the bottom of the feed-box. This distribution of the seed is performed by a mechanism which cannot be represented here, but will be particularly explained hereafter. The ends of these pipes are seen here at *a* and *b*. These pipes *a* and *b* drop the seed into two other pipes *d* and *f*; the pipe *a* transmits its contents into the pipe *d*, which terminates behind the share D, at *b*, where it deposits the seeds in the furrow made by this share. In the same manner, the end of the pipe *b* of the box conveys the seed which passes through it into the pipe *f*, which terminates at *g*, behind the share K. And likewise in the same manner, the third pipe of the box, which cannot be seen in this figure, empties its contents into a third pipe, of which part is seen here at *v*, *y*, and which terminates behind the third share *e*, C. The two teeth of the harrow, passing afterward each of them between two of these furrows, cover the seeds which have dropped into the three furrows.

According as the screw B, in the fore-part of the box, is turned more or less from the right to the left, or from the left to the right, a greater or less quantity of seed drops into each furrow, by means which will be explained hereafter. But so long as this screw remains in the same situation, the quantity of the seed that is dropped, will be constantly the same.

To render the description of this first figure the more distinct and intelligible, some things are passed over here which will be spoken of hereafter, and among others, two traverses which fastened together the two pieces V *r*, S *s*, of the fore-carriage. Also the box B is here made larger than it should be, according to the description which will be given of it, in order that the pipes *a* and *b*, *d* and *f* might appear the more distinctly. For the same reason also the out-lets of the pipes *a* and *b* are not here represented as let into the mouths *d* and *f* of the two other pipes, as they should be in fact.

In the following descriptions, that part of a piece which immediately faces the horse, is always called the fore-part of the piece, excepting only the piece named the bin, and its valves, in speaking of which the contrary rule is observed. But, every where, the right or the left side of a piece, is to be understood as of the same side of the horse.

When a machine is to be made from drawings, those drawings, especially when small, cannot, by their scale, point out precisely the exact dimensions of every nice, and oftentimes very important piece, so as to enable a workman to construct it perfectly. To remedy this defect, all the measures of every piece, and their connection with each other, are here particularly specified in the following description, which is to be looked upon as a surer guide than the measures resulting from the engraved figures: and to render this still more certain, the weight of the nicest pieces is also given.

Description of the two Beams which support the Table and the Hopper, Plate X.

The two beams T V, R S, (fig. 1.) are represented as if seen from above at *a*, *b*, *d*, *e*, (fig. 2.) They are exactly similar. Each of them is three feet five inches and a half long, two inches and five-sixths wide (for example from *b* to *e*), and one inch five-sixths thick. All their sides are at right angles to each other.

These two beams are joined by a traverse *f b* (fig. 2.) and X Z (fig. 1.) This traverse is two inches and five-sixths wide, measuring it horizontally, one inch and three-twelfths thick, and one foot and a half long, exclusive of two tenons, one at each end, by which it is mortised into the two beams, which are parallel to each other. The upper surface of these beams, that of their traverse, are exactly even. The distance from *e* to *f* (fig. 2. Plate XI.) is one foot eleven inches and a quarter; and the same from *i* to *b*.

Underneath each beam, and at the distance of five inches from the extremity *a* (fig. 3.) an iron-pin, seven-twelfths, or two thirds of an inch in diameter, projects to the length of four inches and one-third. One of these pins is seen at Δ (fig. 1.) Its other end is driven fast into the middle

of the under surface of the beam, from which it projects perpendicularly. These two pins are to enter into two holes in the axle-tree of the hind-carriage, which will be spoken of hereafter.

Of the two Handles, Plate X.

Two handles, $k n$, $l m$ (fig. 2.) are fastened to the two beams, each of them by a tenon d , (fig. 3, Plate XI.) five-sixths of an inch thick, which passes through the beam, and is secured underneath it by a wooden pin or peg d , about half an inch in diameter. Each handle is likewise supported upon the beam by a wooden prop $p l$, which is seen at R and T (fig. 1.) Each of these props is three quarters of an inch in diameter, and is driven very tightly into the handle and the beam, at p and l (fig. 3, Plate XI.) so as to pass quite through them. The upper end c of these props is seen at V and X, in fig. 2. From the extremity k of the handle (fig. 2, and 3.) to the extremity a of the beam is one foot, and one-third of an inch, and the distance is the same from d to l , in fig. 2. The breadth and thickness of the lower end of the handles at $g k$ (fig. 2, Plate X. and 3, Plate XI.) is nearly the same as the breadth of the beams, upon which they rest: but they lessen by degrees from k to n , and are rounded off, in such manner that the diameter of their upper end n is but one inch and a third.

With respect to their position, they form, with the beams, an angle of 40 degrees, as at $c k a$ (fig. 3, Plate XI.) The handle is nearly straight from k , to about a third part of its length, and from thence it bends more and more downward to its end n , which is perpendicularly two feet higher than the upper surface $k m$ of the beam. This height is expressed by the pricked line $n m$. The space between the handles likewise increases with their length, so that, at their smallest ends, the distance from the outside of the one, to the outside n of the other (fig. 2, Plate X.) is one foot eight inches and a half, and each of them is equally distant from the middle line $o p$.

These two handles are fastened to each other by a traverse $q r$, which is represented in fig. 1, but is expressed here only by two pricked lines, in order to shew a piece which is under it, and which will soon be spoken of. This traverse is one inch and five-sixths broad, and two-thirds of an inch thick. Its ends, being tenons, are let into mortises in the beams, and fastened there by wooden pins, at q and r . One of these ends appears at q (fig. 3, Plate XI.) From the middle of the length of this traverse hangs an iron hook, as in fig. 1, Plate X. This hook is about a quarter of an inch thick, and five inches and a half long, from its extremity e (fig. 3, Plate XI.) to its other end, which is fastened to the traverse. The lower end of this hook is put through a small ring fastened to the harrow between the screws of the two teeth, and serves to hold up the harrow when the drill is placed upon its hind-carriage, in order to be removed, as will be said hereafter. The traverse is fixed in the handles at the distance of thirteen inches from their extremity k (fig. 2, Plate X. and 3, Plate XI.) The two handles, which the seedman holds in his hands by their ends $m n$, serve to direct the drill.

Of the Harrow, Plate X.

The harrow is composed of three pieces of wood $s t$, $y x$, $t x$, (fig. 2.) and of two teeth fastened to this last. The three pieces are represented at $q O$, $O W$, and $W n$, and the two teeth at $W z$ and $O R$, in fig. 1. The two pieces $s t$, $y x$, (fig. 2.) are each of them fastened to the traverse $s y$, by an iron hinge, in such manner, that the upper surface of the ends s and y of these two pieces is exactly level with the upper surface of the traverse $s y$. Their two other ends, t and x , are terminated by a tenon which is pinned into the ends of the traverse $t x$. The upper surface of these three pieces $s t$, $y x$, $t x$, is perfectly even.

The two pieces $s t$, $y x$, are each of them one foot eight inches long, from the end s , to the traverse at t . They are two inches and one-third broad, measuring over their upper surface, and one inch and two-thirds thick. The fore-end of these pieces towards the hinge, makes an angle of about sixty-five degrees, with the upper surface, as is represented in the profile (fig. 4.) where the lines $d a$, $a b$, express this angle. This slope is made in order that the harrow may the more easily press upon the ground, by moving on its hinges; and for the same reason,

all friction between the sides of the harrow and those of the beams is avoided, by leaving an interval of about one-sixth, or one quarter of an inch between them. The lines, or edges $t s$; $x y$, (fig. 2.) are parallel; and the distance between them is one foot and five-sixths of an inch. The traverse $t x$ is two inches and nineteen twenty-fourths wide, and one inch and two thirds thick.

In the middle of the breadth of the upper surface of this traverse, and cut perpendicularly to that surface, are two square holes, M and N, distant from each other seven inches and a half, from the center of one to the center to the other; and both equally distant from the middle line $o p$.

Of the Teeth of the Harrow, Plate X.

In these two holes M N in the traverse of the harrow are fastened, as will soon be seen, two iron teeth, perfectly alike, so that it will be sufficient to describe one of them. This tooth is shaped almost like the head of a lance, if we suppose its two sides to be bent towards each other, so as to form a kind of groove or channel. These two sides, or fins, are seen in perspective, sideways, in fig. 5; behind in fig. 6; from above, and from before, in fig. 7.

The shank $b d$ (fig. 5.) is five inches and an half long, from its rise at $a b$, to its end d ; and three quarters of an inch thick at $a b$, where it is made square. This thickness is increased a little at c , in order to form the shoulder represented at $a b$ (fig. 7.) The distance from $a b$ (fig. 5.) to this shoulder c , is three inches. The square thickness of the shank, from c to n , is half an inch; which is likewise the size of the holes M N (fig. 2.) The rest of the shank is round, and half an inch in diameter. Its upper end is a screw, fitted to receive a nut about half an inch thick, and a little more than an inch square. The point e does not vary from the direction of the shank, either to the right or the left, as appears by fig. 6: but the side $b c$ (fig. 5.) bends a little forward, so that the point e advances one inch and a quarter beyond the pricked perpendicular $n b f$. The upper and outer extremities c and f of the fins (fig. 7.) are two inches and one-twelfth distant from each other, and equally distant from the middle of the shank. The width of each fin, in this part, from s to f , or from s to c , is one inch and an half. From thence they lessen by degrees down to their point. The edges of these sides, or fins, are almost sharp, but their thickness and strength increase towards their back.

The two teeth of the harrow are placed exactly in the middle of two parallel lines supposed to be drawn from the point of the shares; by which means these teeth will enter into the ground at equal distances from the small furrows made by the shares, into which they will throw back the quantity of earth necessary to cover the seeds perfectly.

As to the position of these two teeth, they are fastened in the two holes M and N of the traverse $t x$ (fig. 2.) as is represented by the perspective view of them in fig. 8. The shank of each tooth is run through the hole in the traverse $x t$; its shoulder is trussed up close to the under surface of this traverse; and a nut, under which is placed a very thin plate of iron, fixes at the top. The back and point of these two pieces should face exactly the fore part of the drill.

Hinges of the Harrow, Plate X.

To return to the hinges s and y (fig. 2.) which are exactly alike, and which are seen at q and n in fig. 1. Their breadth is one inch and two-thirds, during their whole length, from v to f (fig. 2.) The joint s , of this hinge, is half an inch in diameter. The claw, from the joint s to f , is two inches and a quarter long, and is fastened to the traverse $f b$ by a thumb-screw represented in perspective in fig. 9, and which screws into a nut $a b$, which is fastened to the bottom of the traverse by two nails. This screw (fig. 9.) is one-third of an inch diameter. It is screwed down by means of a corresponding screw in the nut under the traverse, till its shoulder $c n$, which is two-thirds of an inch in diameter, presses upon the claw of the hinge: for which see also fig. 4. The length of the other claw of the hinge $s v$ (fig. 2.) from the joint s to its end v , is four inches and a half. The thickness of each claw towards the joint is a quarter of an inch, and from thence that thickness lessens by degrees to the end v . The claw $s v$ is fastened to the piece $s t$ by two flat-headed screws.

Spring of the Harrow, Plate X.

Upon this claw, and between these two screws, presses the end B of a spring A z (fig. 2.) which forms an angle at A, and is fastened to the beam a b, between D and z, by two flat-headed screws, of which the last D is two inches and an half distant from the end z of the spring. These two springs are seen at m i e Z n in fig. 1. The length of this spring from z to A (fig. 2.) is thirteen inches and an half, and from the angle A to B two inches and a quarter. Its breadth at z is one inch and an half; at N it is one inch and one-twelfth; and at B it is thirteen twenty-fourths of an inch. Its thickness at z is five twenty-fourths of an inch, and from thence that thickness diminishes to A, where it is but one-sixth of an inch. The part A B increases in thickness from A to B, where it has a head, which alone presses upon the claw of the hinge between the two flat-headed screws. This part of the spring, with its head, is represented plainly, in perspective, in fig. 10. When this spring is in its state of rest, the whole of its under surface from N to z (fig. 2.) lies exactly flat upon the upper surface of the beam. The end z of this spring is fifteen inches from the end b of the beam to b. These springs should be made of good well-hammered stuff, prepared like that which is used for the springs of coaches; by which means they will have a body, and not be subject to break or bend. If they appear to be too weak, they may be placed a little farther from the joint of the hinge; in which case they will the better press the teeth of the harrow down into the ground.

Connection of the Beams, with the Table and Shares, Plate X.

The thickness of a quarter of an inch is taken off from the upper surface of each of the two beams, from z (fig. 2.) immediately adjoining to the end of the spring, to Q, in the one, and from E to F in the other; being in length eight inches and two-thirds. In these lower spaces, is placed the table, which will soon be spoken of, and of which the extent is here indicated by the pricked lines. This table is seen at H and L, in fig. 1. It is fastened to the beams by four strong flat-headed screws, at z, I, G, and H (fig. 2.) and is seen in profile in fig. 3, Plate II. at i and r. This table rests likewise upon a piece K L (fig. 2.) of which the end K, being a tenon, is pinned into the middle of the length of the traverse f b; as is also seen at U (fig. 1.) This piece K L (fig. 2.) is two inches and five-sixths broad, measuring it horizontally, and one inch and five-sixths thick. Its length is such, that its end L reaches, at most, no farther than the edge Q F of the table. At the end of this piece appears a ring, which is fastened under it, and of which the description and use will be seen hereafter. The upper surface of this piece K L, from K to Y, is level with the upper surface of the two beams, and the traverse f b; but from Y to its end, a quarter of an inch is taken off from its thickness, in the same manner as from the opposite parts of the two beams, to fit it for the reception of the under surface of the table. A side view of this is given in fig. 11. where a b is the profile of this surface, which, from a to b, is level with the surface d a of the traverse, and from b, to its end c, is a quarter of an inch lower, that the table may rest upon it.

In the middle of the breadth of the upper surface of this piece K L (fig. 2.) and perpendicular to that surface, a mortise P is cut quite through it, to receive the tenon which is seen at U, fig. 1. This mortise is throughout two inches long, and one inch wide. Its end P (fig. 2.) is three inches and eleven-twelfths distant from the traverse f b. These two beams are pierced in the same manner by two similar mortises Q and R, of which the ends Q and R are one inch and eleven-twelfths distant from the side S T of the table. The tenons which pass through these two mortises are seen at I and p in fig. 1. These three mortises are to receive the tenons of three exactly similar shares, of which the following is the description. These three shares are seen at D, K, and c, in fig. 1.

Of the Shares, Plate XI.

The shares are cut out of a plank, and fig. 12. represents one of their two surfaces. The lines which limit this surface are perpendicular to each other, excepting i d; the line d c is six inches long; c f, nine inches; f g, two

inches and a quarter; g h, five inches and an half; l m, two inches; and h i, half an inch. This plank is every where an inch thick, except at the edge e d, where it forms an acute angle; as at b, fig. 13, which represents the bottom of the plank c d (fig. 12.) The part g h, in which is the hole k, is the tenon which enters into the mortises P, Q, R, (fig. 2.) before described. Fig. 14. represents the top of this plank, and of its tenon.

Fig. 15. is a perspective view of an iron share which is fixed under the plank, as in fig. 17. Its point (fig. 15.) extends from e b to f. Its sole, which extends from c h to a e, and the ears a b, c d, are all of one piece. Fig. 16. represents a geometrical plan of this share, in which d f, and g h are the places from whence the two ears arise.

The length of the point from e b to f (fig. 15.) and from a b to c (fig. 16.) is four inches. Its height towards b, or towards e (fig. 15.) is about one inch and a quarter, and from thence it lessens gradually to f, which is the point. Its breadth a b (fig. 16.) is the same as the thickness e o (fig. 13.) of the plank of the share, and it lessens gradually from thence to its point c (fig. 16.) A notch is made in the upper part of this point, between e and b (fig. 15.) or between a and b (fig. 16.) to receive the lower end of the angular side a b c (fig. 13.) of the plank.

The sole e a (fig. 15.) or a d (fig. 16.) is of the same length and breadth as at the bottom c m, or o n (fig. 13.) of the plank which it covers. It is about, but not more than two-thirds of an inch thick towards e b (fig. 15.) and half an inch thick at its end a c.

Towards this end are the two thin iron ears, which lie close to the two sides of the plank, to which they are fastened by a single nail, which passes through the plank, as at b, fig. 17.

This share is also fastened to the bottom of the plank by a flat-headed iron pin, g h, fig. 15; which goes through the share at n, and enters into the middle of the thickness of the plank. The head h of this pin is flat, and lies even with the bottom of the sole, in the manner indicated by the pricked lines at a, fig. 17. Towards the flat end c of this pin is a hole, through which, and through the plank, a smaller pin or nail is driven, and is denoted by being pricked in the same figure.

The point of the share, and the bottom of the sole, which rubs upon the ground, should be of steel. The different thicknesses given to the sole, shew that its point inclines a little downward, by which means it enters into the earth very easily.

Fig. 18 represents a perspective view of a thin plate of iron, which is to cover the plank of the share, as in fig. 20, to preserve it from the friction of the ground, which would otherwise soon wear it out. The thickness of this plate, which should be equal every where, is at most one-twelfth of an inch. It is bent at a b, fig. 18, in such manner that this bending fits close to the sharpened edge c d, fig. 20, of the plank; the angle b, fig. 18, being fitted to the notch c (fig. 20) in the iron part of the share, and the lower edges b c, a d, of this plate (fig. 18) joining on both sides to the upper edges of the sole of the share, as in fig. 20. The breadth of this plate from a to b (fig. 20.) is about four inches, and each half of its length, from c to a, or from d to b, is about seven inches and a half. Fig. 19 is the plan, or bottom of this plate.

As this plate covers the ears of the share, and at the same time its own angle c (fig. 20.) is covered by the point of the share, these two pieces must be put on together. This plate is nailed to the two opposite sides of the plank.

The two ends of this plate extend beyond the hindmost part of the plank of the share, in the proportion of b h, fig. 20: and in this space, between these two ends, is the opening of the pipe through which the seed drops into the furrow, as was said before.

The tenon / g (fig. 12.) of the share now described, (and there are three such) enters into one of the three mortises, P, Q, R (fig. 2.) through the bottom of which it is passed, and is fixed above by a wedge driven into the hole k (fig. 12.) These shares are situated in such manner, that their point faces directly to the fore part of the drill. One of them is represented as fixed towards the end b of one of the beams, in fig. 3, which exhibits the profile of that beam.

Of the Piece which is placed under the Middle of the Table, and which bears the middle Share, Plate XI.

The piece K L (fig. 2. Plate X.) which has been already spoken of, is represented with its bottom upward, and in perspective, at *a b*, fig. 21, Plate XI. with the share A, and its tenon B, and with the table, which are also inverted in the same manner. Fig. 22 is a geometrical representation of the under side of the same piece, and of part of the table, excepting the share which is omitted here, and of which only the bottom of the mortise is seen at B.

At the end L of this piece (fig. 22.) is fastened the rein or bridle before mentioned. This bridle is shaped nearly like a horse-shoe; the breadth of each of its branches is three-fourths or five-sixths of an inch; its total breadth is the same as that of the piece to which it is fastened; its total length is three inches and a half, and its thickness every where is about one-sixth of an inch. The whole thickness of the two branches of this bridle is let into the piece of wood to which it is fastened; so that it forms an even surface. This bridle is fastened to the piece by two flat-headed screws, which lie even with the branches of the bridle, through and into which they are screwed. It is placed in such a manner, that the outside of its circular part L is one inch and a quarter distant from the edge *e f* of the table. It is used only when the drill is put upon its hind carriage.

a and *b* are the heads of two large flat-headed screws, which pass through the piece K L, and fix it to the table. From the center of the head *b*, to the edge of *c d* of the table, is one inch and two-thirds. From the center of the head *a*, to the edge *e f* of the table, is one inch and one-third. These two screws are placed in the middle of the branch of this piece L K. Their diameter is five-twelfths of an inch, and that of their head is an inch and a twelfth. These heads are flat, and screw in a level with the wood.

Of the two Bridles which receive the End of the Bar which supports the Drill upon its Hind-carriage, Plate XI.

Underneath this piece, K L, are likewise fastened two bridles very like each other. They are represented in perspective by the single figure 23; but both of them may be seen in their proper places, at *g h* and *e f*, fig. 21. Their place in fig. 22 is marked only by pricked lines, in order to let the pieces under them be seen. These two bridles are made of a flat piece of iron, one inch and a sixth wide from *a* to *b*, or from *c* to *d* (fig. 23.) and a very little more than one-sixth of an inch thick. They are bent square at *c d* and *f g*, and are pierced with two holes, *b* and *e*, one-fourth of an inch in diameter, of which the centers are three-fourths of an inch from the ends of the iron. Thus far these two bridles are like each other. What they differ in, is as follows: that which is placed at *g h* (fig. 21.) is three inches and one-sixth high, from its bottom *a*, to the upper surface of its top *c*, or from *e f*, fig. 23; and this height in the belt which is placed at *e f* (fig. 21.) is three inches and five twelfths: that which has placed at *g h*, is two inches and five-sixths long, from its outside at *c d*, to its outside at *g f*, (fig. 23.) and this part of the bridle placed at *e f*, is three inches and one third.

Both these bridles placed at *g h* and *e f* (fig. 21.) go over the piece of wood *a b*, to which their ends are fastened by flat headed screws, which pass through the holes *b* and *e* (fig. 23.) beforementioned. These ends rest immediately upon the table. As the distance between the ends of the bridle *e f* is exactly equal to the breadth of the piece to which they are fastened, they are applied to the two lateral surfaces of that piece, without being let into it: but as the bridle *g h* is not quite so long, the ends of this are let into those surfaces, as is seen in fig. 21. and in the picked plan of these two bridles, *b i*, *k n*, fig. 22. The ends of these bridles stand perpendicular to the table. The bridle *g h*, fig. 21, is one inch and fifteen twenty-fourths from the edge *t s* of the table; and the bridle *e f* is five inches and eleven twelfth distant from the same edge *t s*.

The use of these two bridles is to receive the end of the bar hereafter described, which serves to support the drill upon its fore-carriage, when the hind-carriage is joined to it: and to prevent this end of the bar from slipping out of these bridles, a moveable iron pin is put through it. This pin is suspended by a piece of pack-thread. It passes through

the bridle L (fig. 2. Plate X. and 22. Plate XI.) and *b* (fig. 21.) before described.

Of the upper Surface of the Table, Plate XI.

Fig. 24. represents a geometrical plan of the upper surface of the table, one end of which is omitted, as superfluous in this figure, because both its ends are alike. The pricked line *l b* is traced here only to mark the middle of the table, and determine some measures. The fore-ends of the beams appear here at *f* and *g*, with their mortises A and B, into which their shares are fastened. C, D, E, F, are the four large flat-headed screws which fasten the table to the beams. The diameter of these screws towards their head is five twelfths of an inch, that of their head is one inch and a twelfth, and their length is three inches and seven twelfths. They enter into the middle of the breadth of the beams, and the centers of the holes in the tables through which they pass, are eleven twelfths of an inch distant from the nearest edges of the table. The whole breadth of the table, at C D, or E F, is eight inches and two thirds. The two corners G and H are thirteen inches distant from the middle line *l b*, and the end K is one foot three inches and three fourths distant from the same line *l b*. The thickness of this table is every where one inch and two thirds.

At each end of the table is a notch K L P, of which the inner surfaces are perpendicular to each other. These notches are at H and L in fig. 1, Plate X. Each of them is three inches and three quarters, from K to L, fig. 24, and one inch seven twelfths wide from L to P. They are situated in the middle of the breadth of the table. Their use is to receive the lower end of two standards hereafter described (fig. 34.) of which one is seen at M H, fig. 1, and the base of the other towards L.

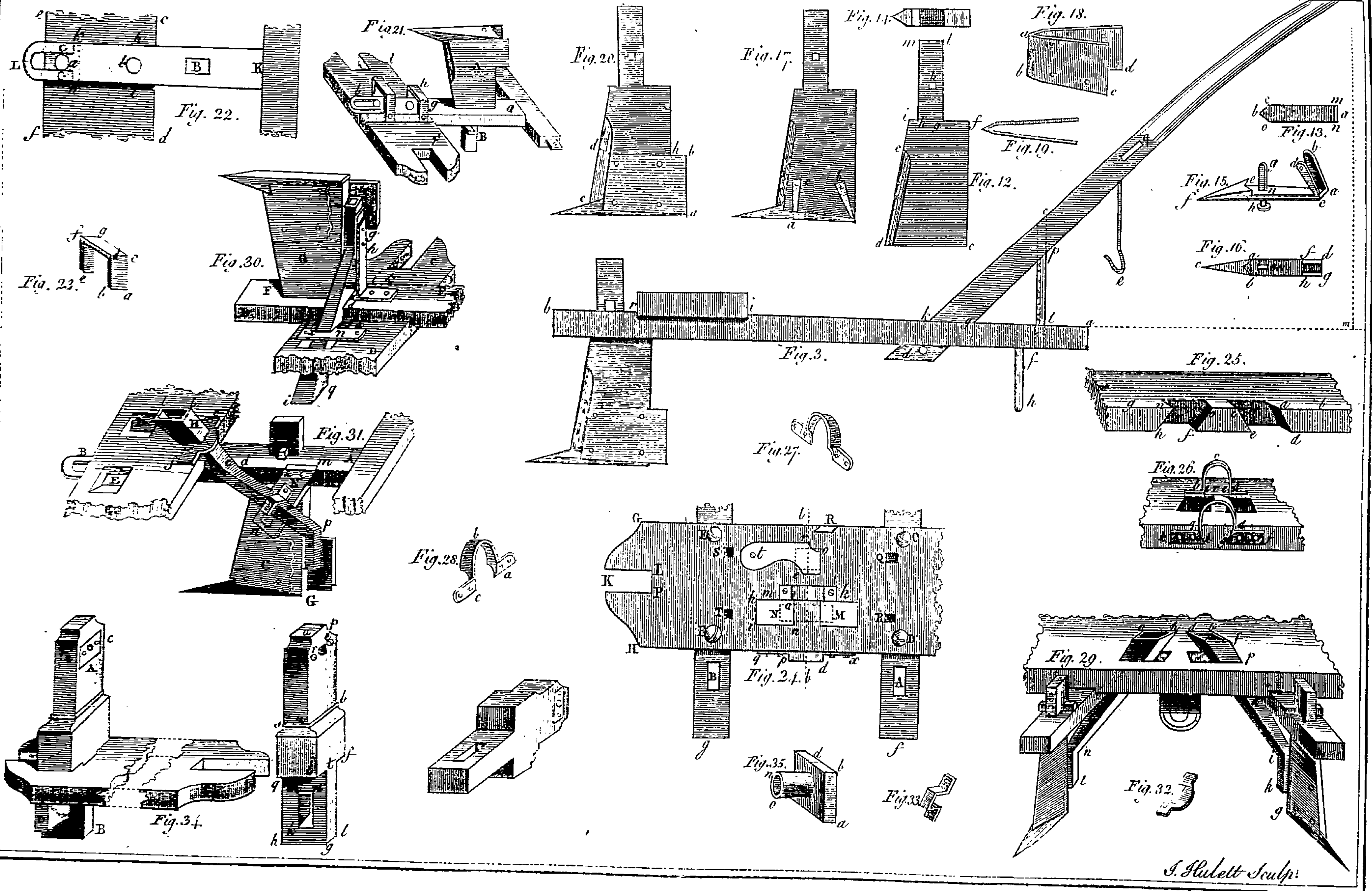
This table has two holes, M and N (fig. 24.) of which the upper openings are exactly equal, and alike situated, each of them forms a right angled parallelogram *a b i n*. The side *b i* is parallel to the edge D F of the table, from which it is one inch and an half distant, and its length is three inches and a quarter.

The upper edge of the end *a n* is eleven twelfths of an inch distant from the middle line *l b*, and its length is one inch and eleven twelfths. The inner and parallel sides *a b*, *n i*, of these holes are perpendicular to the upper surface of the table; but their ends *a n*, *b i*, are sloped, in such manner, that each of them forms an angle of fifty or fifty-five degrees towards the line *l b*. This is expressed in the profile of these two holes (fig. 25. by the angles *b a d*, *b e c*, and *g o f*, *g n h*, each of which has that measure. Q, R, S, T, are four mortises, of equal size and depth, cut perpendicularly to the upper surface of the table. Each of them is nineteen twenty fourths of an inch long in the same direction as the length of the table, two thirds of an inch wide, and about one inch deep. They are intended to receive the four feet of the hopper, which will be described hereafter. Two of these feet are seen in their mortises at *k* and *l*, fig. 1, Plate X. The centre of each of these mortises is six inches and five twelfths distant from the line *l b* (fig. 24.) and an inch and three quarters from the edges C E, D F, of the table.

Of the Bridles which receive the End of the Bar which supports the Drill upon its fore-carriage, Plate XI

From *k* to F, fig. 24. is a bridle which is seen in front in fig. 26. It is made of iron, one inch or one inch and a twelfth broad, and one sixth of an inch thick. It is bent in a semi-circle at *a c b*, and lies flat on the table at its end *a* and *b*, which are fastened to it by two flat-headed screws *a* and *b*, fig. 26. and *k m*, fig. 24. This bridle is perpendicular to the upper surface of the table. The highest part of the upper side of its arch *c* fig. 26, is two inches above the table; and its width, from outside to outside, from *c* to *i*, is two inches and a half. The length of each straight part, or claw, which is fastened to the table, is one inch and a quarter. The centers of the screws *k* and *m* (fig. 24.) are each one inch and three quarters from the middle line *l b*, and four inches from the edge D F of the table.

d r q (fig. 26.) is the upright of another bridle, of which the top, or upper surface, is seen at *x d p q*, fig. 24. (the front and side in the perspective figure 27, and the back and sides in the perspective figure 28. The hinder surface of the two claws, represented at *a* and *c* (fig. 28.)



28.) is screwed on to the fore-surface of the table, as at *f g* and *b k*, fig. 26, by two flat-headed screws, each of which is one inch and seven twelfths long, and near a quarter of an inch in diameter towards its head, which is half an inch in diameter. The middle of this bridle answers to the middle of the length of the table. The under surface of the bridle, and of its wings, answers to the plane of the fore-surface of the table, to which it is fastened. The length of each wing is about two inches and a half; their breadth is five sixths, and their thickness a quarter of an inch. The length and thickness of its arched part are equal to those of the wings. The bending of that part is such as is represented at *g d r q b*, fig. 26. The distance *g b* between the two wings is one inch and eleven twelfths. The greatest width of the bridle, from outside to outside, as at *d q*, is two inches and three fourths; and lastly, the upper surface of its highest part *r*, is one inch and two thirds above the upper surface of the table.

The use of these two bridles is to receive the end of the bar, which will be described hereafter. This bar is seen at *x d*, fig. 1, Plate X. where one of the rings appears towards *d*. A wooden wedge *o t* (fig. 24, Plate XI.) is slipped, if there be occasion for it, between this bar and the table, to which last it is fastened by a single flat-headed screw *t*, around which it turns, as around a center. The shape and extent of this wedge is such as is here represented according to the scale. Its thickness, throughout, is seven twelfths of an inch, excepting only at the part *r o e*, where its upper surface inclines from *r*, to *o e*, in such manner, that the edge *o e* is almost sharp, that it may slide, like a wedge, under the end of the abovementioned bar, which passes through the two bridles or belts. The length of this piece is five inches and one twelfth, from the center *t*, to its end *a e*. This center *t* is six inches and one sixth from the edge *D F* of the table, and four inches and a quarter distant from the middle line *l b*. We shall hereafter see, that the bar which enters into the two belts now described, ought not to fill entirely the belt *a b c*, fig. 26, but should leave room to introduce under it the wedge just spoken of, which is not to be inserted but when it is intended to make the other end of the bar press hard upon the axle-tree of the fore-carriage, which should never be done at the time of sowing, unless the husbandman would scarcely bury the seed.

Of the two Pipes of the Shares of the Beams, Plate XI.

Through the two holes *M* and *N* of the table (fig. 24.) pass two brass pipes, which descend to, and open at, the back of the sheers fastened in the mortises *A* and *B* of the two beams. These pipes are seen at *d* and *f* in fig. 1, from whence they pass through the two holes in the table, and terminate behind the two shares *D* and *K*, as is represented in perspective in fig. 29. These two pipes *f p a i k*, and *o r n l*, (fig. 29.) are perfectly alike. They are almost square during the whole length; wider towards the end *f d*, than towards the end *k*; and they are made of plates of brass, somewhat less than a twelfth of an inch thick, well soldered together. Their opening at *f d* forms a parallelogram, which is an inch and one sixth wide from *b* to *f*, and an inch and three quarters long from *b* to *d*. The plane or perpendicular projection of these openings in the table, is indicated in fig. 24, by the pricked lines between the letters *M* and *N*, where it is to be observed, that they are both equally distant from the middle line *l b*, and an inch and a half from the edge *D F* of the table. All the rims of these openings, *f, b, d, b, o*, (fig. 29.) are nearly parallel to the upper surface of the table, above which they rise two inches and two thirds. As these two pipes are alike, and situated in the same manner, one on the right, and the other on the left hand side of the drill, it will be sufficient to apply to one of them, what remains to be said of both. This pipe runs in a straight, but oblique line, from its opening *f d* to *i*, directly behind and under the share, from whence its direction becomes perpendicular to its other opening *k*, which is at the height of three inches and a quarter from the bottom *g* of the share. From its bending at *i* to the opening *k*, is three inches. This opening *k* is a square, of which the sides are two thirds, or three quarters of an inch long.

This pipe is held to the side *p* of the hole, by a piece of iron which is under the table; and it is also fastened near

the bending *i*, by another piece of iron fixed under the beam. These fastenings are seen in fig. 30, which represents, in perspective, the bottom *C D* of the table *E F* of the beam on the right-hand side of the drill, and the share *G* which is fastened to it. *q l* is the upper opening of the pipe, which runs from thence close to the side *a b* of the hole of the table, where it is fastened by a plate of iron, *n x*, about one eighth of an inch thick. In this plate is a notch which fits close to three sides of this pipe. This plate is fastened to the under surface of the table, by two flat-headed screws, *x* and *n*. The pipe continues in the same direction from its upper opening *q l*, to its bending at *e*, behind the share; but from thence to *f*, it follows the direction of the back of this share. It is fastened towards this bending by an iron square, *k i b g*, the thickness of which is about one eighth of an inch. This square is fastened under the beam by two flat-headed screws, *k* and *i*, and to the pipe by two other screws, *g* and *b*, the ends of which screw into a piece of iron, which is soldered to the pipe, and which is seen between the square and the pipe, from *f* to *c*. The beam *A B* has a shallow notch at *d*, to make room for the passage of the pipe.

Of the Pipe of the middle Share, Plate XI.

The two pipes which terminate behind the two shares fastened near the ends of the beam at *Q* and *R* (fig. 2, Plate X.) have now been described. A third pipe, of nearly the same form, terminates behind the third share, which is fastened at *P*, in the piece *K L*. This is the pipe which passes between *U* and *y*, in order to its terminating behind the share *e C*.

This piece *K L* is represented in perspective at *A B*, fig. 31, Plate XI. which shews its right side, with its share *C*, and the portion of the middle of the table, where are the two holes *D, E*, through which pass the two pipes beforementioned.

This third pipe is made like the two others, of plates of brass, of the same thickness and the same shape. Its opening, *b l* forms a parallelogram of nearly the same size as the similar openings of the two other pipes. The plane of this opening, or its perpendicular projection, upon the table, is indicated by pricked lines near *o c e*, fig. 24, where it is to be observed, that the middle of this parallelogram is in the middle line *l b* of the table, and that its side *c e* is five inches and five twelfths distant from the edge *D F* of the table. The rims of this opening *b l* (fig. 31.) are raised about two inches above the upper surface of the table. From thence this pipe descends in a straight, but oblique line, towards the share which is behind the table; and at the same time bears to the right to *d* and *c*, where it bends, in order to take the direction of the lateral surface of the piece *A B*, against which it rests. From thence it continues in this direction to *r*, where it bends again, to *p*, immediately behind the share; and there it is bent again, so as to descend perpendicularly behind this share, down to *k*, which is within three inches and a quarter of the bottom of the share *G*.

The table is notched at *H*, to let in one side of the pipe. This notch is also seen at *R*, in fig. 24. The pipe is fastened in this place by an iron plate *c f*, fig. 31, about one eighth of an inch thick, which is fixed upon the table by two flat-headed screws near *c* and *f*. This piece is represented by itself in fig. 32, *m n*; fig. 31, is a piece of iron, at least one sixth of an inch thick, fastened by two screws, at *N*, against the side of the piece of wood *A B*, into which the thickness of this iron is let, as may be seen at *m*, in such manner that the outward surface of this piece *m n*, is level with that of the piece of wood *A B*. The pipe is fastened against this piece of iron *m n*, by a belt fixed by two screws to the piece of iron *m n*. This belt is represented by itself in fig. 33.

Of the Standards, Plate XI.

In the notches *Æ W* at the two ends of the table, fig. 2, Plate X. are placed two standards, represented in perspective in fig. 34, Plate XI. with the two ends of the table, of which the middle is suppressed, as needless in this representation. These two standards being exactly alike, it will be sufficient to describe one of them.

In each standard may be distinguished three parts, namely, the head, which reaches from the line *p a* to the top of the moulding *b d s*; the base, which extends from the top

b d s of the moulding, to the under part of the shoulder *f u q*; and the tail or tenon, which begins at the bottom of the shoulder.

All the sides of this standard are at right angles to each other, excepting only the two indentures *p* and *a* in the head, and the mouldings at the base. The inner surface *A B*, which faces the other standards, is every where an even plane.

The head is three inches and a quarter wide, from *b* to *d*; two inches and one sixth thick, from *d* to *s*; and seven inches high, from the line *b d* to the line *p a*.

The base is four inches and five sixths wide from *f* to *u*; two inches and five sixths thick from *u* to *q*; and two inches and a half in perpendicular height from *f u* to *b d*.

The tail or tenon, which proceeds from the lower middle of the base, is equal in breadth *g h*, to the breadth *u q* of the base, that is to say, it is two inches and five sixths wide. Its length, *t g*, is six inches and a quarter. Its thickness is the same as the width *P L* (fig. 24.) of the notch in the end of the table, which receives the tenon; that is to say, one inch and seven twelfths. The hole or mortise *k n* is in the middle of the breadth of the tenon, and forms a right angled parallelogram, two inches long from *m* to *k*, and eleven twelfths of an inch wide from *n* to *m*. The height of this hole is determined by the thickness of the table, in such manner, that the distance between the bottom *f u q* of the base, to the top *n m* of the hole, is somewhat less than the thickness of the table.

Each standard is fastened to the table, as may be seen in the figure, in the same manner as a common turning lathe is fastened, by a key *D*, about eight inches and a half long, driven tightly up to its middle, in that part of the mortise which is under the table; and for greater solidity, one of the keys is put in at the fore part of one mortise, and the other at the hind part of the other.

A round hole, one inch and five twelfths in diameter, is bored through the head of the standard, near *A*. The center or axis of this hole is exactly in the middle of the breadth of the head, and the hole is made through it exactly horizontal to the upper surface of the table, or, in other words, perpendicular to the side of the standard. The pipe *n o* of the ferule, fig. 35, is put into this hole. The diameter of this pipe is the same as that of the hole. The pipe *n o*, is of one piece with its scutcheon *a b d*, which is one-third of an inch thick: its breadth *a b* is one inch and five-sixths, and its length *b d* is three inches. All its surfaces are at right angles, and parallel to each other. The axis of this pipe is in the middle of its scutcheon, and perpendicular to its surface. Both the scutcheon and the pipe (being but one piece) are bored through with the same hole, which is five-sixths of an inch in diameter; and in the upper surface of the inside of this hole is a groove, which reaches from one end to the other. One end of it is seen at *n*, and its use will soon then be shown. The end *n o* of this pipe is put into the hole *A* of the standard (fig. 34.) At the inner side *A B* of this standard, and the scutcheon *a b d* (fig. 35.) is let into this surface at *c i* (fig. 34.) where it is fastened by two screws, of which the end s are seen at *c* and *i*, in this figure, and at *c* and *r* in the adjoining representation of the outside of the other standard. The two small holes in the scutcheon are female screws, to receive the ends of the screws before mentioned, which are one-third of an inch in diameter, and their heads are two-thirds. The outer surface *c i* of the scutcheon is made to lie exactly even with the inner surface of the standard, and the center of its pipe is at the perpendicular height of five inches, and seven-twelfths above the surface of the table. These two pipes (one in each standard) are destined to receive the two pivots *a b*, *g h*, of an iron axis; and the groove *n*, (fig. 35.) then becomes useful, by affording the means of introducing a little oil, to keep the pivots from losing their temper by their friction, and to make them turn with the greater ease.

The scutcheon and its pipe should be cast in one piece of good metal, sufficiently hard, but by no means brittle.

Of the Axis, and the Pieces which are fastened to it, Plate XII.

The pivots are of the same diameter as their holes; and their shoulders *b* and *h* (fig. 36.) are at the same distance from each other as the inner surfaces of the standards, that is to say, two feet.

The axis is represented naked in fig. 36; but the several

pieces represented separately in figures 37, 38, 40, 41, 42, 43, 44, 45, and 46, are to be fastened to it.

Fig. 39 represents all these pieces fixed upon the axis. It is to be observed here, that the long pivot *c* (fig. 39.) goes through the hole of the standard which is on the left-hand side of the drill, and the pivot *r* through the standard on the right-hand; so that all these figures exhibit a front view of the axis and its pieces.

The pivot *a b* (fig. 36.) on the right-hand side, is one inch and a quarter long; and that on the left, *b g*, about two inches. The diameter of the axis towards the shoulder *b* and *h* is one inch and a twenty-fourth part of an inch. From thence it thickens gradually to near the middle of its length, in order to facilitate the fixing of the pieces which are to be slipped on, over its two ends. In the middle, its diameter is one inch and an eighth.

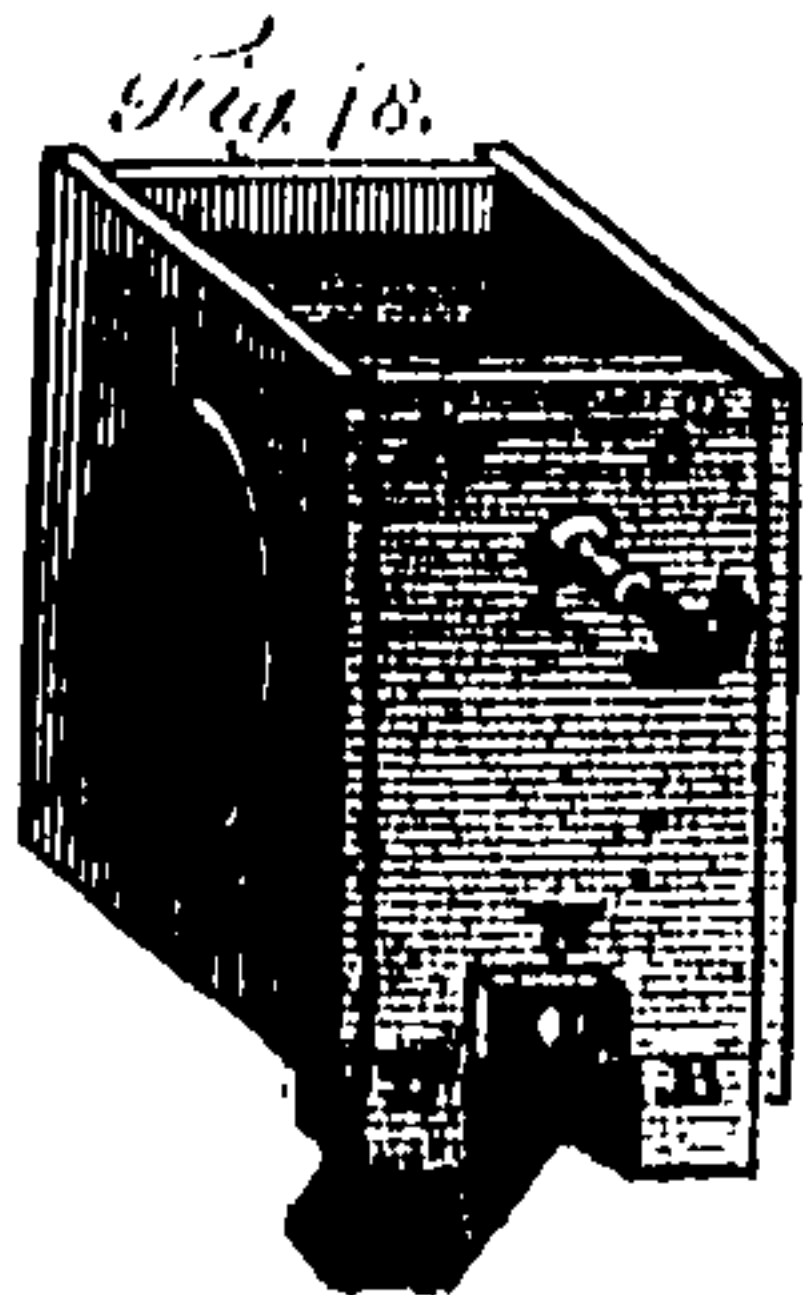
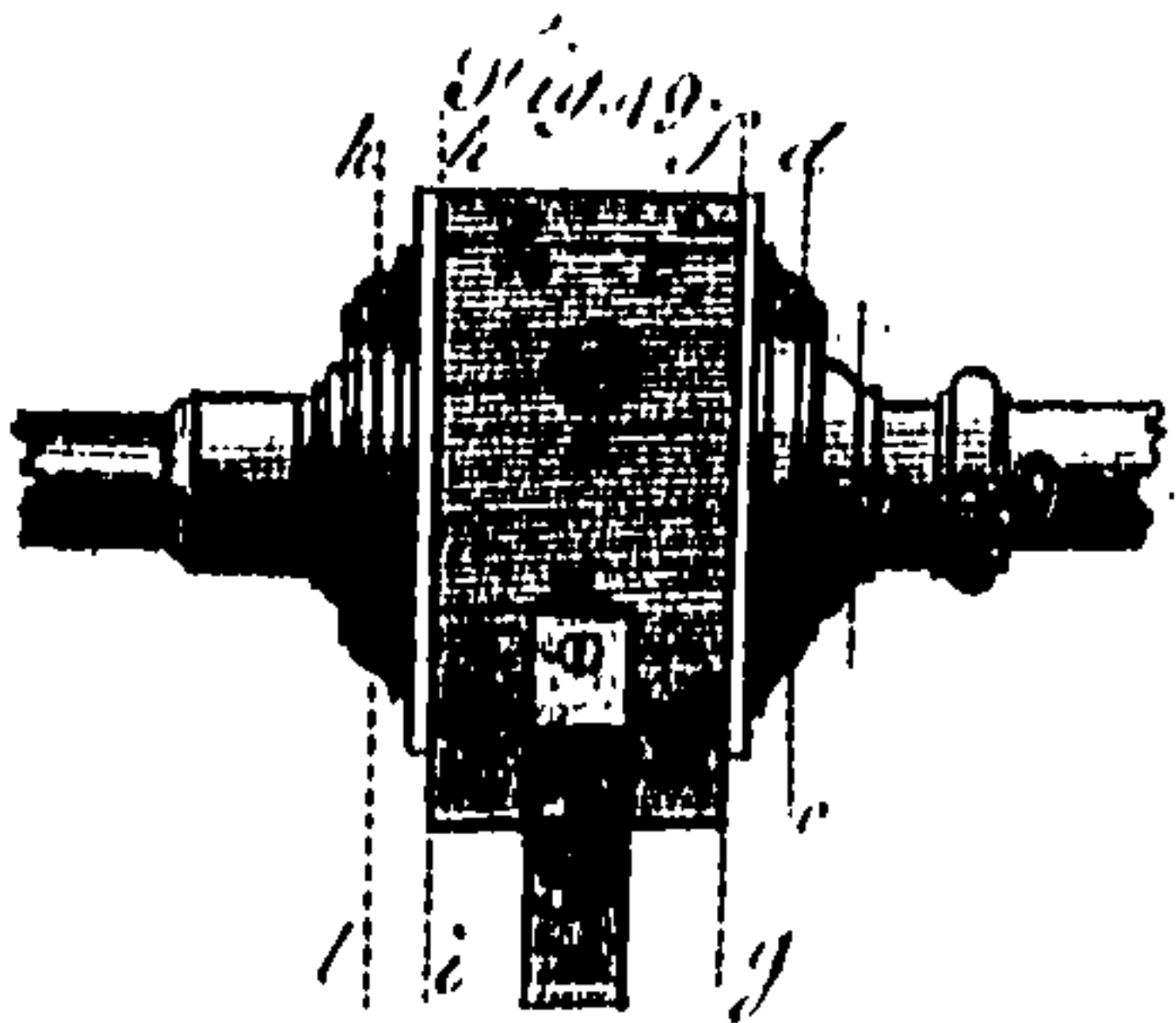
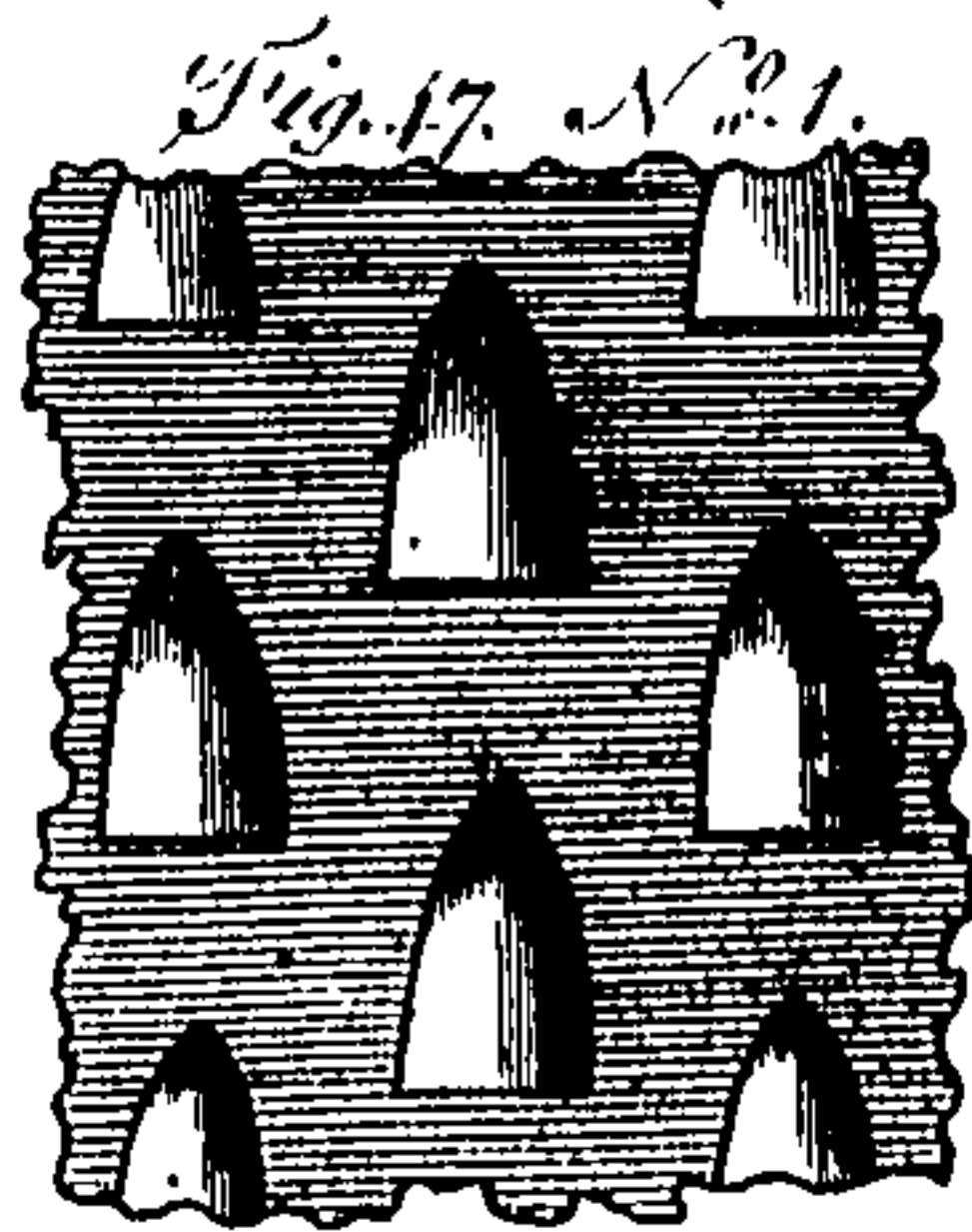
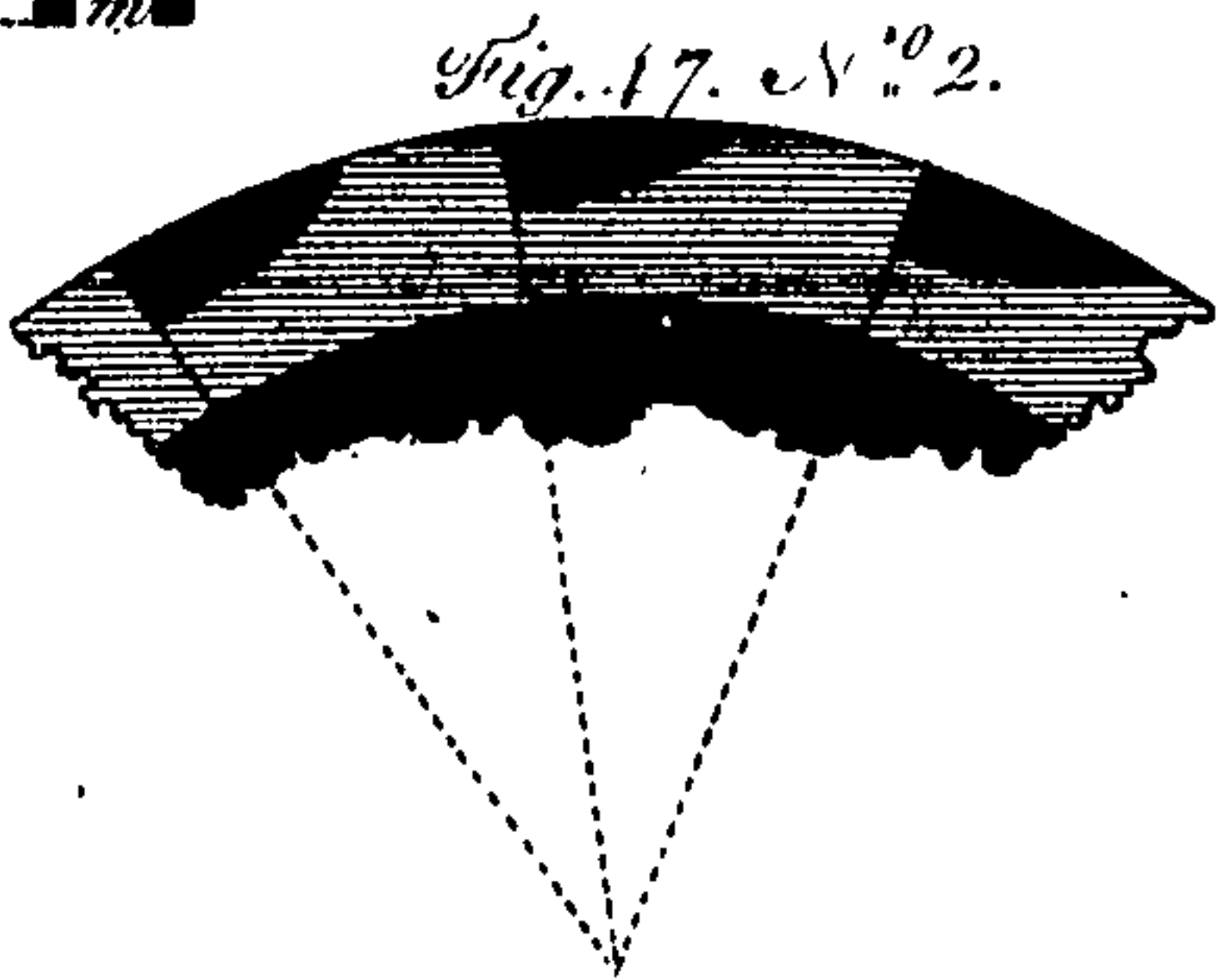
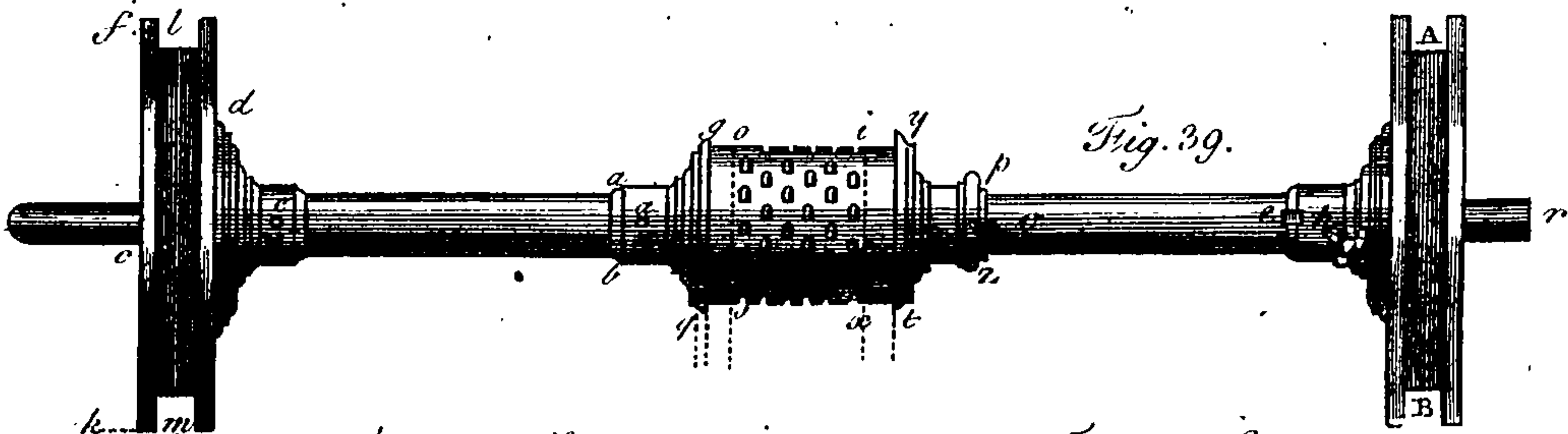
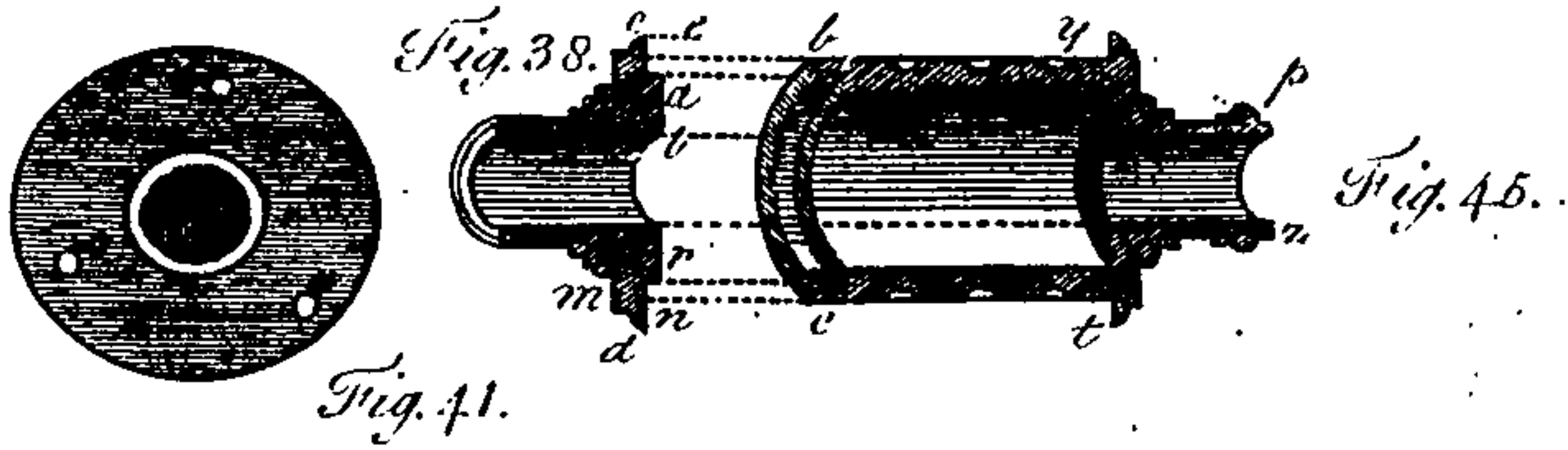
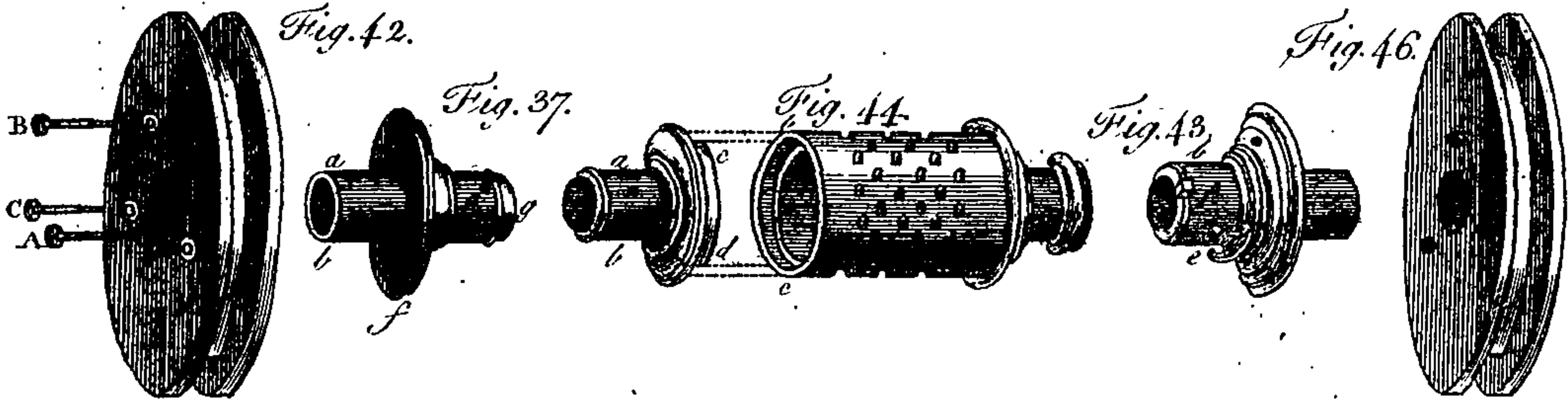
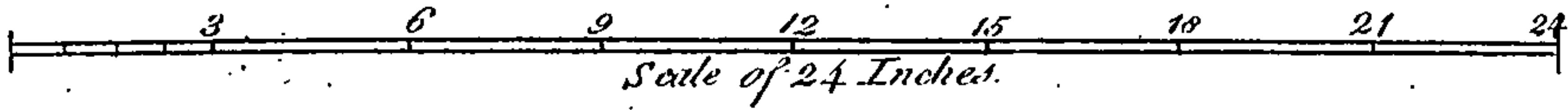
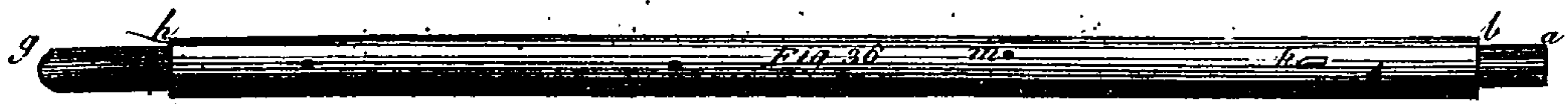
The first piece which is slipped over its end *g* (fig. 36.) is represented in perspective in fig. 37: a section of it is seen in fig. 38, and it appears in profile at *g a b q* in fig. 39. It is a hollow cylinder, of which the outer diameter *a b* (fig. 37.) is one inch and thirteen twenty-fourths of an inch. It has a shoulder, of which the total diameter *e d* (fig. 38.) or *g q* (fig. 36.) is three inches and five twelfths. Its thickness from *a* to *b* (fig. 31.) is seventeen twenty-fourths of an inch; and the thickness *n m* of the shoulder is one-sixth of an inch. This hollow cylinder and its shoulder are made of the same piece of brass, cast in a mould, and afterwards turned. The diameter of the hollow of this cylinder is the same as that of the middle of the axis, upon which it goes very tightly, and is fastened, as in fig. 39. by a riveted pin *n*, one-sixth of an inch in diameter, which passes through the axis and the cylinder. This cylinder is placed in such manner that its rim *a b* is eight inches and fifteen twenty-fourths of an inch distant from the shoulder *e* of the axis, fig. 39, or from the shoulder *b* (fig. 36.)

After this cylinder is firmly fixed, another hollow cylinder, represented in perspective in fig. 40, is forced over the end *g* of the axis fig. 36. Its end *g* is put on first, and forced forward, till the edge of its other opening *a b* (fig. 40.) is about a twelfth part of an inch beyond the shoulder *h* of the axis fig. 36. The reason for putting it thus a little beyond the shoulder *h*, is, that it may not touch the pipe of the standard when it turns.

This cylinder (fig. 40.) has, nearly in the middle of its length, a shoulder, of which the flat side *f d*, which is also represented in full view in fig. 41, forms a circle perpendicular to the axis of the cylinder. This circle or shoulder is four inches in diameter, and a quarter of an inch thick towards its edge; but it is thicker towards the middle, as is seen in its profile at *d* (fig. 39.) The whole length of the cylinder between its two ends *a b* and *g* (fig. 40.) is three inches; and the diameter of its thickness at each end, *a b* and *c*, is one inch and five-twelfths: the length *n a*, from the end *a b* to the flat side *d f* of the shoulder, is one inch and nine twenty-fourths.

This cylinder and its shoulder are of one piece of brass, cast in a mould, and turned in a turner's lathe. When put upon the axis, over which it goes very tight, in such manner that, as was said before, its end *a b* (fig. 40.) is placed about a twelfth part of an inch within the shoulder *h* of the axis (fig. 36.) It is fastened by a pin which goes in at the hole *c* (fig. 40.) and passes through the axis. This pin, which is of iron, and one-sixth of an inch in diameter, goes tight through the cylinder and the axis, without projecting at either of its ends. The cylinder is represented as pinned at *N* (fig. 39.)

Fig. 42, is a wooden pulley, of which a part is seen at *P*, (fig. 1, Plate X.) and of which the hole in its center is of the same diameter as the end *a b* of the cylinder (fig. 40, Plate XII.) This end of that cylinder is put through this pulley; which is every where one inch and a quarter thick, that is to say, somewhat less than the length of the end *n a* of the cylinder (fig. 40); so that when the pulley is put upon the cylinder, and its side is placed against the shoulder *d f*, the end *a b* of the cylinder projects a little beyond the other side of the pulley, to prevent its rubbing against the adjoining standard. This pulley is represented in profile at *l m* (fig. 39.) Its extreme diameter, *j k*, is eight inches; and its groove *l m*, which is square, is an inch and a quarter deep, and three quarters of an inch wide. This pulley is placed close to the brass scutcheon, to which it is fastened by three screws *A*, *B*, *C*, (fig. 42.) which screws into the



the three holes *a*, *b*, *c*, (these being female screws) in the flat part of the shoulder (fig. 41.) of the cylinder (fig. 40.) Each of these screws (fig. 42.) is from a quarter to a third part of an inch in diameter; and their head, which is flat, is about a quarter of an inch thick, and two-thirds of an inch in diameter. These heads are screwed into the holes *a*, *b* and *c*, till they lie even with the surface of the pulley on that side.

To the other end *b* of the axis (fig. 36.) is fitted exactly, though so as to slip on with ease, a third hollow cylinder (fig. 43.) of which the profile is seen at *b* (fig. 39.) It is like that which is marked *N* *d* at the other end of the axis; with this only difference, that the extreme diameter of the end *b* *c* of the cylinder (fig. 43.) is about two inches. This cylinder is fastened to the axis by a thumb-screw *e*, which goes through a female screw in the cylinder, and of which the end enters into the hole *l* in the axis (fig. 36.) which is not a female screw: and that the end of the screw may be directed to this hole, without any difficulty, when the cylinder is upon the axis, this last is provided with a small tongue *k*, which goes exactly into the notch *f*, (fig. 43.) as is seen at *e*, (fig. 39.)

A pulley exactly like the former is fastened to the shoulder of this cylinder, by three similar screws, and in the same manner: observing equally here, that the outer surface of this pulley does not rub against its adjoining standard. This pulley is seen at *Q*, (fig. 1, Plate X.)

It is sometimes necessary to take this pulley and the cylinder off from the end *r* of the axis (fig. 39.) which is the reason why this cylinder is fastened by a screw, and not by a pin, like the other. They are taken off, to make room for putting upon the axis the cellular cylinder, which is of cast brass, and turned in a lathe.

Of the cellular Cylinder, Plate XII.

This cylinder is seen in profile, upon the axis, at *p*, *y*, *g*, *q*, *t*, *z*, (fig. 39.) and in perspective in fig. 44. Fig. 45, represents its longitudinal section. The part of this cylinder which is between the two lines *y* *t* and *p* *z*, (fig. 39.) is exactly like the above described cylinder, fig. 37 and 38, and *g*, *a*, *b*, *q*, (fig. 39.)

The only difference between them is, that the one is fixed permanently to the axis, by a pin *n*, (fig. 39.) and the other is fastened by a screw *v*, which passes through a female screw near the end of the cylinder, which is strengthened there for that purpose, by a moulding or collar *p* *z*. The end of this screw enters into a hole *m* in the axis (fig. 36.) but this hole is not a screw. The other part of the cellular cylinder included between the two lines *y* *t* and *g* *q*, (fig. 39.) is three inches and five-twelfths long; its outward diameter, throughout this length, is two inches and twenty-one twenty-fourths of an inch; and its inner diameter is two inches and a third. This inner diameter is a little wider towards the end *b* *c* of the cylinder, (fig. 44 and 45.) It is exactly the same as the outer diameter of the projecting part *c* *d* of fig. 37, which is to go into, and fit closely to the end *b* *c* of the cellular cylinder, (fig. 44.) so that the edge of this end *b* *c* may run quite up to the flat side of the shoulder of fig. 37. The pricked lines in fig. 45 and 38, are intended to express the correspondence of the parts of these two cylinders, which are to be united, by putting the end of one into the end of the other. Fig. 39 shows the cellular cylinder joined to the shoulder of the other cylinder: in which position it is that the cellular cylinder is fastened to the axis by the screw *v*, as before said: and that the end of this screw may be directed straight to the hole in the axis, whenever this cylinder is put on, two contiguous lines or marks may be made, one upon the edge *p* *z* of the cylinder, and the other upon the axis.

Of the Cavities of the cellular Cylinder, Plate XII.

On the surface of this cylinder, between the lines *y* *t*, and *g* *q* (fig. 39.) are scooped hollows or cavities, represented at large in fig. 47, N° 1. and seen in profile in fig. 47, N° 2. They are shaped nearly like a niche, which terminates in a cone at its top, and is rounded gradually deeper and deeper down to its bottom, which is a flat, perpendicular to the lowest part of the cavity.

To conceive and fix the position of these cavities upon the cylinder, the two pricked lines *i* *x*, *o* *s* (fig. 41.) must be drawn round the cylinder, at equal distances from the lines

y *t* and *g* *q*, and distant from each other two inches and one third, which is the inner breadth of the seed-box in which the cylinder is placed, as will be more particularly explained in the description of it.

The breadth between the lines *i* *x*, and *o* *s*, must then be divided into six equal spaces, by five other parallel lines drawn round the cylinder. Each of these spaces marks the width of each row of cavities; and these six rows of cavities must face exactly the six valves of the bin, which will soon be spoken of.

After this, the places must be marked for twelve similar cavities, placed at equal distances from each other, in each of the breadths traced round the cylinder; observing, that the length of the cavities is to be in the same direction as those breadths; and also, that the flat end of each cavity must be undermost, and the rounded end uppermost, when the cylinder fronts the fore-part of the drill, which is the view represented fig. 39; for it is the flat end of the cavities that is to go foremost, when the cylinder turns and drops the seed.

It is likewise to be observed, that each cavity should be opposite to the interval between two cavities in the next adjoining rows, as they are placed in fig. 39, 44, and 47.

It will be right to have two or three, or even more, cellular cylinders, equally fitted to the axis (fig. 39.) but with cavities of different sizes, in order to be thereby enabled either to sow more or less seed, or smaller or larger seeds, such as barley, lentils, pease, beans, millet, oats, &c. for each of which its proper cylinder should be used.

The cavities in fig. 47, N° 1 and 2, are of a size fit for wheat, barley, lentils; for millet, they must be much smaller; for pease, somewhat deeper; for oats, there should be but eight or nine cavities in each row, in order that those cavities may be made longer than for wheat, on account of the length of the oat, which is the only seed that I have found less easy to sow than wheat: the reasons are, the lightness of the oats, their not slipping easily between each other, and their having at one end of the grain a pretty long, flexible, and elastic point. These obstacles sometimes hinder the grains from entering into the cavities, and the seedman must be more careful when he sows oats, than when he sows any other kind of grain; though, notwithstanding these difficulties, I have had them sown pretty well.

To sow beans, the cylinder must have but three rows of cavities, of a length, breadth, and depth proportioned to the size of the beans. The bin, which has six valves for wheat, should have but three for beans, and these valves should be proportioned to the breadth of the cavities, which must be placed exactly opposite to them, as for wheat.

The following rule will determine the proper size of the cavities, by applying, as may easily be done, what is here said of wheat to any other kind of grain.

The cavities must be large enough to contain three or four grains of wheat, and their depth must be such that these grains do not rise above the surface of the cylinder, in order that when the cavities filled with seeds, pass under the valves of the bin, the grains may not fall out of the cavities. This will be still better understood, after reading the description of the seed-box.

Of the Seed-Box, Plate XII and XIII.

After unscrewing and taking off from the axis, the pulley *A* *B* (fig. 39.) its cylinder *b*, and the cellular cylinder *p* *z*, *g* *q*; the seed-box (fig. 48.) is placed upon the axis, by running the barred end of this last, through a round hole in each of the two parallel sides of the seed-box. The diameter of these holes is the same as that of the cellular cylinder, which is then to be put over the axis, by passing its proper end through the hole to the side of the seed-box, which it traverses, and fastening it in the manner before directed. The pulley is also then to be replaced. The front of this box is seen at *B* (fig. 1, Plate X.)

Fig. 49 represents the box and the cellular cylinder placed upon the axis, where it is to be observed that the outer breadth of the box, expressed by the interval between the lines *d* *e* and *k* *l*, is exactly the same as the length of the cylinder expressed in fig. 39, by the distance between the lines or shoulders *y* *t*, and *g* *q*; so that the box is held between these two shoulders *y* *t*, and *g* *q*. It is also to be observed, that the inner breadth of the box, expressed by the interval between the lines *f* *g*, and *h* *i*, in fig. 49, is exactly the

the three holes *a*, *b*, *c*, (these being female screws) in the flat part of the shoulder (fig. 41.) of the cylinder (fig. 40.) Each of these screws (fig. 42.) is from a quarter to a third part of an inch in diameter; and their head, which is flat, is about a quarter of an inch thick, and two-thirds of an inch in diameter. These heads are screwed into the holes *a*, *b* and *c*, till they lie even with the surface of the pulley on that side.

To the other end *b* of the axis (fig. 36.) is fitted exactly, though so as to slip on with ease, a third hollow cylinder (fig. 43.) of which the profile is seen at *b* (fig. 39.) It is like that which is marked *N d* at the other end of the axis; with this only difference, that the extreme diameter of the end *b e* of the cylinder (fig. 43.) is about two inches. This cylinder is fastened to the axis by a thumb-screw *e*, which goes through a female screw in the cylinder, and of which the end enters into the hole *l* in the axis (fig. 36.) which is not a female screw: and that the end of the screw may be directed to this hole, without any difficulty, when the cylinder is upon the axis, this last is provided with a small tongue *k*, which goes exactly into the notch *f*, (fig. 43.) as is seen at *e*, (fig. 39.)

A pulley exactly like the former is fastened to the shoulder of this cylinder, by three similar screws, and in the same manner: observing equally here, that the outer surface of this pulley does not rub against its adjoining standard. This pulley is seen at *Q*, (fig. 1, Plate X.)

It is sometimes necessary to take this pulley and the cylinder off from the end *r* of the axis (fig. 39.) which is the reason why this cylinder is fastened by a screw, and not by a pin, like the other. They are taken off, to make room for putting upon the axis the cellular cylinder, which is of cast brass, and turned in a lathe.

Of the cellular Cylinder, Plate XII.

This cylinder is seen in profile, upon the axis, at *p*, *y*, *g*, *q*, *t*, *z*, (fig. 39.) and in perspective in fig. 44. Fig. 45, represents its longitudinal section. The part of this cylinder which is between the two lines *y t* and *p z*, (fig. 39.) is exactly like the above described cylinder, fig. 37 and 38, and *g*, *a*, *b*, *q*, (fig. 39.)

The only difference between them is, that the one is fixed permanently to the axis, by a pin *n*, (fig. 39.) and the other is fastened by a screw *v*, which passes through a female screw near the end of the cylinder, which is strengthened there for that purpose, by a moulding or collar *p z*. The end of this screw enters into a hole *m* in the axis (fig. 36.) but this hole is not a screw. The other part of the cellular cylinder included between the two lines *y t* and *g q*, (fig. 39.) is three inches and five-twelfths long; its outward diameter, throughout this length, is two inches and twenty-one twenty-fourths of an inch; and its inner diameter is two inches and a third. This inner diameter is a little wider towards the end *b e* of the cylinder, (fig. 44 and 45.) It is exactly the same as the outer diameter of the projecting part *c d* of fig. 37, which is to go into, and fit closely to the end *b e* of the cellular cylinder, (fig. 44.) so that the edge of this end *b e* may run quite up to the flat side of the shoulder of fig. 37. The pricked lines in fig. 45 and 38, are intended to express the correspondence of the parts of these two cylinders, which are to be united, by putting the end of one into the end of the other. Fig. 39 shows the cellular cylinder joined to the shoulder of the other cylinder: in which position it is that the cellular cylinder is fastened to the axis by the screw *v*, as before said: and that the end of this screw may be directed straight to the hole in the axis, whenever this cylinder is put on, two contiguous lines or marks may be made, one upon the edge *p z* of the cylinder, and the other upon the axis.

Of the Cavities of the cellular Cylinder, Plate XII.

On the surface of this cylinder, between the lines *y t*, and *g q* (fig. 39.) are scooped hollows or cavities, represented at large in fig. 47, N° 1. and seen in profile in fig. 47, N° 2. They are shaped nearly like a niche, which terminates in a cone at its top, and is rounded gradually deeper and deeper down to its bottom, which is a flat, perpendicular to the lowest part of the cavity.

To conceive and fix the position of these cavities upon the cylinder, the two pricked lines *i s*, *o s* (fig. 41.) must be drawn round the cylinder, at equal distances from the lines

by *t* and *g q*, and distant from each other two inches and one third, which is the inner breadth of the seed-box in which the cylinder is placed, as will be more particularly explained in the description of it.

The breadth between the lines *i s*, and *o s*, must then be divided into six equal spaces, by five other parallel lines drawn round the cylinder. Each of these spaces marks the width of each row of cavities; and these six rows of cavities must face exactly the six valves of the bin, which will soon be spoken of.

After this, the places must be marked for twelve similar cavities, placed at equal distances from each other, in each of the breadths traced round the cylinder; observing, that the length of the cavities is to be in the same direction as those breadths; and also, that the flat end of each cavity must be undermost, and the rounded end uppermost, when the cylinder fronts the fore-part of the drill, which is the view represented fig. 39; for it is the flat end of the cavities that is to go foremost, when the cylinder turns and drops the feed.

It is likewise to be observed, that each cavity should be opposite to the interval between two cavities in the next adjoining rows, as they are placed in fig. 39, 44, and 47.

It will be right to have two or three, or even more, cellular cylinders, equally fitted to the axis (fig. 39.) but with cavities of different sizes, in order to be thereby enabled either to sow more or less seed, or smaller or larger seeds, such as barley, lentils, pease, beans, millet, oats, &c. for each of which its proper cylinder should be used.

The cavities in fig. 47, N° 1 and 2, are of a size fit for wheat, barley, lentils; for millet, they must be much smaller; for pease, somewhat deeper; for oats, there should be but eight or nine cavities in each row, in order that those cavities may be made longer than for wheat, on account of the length of the oat, which is the only seed that I have found less easy to sow than wheat: the reasons are, the lightness of the oats, their not slipping easily between each other, and their having at one end of the grain a pretty long, flexible, and elastic point. These obstacles sometimes hinder the grains from entering into the cavities, and the seedsman must be more careful when he sows oats, than when he sows any other kind of grain; though, notwithstanding these difficulties, I have had them sown pretty well.

To sow beans, the cylinder must have but three rows of cavities, of a length, breadth, and depth proportioned to the size of the beans. The bin, which has six valves for wheat, should have but three for beans, and these valves should be proportioned to the breadth of the cavities, which must be placed exactly opposite to them, as for wheat.

The following rule will determine the proper size of the cavities, by applying, as may easily be done, what is here said of wheat to any other kind of grain.

The cavities must be large enough to contain three or four grains of wheat, and their depth must be such that these grains do not rise above the surface of the cylinder, in order that when the cavities filled with seeds, pass under the valves of the bin, the grains may not fall out of the cavities. This will be still better understood, after reading the description of the seed-box.

Of the Seed-Box, Plate XII and XIII.

After unscrewing and taking off from the axis, the pulley *A B* (fig. 39.) its cylinder *b*, and the cellular cylinder *p z*, *g q*; the seed-box (fig. 48.) is placed upon the axis, by running the barred end of this last, through a round hole in each of the two parallel sides of the seed-box. The diameter of these holes is the same as that of the cellular cylinder, which is then to be put over the axis, by passing its proper end through the hole to the side of the seed-box, which it traverses, and fastening it in the manner before directed. The pulley is also then to be replaced. The front of this box is seen at *B* (fig. 1, Plate X.)

Fig. 49 represents the box and the cellular cylinder placed upon the axis, where it is to be observed that the outer breadth of the box, expressed by the interval between the lines *d e* and *k l*, is exactly the same as the length of the cylinder expressed in fig. 39, by the distance between the lines or shoulders *y t*, and *g q*; so that the box is held between these two shoulders *y t*, and *g q*. It is also to be observed, that the inner breadth of the box, expressed by the interval between the lines *f g*, and *b i*, in fig. 49, is exactly the

same as the length of the cylinder expressed by the lines $i x$, and $o s$, in fig. 39.

This brass-box has neither cover nor bottom, but is formed of four plates, each five twenty-fourths of an inch thick. Fig. 50 represents the inside of the plate F G, (fig. 48.) which is on the left-hand side of the drill, with the pieces which the box contains, and a section of the cylinder, lengthways of one of the rows of cavities. Fig. 51 represents the outside of the plate opposite to the former, and which consequently is on the right-hand side of the drill.

These two plates (fig. 50 and 51.) are exactly equal. Each of them forms a parallelogram, of which the length A B (fig. 50, and 51.) is four inches and eleven-twelfths, and the breadth B E four inches and fifteen-twenty-fourths. Both of them are perforated by a large round hole, of the same diameter as that part of the cylinder in which are the cavities. The center of this hole is in the middle of the breadth of these plates, and the upper extremity b , of this hole (fig. 50 and 51.) is an inch and one-sixth distant from the upper edge, D A, of the plate. Both the plates have four mortises, G, H, K, L; (fig. 51.) the breadth of which is equal to the thickness of the plates, and the length about half an inch; though this last is almost arbitrary. Both of them have also, directly facing each other, a hole at n (fig. 50, and 51.) three-twenty-fourths of an inch diameter, and of which the center is at the distance of five-twenty-fourths of an inch from the line D A, and half an inch from the line A B. The inner surface of both the plates is even; and lastly, each of them has, on its outer surface, a shoulder which projects round the rim of the great hole. One of these shoulders is seen in perspective in fig. 48. The profile of one of them is seen between the lines $d c$ and $f g$ (fig. 49.) and that of the other between the lines $b i$ and $k l$. Fig. 54 represents a section of them both. The thickness of this shoulder, that is to say, the distance to which it is to project, has already been determined by the total distance between the lines $y t$ and $g q$ (fig. 39.) When the inner surfaces of these two plates (fig. 50, and 51.) are laid against each other, their edges and holes, now described, should coincide exactly.

What they differ in is, first, that one of them (fig. 51. has a small opening M N, which the other has not, and which will be described in its proper place: and secondly, that the hole n (fig. 50 and 51.) is a female screw in fig. 50, to receive the end of a screw which traverses the box, but is not wormed in that manner in fig. 51, where the outside of the plate is hollowed a little around this hole, to make room for the flat head of this screw, which will be spoken of hereafter.

The two plates now described are fixed in their proper places by means of two others (fig. 55, and 56.) which last are of equal size with each other. D E (fig. 50.) is the profile of fig. 55, which is the back of the box; and A B (fig. 50.) is the profile of fig. 56, which is the front of the box represented at A (fig. 48 and 49.)

The two tenons A and B (fig. 55.) enter into the two mortises which are hid near G and H in fig. 50. The two other tenons C and D (fig. 55.) are expressed near G H in fig. 50, and receive the mortises G and H of fig. 51. In like manner the two tenons E and F of fig. 56, enter into the mortises hidden near K and L in fig. 50, where are marked the two other tenons, likewise seen at G and H in fig. 56, which are to receive the mortises K and L of fig. 51. The distance between the tenons of the same side of a plate, and consequently between their mortises, is arbitrary; as is also the length of the tenons, which are pierced, in order to their being fixed very tightly by pins about the twelfth part of an inch thick. These two plates (fig. 55 and 56.) when rightly placed between the other two plates, should be perpendicular to them, and parallel to each other, as well as to the lateral edges of those other plates, and the distance between them, from inside to inside, should be four inches. The upper edges of the four plates, when they are put together, should be horizontally level; by which means the bottom of the two largest plates will reach lower down than the smaller. These two smaller plates (fig. 55, and 56.) are shaped like a parallelogram two inches and a third wide, and four inches and thirteen twenty-fourths long. This breadth answers exactly to the space between the lines $i x$ and $o s$, (fig. 39.) and between the lines $f g$ and $b i$, (fig. 49.)

The plate (fig. 55.) which is seen in perspective in fig. 52, has, quite across its inner surface, a solid plint $x L$, which is of the same piece as the plate, and runs parallel

to $f g$, (fig. 52, and 55.) The bottom of this plint is flat, and its top is arched like a portion of a circle. Its thickness from i to n is nine twenty-fourths of an inch, and its projecture $i x$, (fig. 5.) is such that its edge $x L$ meets the surface of the cellular cylinder, as in the profile d (fig. 50.)

The use of this plint is to strengthen the assemblage of the plates; for which purpose its ends $x L$, (fig. 52.) should join exactly to the larger plates: and it serves likewise to prevent the grains of corn from slipping down between the plate and the cellular cylinder.

To the top of the inside of this plate is fastened, by two screws a and p (fig. 52.) a plate of brass, one-twelfth of an inch thick. Its extent, $a p$, $d b$, is a rectangle parallelogram, of which the breadth $a p$, or $d b$, is the same as that of the plate to which it is fastened; so that its edges $a b$ and $p d$ lie close to the insides of the two largest plates (fig. 50 and 51.) The profile of this plate is seen at $a l b$, (fig. 50.) where it is inclined from l to b , in such manner that the whole length of its edge $b d$, (fig. 52.) is almost close to the surface of the cylinder, directly above its axis, as in the profile b , (fig. 50.) But this plate must not quite touch the cylinder, because it would then obstruct its motion, or at least occasion a needless and detrimental friction. Its use is to hinder the corn which fills the space F, from falling down into the space M, and to make it pass only under the piece $r q$ (which will soon be described) to drop from thence into three pipes, which begin near e , as will be seen hereafter.

The plate fig. 56, (seen in perspective in fig. 53, with some pieces fixed to it) has, rising upon its inner surface, four exactly similar small partitions, which are of a piece with the plate. These four partitions $c p$, $d e$, $f g$, $b i$, (fig. 56.) are seen in perspective at $m s$, $o t$, $q v$, and $r x$, in fig. 53. The top $r x$ of all these partitions is rounded like the quarter part of a circle, and the bottom $x v$ is flat, and at the same height as the axis of the cylinder, as may be seen in the profile e of one of these partitions (fig. 50.) The two outer partitions $c p$ and $b i$, (fig. 56) are at the edges of the plate, and the two others $d e$, $f g$, divide the space between c and b into three equal parts. These partitions are about a twelfth part of an inch in thickness, and their rounded part terminates in an edge, that the grains which may chance to fall upon it may not lodge there. The height $u r$, (fig. 53.) or $i b$, (fig. 56.) of all these partitions, is nine twenty-fourths of an inch. The lower ends $s w$, $t o$, $v a$, $x u$, (fig. 53.) of all these partitions, are in a plane perpendicular to the plate, and parallel to the edges $b a$, $q r$, of this plate (fig. 56.)

This plate has also upon its outer surface a small cylinder, which is seen in profile at K, (fig. 50.) in front at A, (fig. 49.) and in perspective A, (fig. 49) and B, (fig. 1. Plate X.) Its whole length is two-thirds of an inch, and its diameter is half inch excepting its shoulder at the plate, which is a little more.

This cylinder is pierced lengthways with a female screw, which goes through the plate perpendicularly to its surface, and through which passes a screw C q, (fig. 50.) five twenty-fourths of an inch in diameter, of which the end is seen at q , and the head at C. This head is also seen at B, (fig. 1. Plate X.) The hole is seen at k (fig. 56.) in the inner surface of the plate. The center of this hole k is in the middle of the breadth of the plate, and at the distance of five twenty-fourths of an inch from its edge $a b$. This fixes the place of the screw and of its cylinder; the only use of which last is, by its length, to give the greater stability and firmness to the screw, which keeps the bin at a greater or less distance from the cellular cylinder.

Of the Bin and its Valves, Plate XIII.

The bin, which has six valves, is seen in profile at $q n$, (fig. 50.) The outside of this bin is seen in perspective at $g h n$, (fig. 53.) with the ends of the valves a , b , c , d , e , f , separated from each other by partitions. It is suspended in the box by the axis or screw before mentioned (fig. 50, and 51.) which goes in at the hole n in the end (fig. 51.) of the box, then passes through the hole n of the bin (fig. 50, and 53.) runs quite through the length of the bin, and screws into the female screw in the plate (fig. 50.) which, as was said before, is directly opposite to the hole n in the plate (fig. 51.) The head of this screw, at n (fig. 51.) lies even with the outer surface of this plate.

Fig. 57, represents in perspective the bin alone and its parti-

partitions, all made of one piece, or plate of brass. Fig. 58, represents geometrically the fore-part of the bin, which is here turned towards the seedman. Fig. 60 represents its back. Fig. 62 its bottom. Fig. 59 one of its utmost sides, or largest partitions, both of which are equal and alike. And fig. 61 the side or profile of one of the smaller partitions; which are all equal and like to each other.

The whole length of the bin from outside to outside, that is to say, from a to c , and from b to d , (fig. 58.) or from c to d , and from e to f , (fig. 60.) is the same as the breadth of the inside of the box, or of the space between the lines $i x$ and $o s$, (fig. 39.) or $f g$ and $h i$, (fig. 49.) The bottom of the bin is a parallelogram i, k, d, b , (fig. 58.) or $a b d c$ (fig. 60.) eleven twenty-fourths of an inch wide at $a c$ and $b d$. This bottom is of the same thickness as the largest partitions or sides $a b, c d$, (fig. 58.) and the five smaller partitions; that is to say, three twenty-fourths of an inch. These partitions, both great and small, are at equal distances from each other, and all their sides are perpendicular to the bottom of the bin.

The whole length of the two largest partitions, (fig. 59.) from b , to the pricked line $g d$, which is perpendicular to $a b$, is one inch and seventeen twenty-fourths. Their breadth at $a i$ and $b c$ is five-ninths of an inch. The line $c m$, parallel to $b a$, is eleven twenty-fourths of an inch long. The notch $l m$ is one-twelfth of an inch deep. The angle a, b, c , is of eighty-five degrees. The perpendicular distance from the center of the hole s , to the line $g d$, is a quarter of an inch; and the perpendicular distance from the same center to the line $a b$, is five-twelfths of an inch. The diameter of this hole is a full twelfth of an inch. The perpendicular distance from the center of the hole r , to the line $g d$, is very near, but not quite, one-sixth part of an inch; and the perpendicular distance from this same center to the line $a b$, is five twenty-fourths of an inch. The diameter of this hole is one-sixth of an inch. These two main partitions, $a b$ and $c d$, (fig. 58.) which have now been described in the account of fig. 59, are exactly alike, and pierced in the same manner; so that if they could be laid flat together, inside to inside, their dimensions and holes would tally perfectly.

It is through the hole r , (fig. 59.) that the screw or axis is passed which keeps the bin suspended to the plates, and which was mentioned before. These two holes $r r$ are seen in fig. 57, where their axis is indicated by two prick-lines. And it is through the hole s , (fig. 59.) that the screw or axis is passed which goes through the valves, next to be spoken of, and by which they are suspended in the bin. These two holes $s s$ are seen in fig. 57, with their axis, which is indicated by two pricked lines.

Fig. 61, represents the profile of the small partitions. Its total height from $a b$ to $c d$, is equal to the breadth $d b$ of the bottom (fig. 60.) as is shewn in fig. 58. The shape and size of these small partitions is exactly alike, and equal to that part of fig. 59, which is included between the lines e, f, b, c ; so that their edges would tally in all respects, if they were laid one upon the other. The line $c d$, (fig. 61.) is perpendicular to $c a$.

The edge $m c$, (fig. 59.) is a bevil, sloped towards the inside of the bin, as at $e f$, (fig. 57.) and $a d$, (fig. 62.) The like edge $z b$, (fig. 57.) and $b f$, (fig. 62.) is sloped in the same manner. All the similar edges $e b$, (fig. 61.) of the small partitions, which are included between the lines $e f$ and $b d$, (fig. 58.) are bevils on each side, and form as many acute edges, as is seen in fig. 62, between the lines $a b$ and $d f$. The distance between the lines $a b$ and $g b$, is five-ninths of an inch.

Fig. 58, is repeated in fig. 64, with only the addition of the six springs $a b, c d, e f, g h, i k, l m$, each of which is fastened by a small screw, a, c, e, g, i, k , at one of their ends, next to the bottom of the bin, and in the middle of the interval between two partitions. The breadth of these springs is nearly equal to two-thirds of this interval, and their thickness is the same as that of a common spring of a watch, which is the stuff they are made of. Fig. 63, exhibits a front view of one of these springs. Their length and bending, when in a state of rest, is represented in the profile $e d$, (fig. 65.) $b a$ (fig. 66.) the profile of these springs in a state of contraction.

Fig. 64, is represented in fig. 67, with only the addition of the six valves $c d, e f, g h, i k, l m, n o$, seen in profile in fig. 65 and 66. Each of these six valves is, at most, one-

twelfth of an inch thick, and their total length, $a b$, (fig. 65.) is one inch and thirteen twenty-fourths. The six valves, put together, weigh twenty penny-weights, or five-sixths of an ounce. When put into their proper places (fig. 67.) each of them covers one of the before-mentioned springs. The breadth of each of them is equal to the whole width of the interval between two partitions; between which they must only be able to move. They are all fastened to the same axis, $a b$, which, as was said before, passes through the holes $s s$, (fig. 57 and 50.) The diameter of this axis is a full twelfth part of an inch. One of its ends screws at a , (fig. 67.) into one of the aforesaid holes s , and the other end, which has a flat head, is buried at b ; in the other hole s ; for which purpose the outside of the plate is pared away a little, around this hole. One of these holes is seen at p , in fig. 50 and 53. The valves are laid flat in fig. 67, with their springs contracted, as in the profile (fig. 66.) When the springs are at liberty, they push the valves out of the partitions, as far as is represented in the profile (fig. 65.) But they are kept within partitions, by a cover $a b$, (fig. 69.) which is put into the notch $f m$, (fig. 59.) and $c d$, (fig. 60.); and, in short, into all the notches, which are upon a level with each other, from $i e$ to $f k$, (fig. 58.)

Fig. 67, is repeated in fig. 69, with only the addition of the cover, which is three quarters of an inch wide; as long as the whole breadth of the bin, and not quite a twelfth part of an inch thick. It is fastened by two screws a and b , which go into the upper edge of the large partitions, as appears in the profile (fig. 66 and 70.) Fig. 70 represents one of the large partitions of the bin, with the end $e d$ of its cover, and the head of one of the screws which fasten it. Fig. 66, represents the profile of one of the small partitions of a valve $e f$, of its spring $a b$, and of the cover $d c$. This figure shews also, that the end of the valve closes with the lowest edge of the partitions; as may be seen more distinctly at $d o$, (fig. 67 and 69.)

Fig. 68, represents the back of these six valves fastened to their axis.

The end of each valve, d, f, h, k, m, o , (fig. 67.) is bent a little outward; as in fig. 71, which is only a repetition of fig. 62, with the addition of the springs of the valves, and their cover.

The whole bin, furnished with the six valves and their axis, the six springs and their screws, and the cover and its two screws, but not the axis or screw which suspends the bin in the box, weighs four ounces and a half.

The bin thus completed, and suspended in the box, as was said before in speaking in fig. 50 and 53, is again covered by a thin plate of brass represented in perspective at i, A, k, N, P , (fig. 53.) and of which the profile is likewise seen at i, A, s, k , (fig. 50.) This plate is bent at $A P$, (fig. 53.) in such manner that its bended part turns inward, over the upper edge of the front of the brass-box; and its edge, which is seen in profile at $A i$, (fig. 50 and 53.) and fully at $e n$, (fig. 48 and 39.) is fastened to the upper part of the outer surface of this plate of the box, by two screws c and n , which go into the holes l and m , in fig. 56. This plate, from its bending $A P$, (fig. 53.) projects over into the box, inclining down to the bin, which it covers as low as $N k$, where the cover of the bin before mentioned ends. This plate performs the office of a spring, and should therefore be screwed on very tight. It presses the bin against the end q of the setew $q C$, (fig. 50.) The breadth $A P$ and $k N$ of this plate, (fig. 53.) is the same as the breadth of the inside of the box; so that its two edges, $A k$ and $P N$, lie close to the inner surfaces of the two large plates, (fig. 50 and 51.) which form the ends of the box.

Of the three Pipes of the Seed-Box, Plate XII. and XIII.

Fig. 72, represents a perspective view of the three pipes, which are seen partly at B, D, E , fig. 48 and 49, Plate XII. and at $a b$, fig. 1, Plate X. They are made of plates of brass, about a twelfth part of an inch thick, and are separated from each other only by a simple partition. Their front is seen in perspective, and on the right hand side of the drill, in fig. 72. Their back is shewn in perspective, and on the right hand side of the drill, in fig. 53. Their front is represented geometrically in fig. 49 and 73; and their back in fig. 75. Fig. 74, represents geometrically, the side or profile of the middle pipe, which is inclined with

the piece that fastens it to the plate. The profile of the pipes on each side of this is indicated by pricked lines.

These three pipes, (fig. 72.) are set against the plate (fig. 56.) in such manner that the edges a, b, c, d , (fig. 72.) are applied close to it, and in the same order, at i, r, v, g , fig. 56. The edges g, h, f, e , (fig. 72.) are applied in like manner at p, q, s, e , (fig. 56.) The line b, h , (fig. 72.) is set exactly even with r, q , (fig. 56.) By this means the anterior surfaces b, c, k, i , and f, h, l, m , of the two outer pipes, (fig. 72.) exceed the bottom of the box, as at B, D , (fig. 48 and 49;) and the upper edges a, n, d, o, e, p, g, q , (fig. 72.) join to the lower edges of the four partitions (fig. 56.) as i, g, e, p , as is seen in perspective in fig. 53, at x, u, v, a, t, e , and s, w .

These three pipes, which hold together, are fastened to the plate by means of a single brass scutcheon A , (fig. 72.) which is seen directly in front at H , (fig. 49.) and at A , (fig. 73.) Its fore-part and right hand side are seen in perspective at A in fig. 72; and its fore part and left-hand side at H (fig. 48.) fig. 75 shews a full view of the back part of it at A ; and the whole profile of it on the right-hand side, is seen at N, u, B, L , (fig. 50.) and at b, d, l, f , (fig. 74.) This scutcheon is bent at d and at m . Its breadth is the same as that of the middle pipe, which is the interval between the other two, as is seen in fig. 48, 49, 72, 73, 75. Its part b, d , (fig. 74.) is foldered or riveted to the lower surface of the middle pipe: from thence it takes an horizontal direction from d to m , and then ascends perpendicularly from m to f . This length m, d is one inch, and the thickness of the scutcheon, throughout, as about a sixth part of an inch, or somewhat less. The thickness of the plate, fig. 56, of which the profile is here at q, l , fig. 74, is exactly embraced between the extremity r, i of the pipe, and the scutcheon f, l . The bottom q, r , (fig. 56.) of this plate, rests upon the horizontal part o, l of the scutcheon, (fig. 74;) and this scutcheon is fastened to the plate by a screw p, g , which goes into the hole n , (fig. 56.) It is to be observed, that the line r, o , (fig. 74.) is equal to the edges a, b, c, d, e, f, g, h , (fig. 72.) of which it expresses the profile; that its farther extent o, a , (fig. 74.) is equal with lines q, i, c, k, f, l, b, m , (fig. 72.) of which it expresses the profile: and that the line d, l , (fig. 74.) is in the same horizontal plane as the line b, h , (fig. 72.)

The angle r, i, e , (fig. 74.) is of one hundred and twenty-six degrees; and the distance from o to i is one third of an inch. The outside breadth of these three pipes, taken together, is the same as that of the plate; and each of them occupies a third part of that space, as in fig. 53, 46, 73 and 75. Each of them is square. The length of the two outer pipes, from the line b, h , (fig. 72.) or from the bottom q, r , of the plate, (fig. 56.) to the line i, m , (fig. 72.) or x, o , (fig. 56.) is one inch and a twelfth: the length of the middle pipe, (fig. 74.) from i , where it joins to the plate, to its other end e , is four inches and five twelfths.

These three pipes are fastened to the plate, as in fig. 53. The edges $x, z, v, T, E, t, l, D, s, y$, of their upper openings, are circular, that they may fit exactly, and fit close to the circumference of the cylinder, which is there indicated by pricked lines, and is shewn in fig. 50, by the line t, v, f , which expresses the profile of these edges, against which the cylinder rubs lightly when it turns.

Manner of working the Seed-box, and of the Pieces which it contains, Plate XIII.

The line or edge g, h of the six valves, (fig. 53.) must be very near to the surface of the cellular cylinder, through not quite so close as to occasion a friction when the cylinder turns; and the lower end of each valve must answer to a row of cavities; so that the part F of the seed-box, (fig. 50.) being filled with corn, and the cylinder turning from b to r , this last carries with it the grains that fall into the cavities which pass under the edge of the corresponding valves: those that fall from the two valves a and b , (fig. 53.) are dropped, by the cavities, into the pipe G , in the space between the pricked lines g, s and b, t , and are conveyed to the back of the share which is on the left hand side of the drill: those that fall from the two next valves, c and d , are dropped between the pricked lines b, t and d, v , into the pipe H , and are conveyed to the back of the share which is in the middle of the drill: and those that fall from the two last valves, e and f , are dropped between the pricked lines d, v and b, x , into the pipe M , and are conveyed to the back of the share which is on the right side of the drill.

If it happens that several grains press together at the same time, at the outlet of any one of the valves, so as to choak it, that valve immediately gives way, lets them pass, and is instantly replaced as before, by means of its spring which pushes it back. No grain is ever broken by the valves: so that if this accident does sometimes happen to a few, it is not during the time of actually sowing the seed, but only when the drill is turned, in order to begin another bout, or when the seedsmen, instead of drawing the drill forward, drags it towards himself, and makes the cylinder turn backward.

By loosening the screw C, q , (fig. 50.) which is at B in fig. 1, the bin, before pressed against this screw by the spring or plate A, s, k , (fig. 50.) is moved farther from the cylinder, the space between the cylinder and the end of the valves is increased, and a greater quantity of corn then passes at a time. By turning the screw C, q farther in, the bin is pushed nearer to the cylinder, and fewer seeds are dropped.

To know exactly how much the bin should, at any time, be set nearer to, or farther from the cylinder, there is, at one of the sides of the bin, a small screw, of which the head of m passes through a circular opening M, N , (fig. 51.) in the largest plate of the box, where it becomes a certain guide, by means of a few equal divisions engraved and numbered at the edge of that opening. The center of the arch of this opening is the same as that of the hole n , upon which the bin moves.

Of the Hopper, Plate XIII.

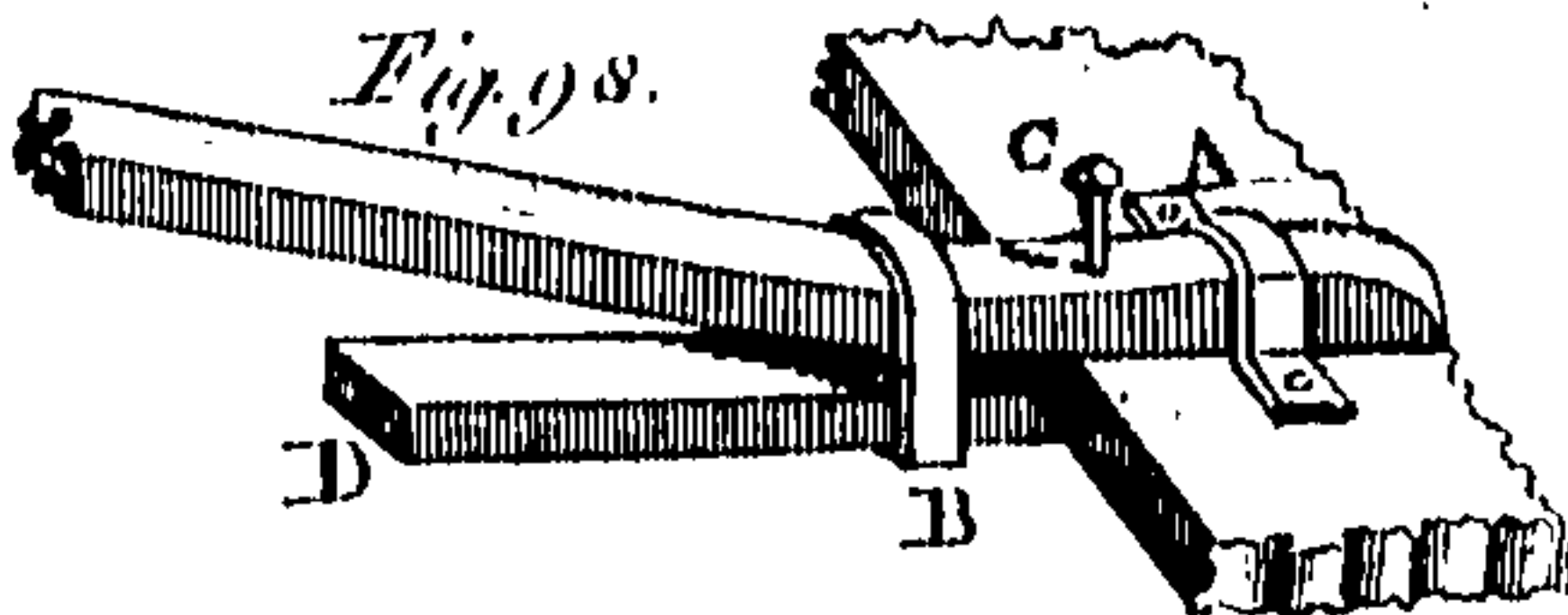
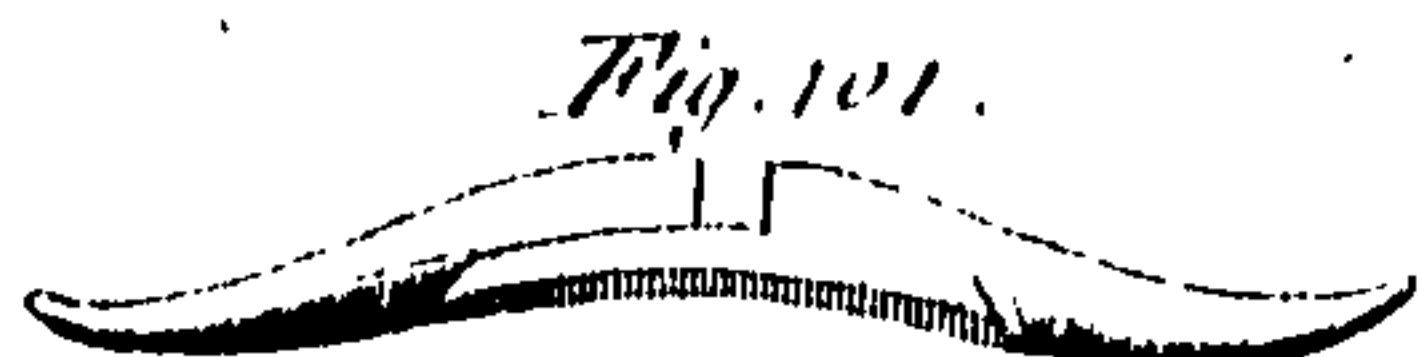
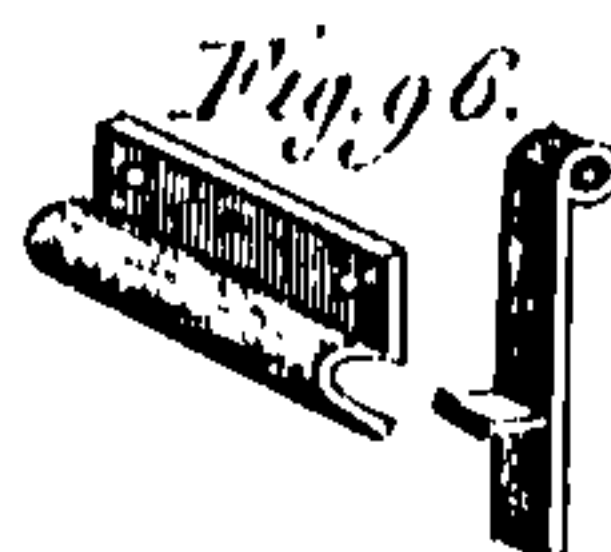
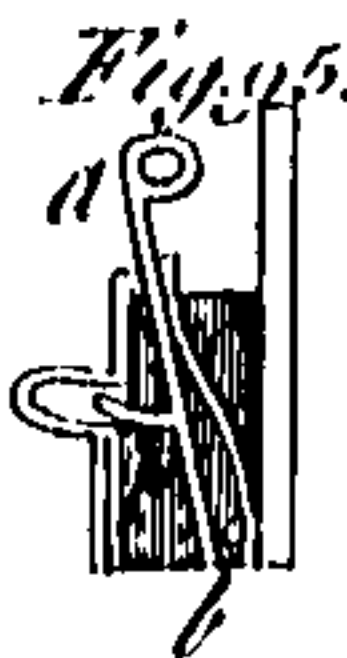
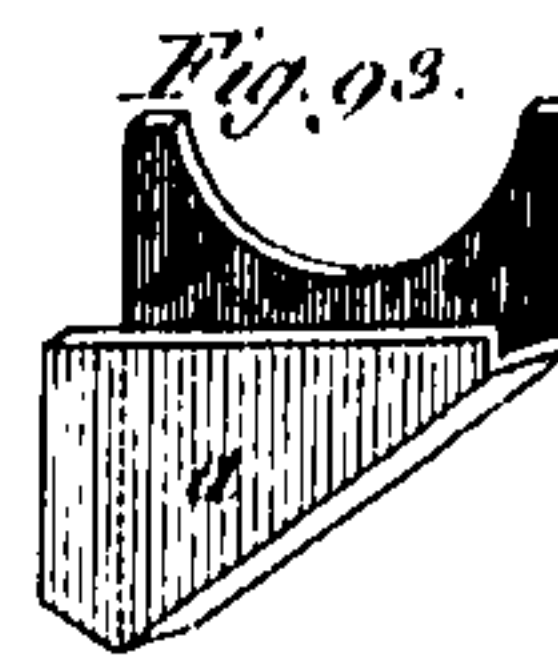
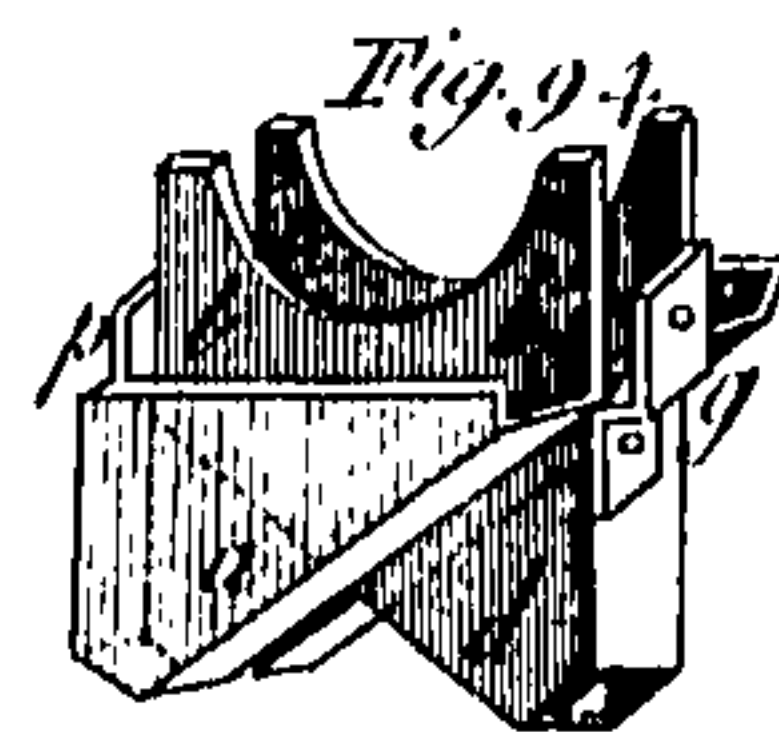
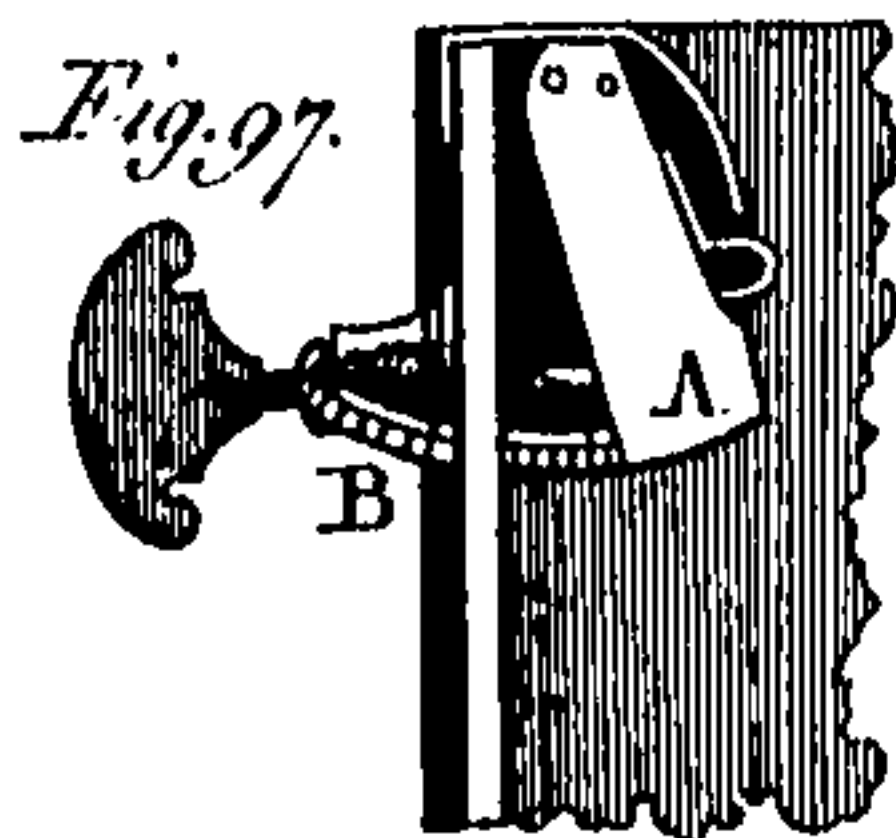
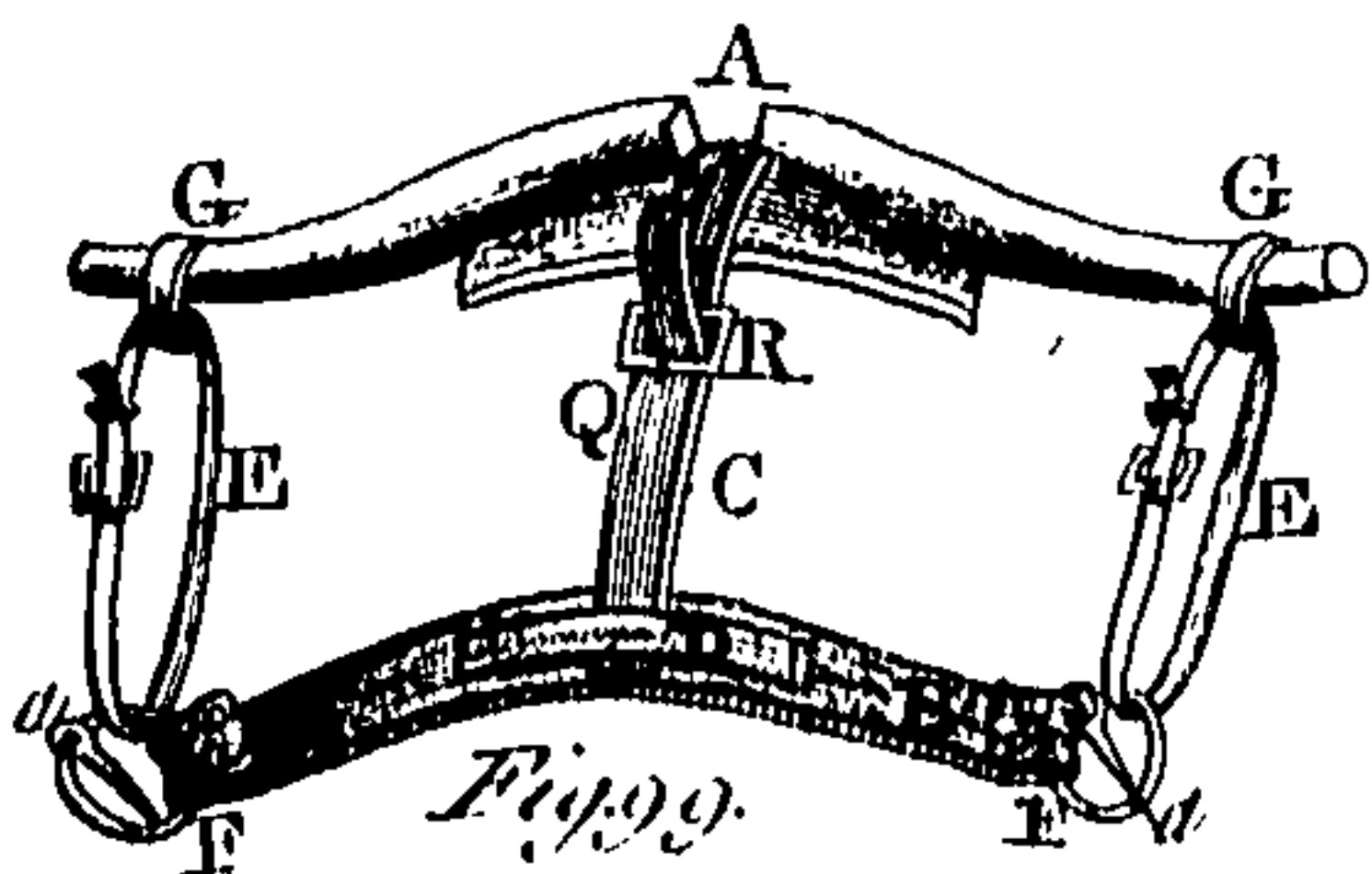
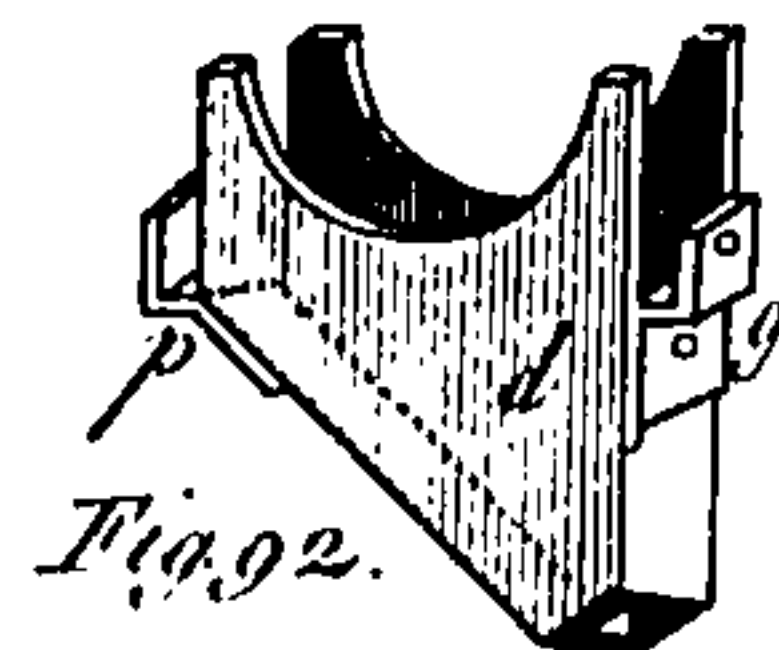
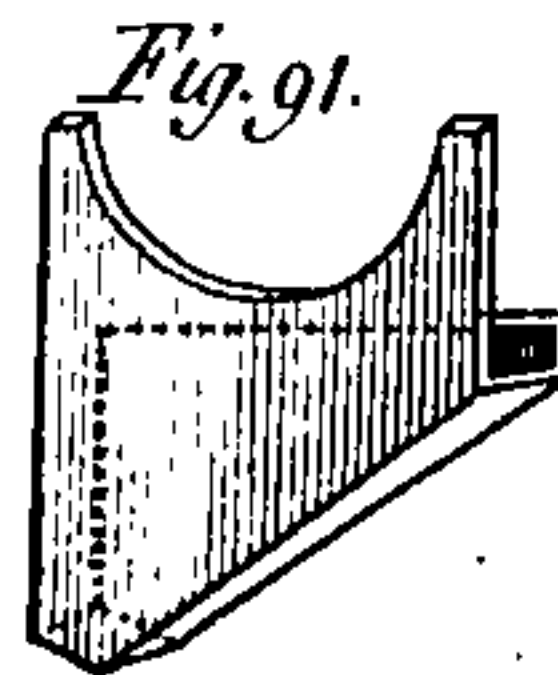
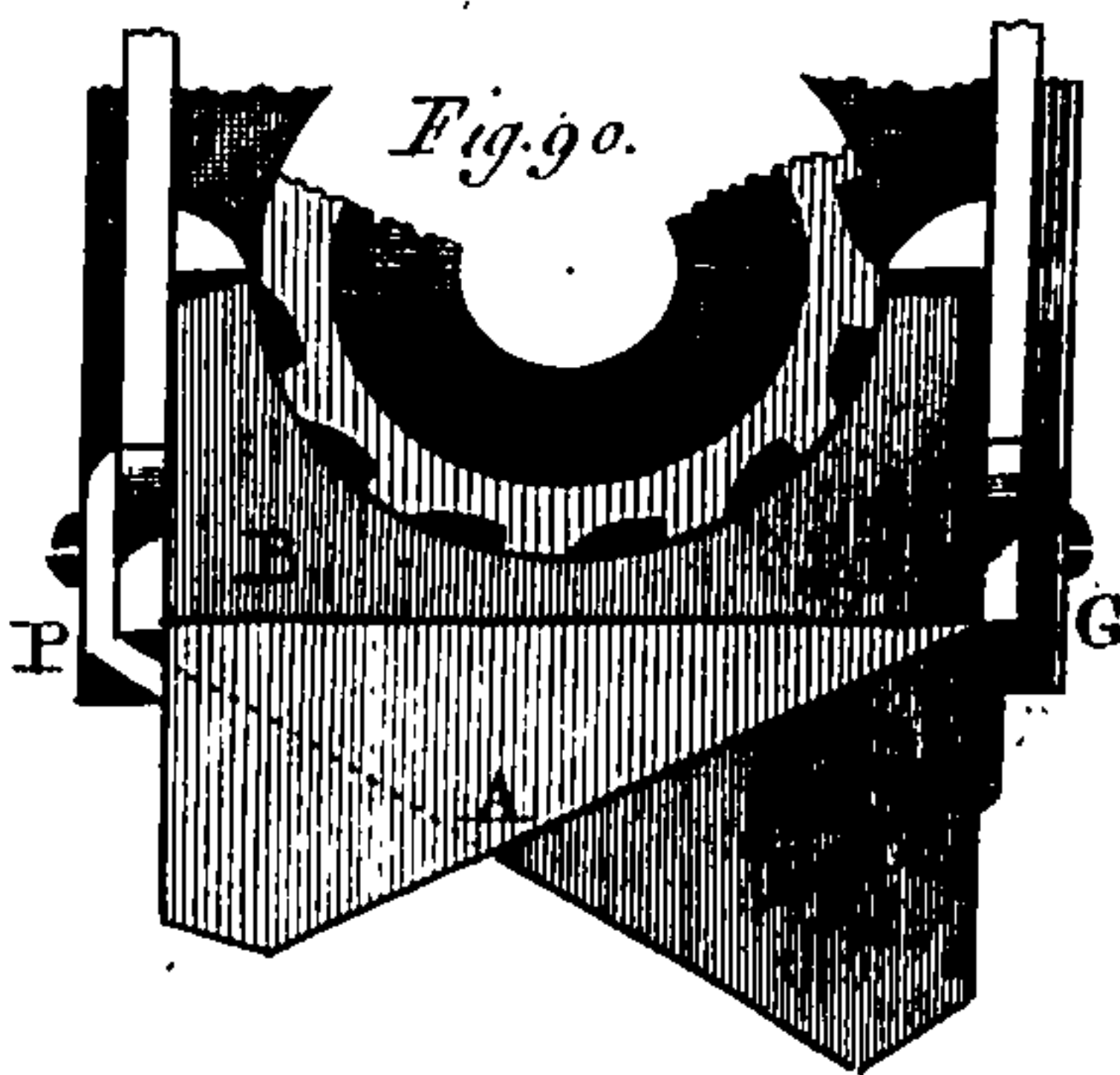
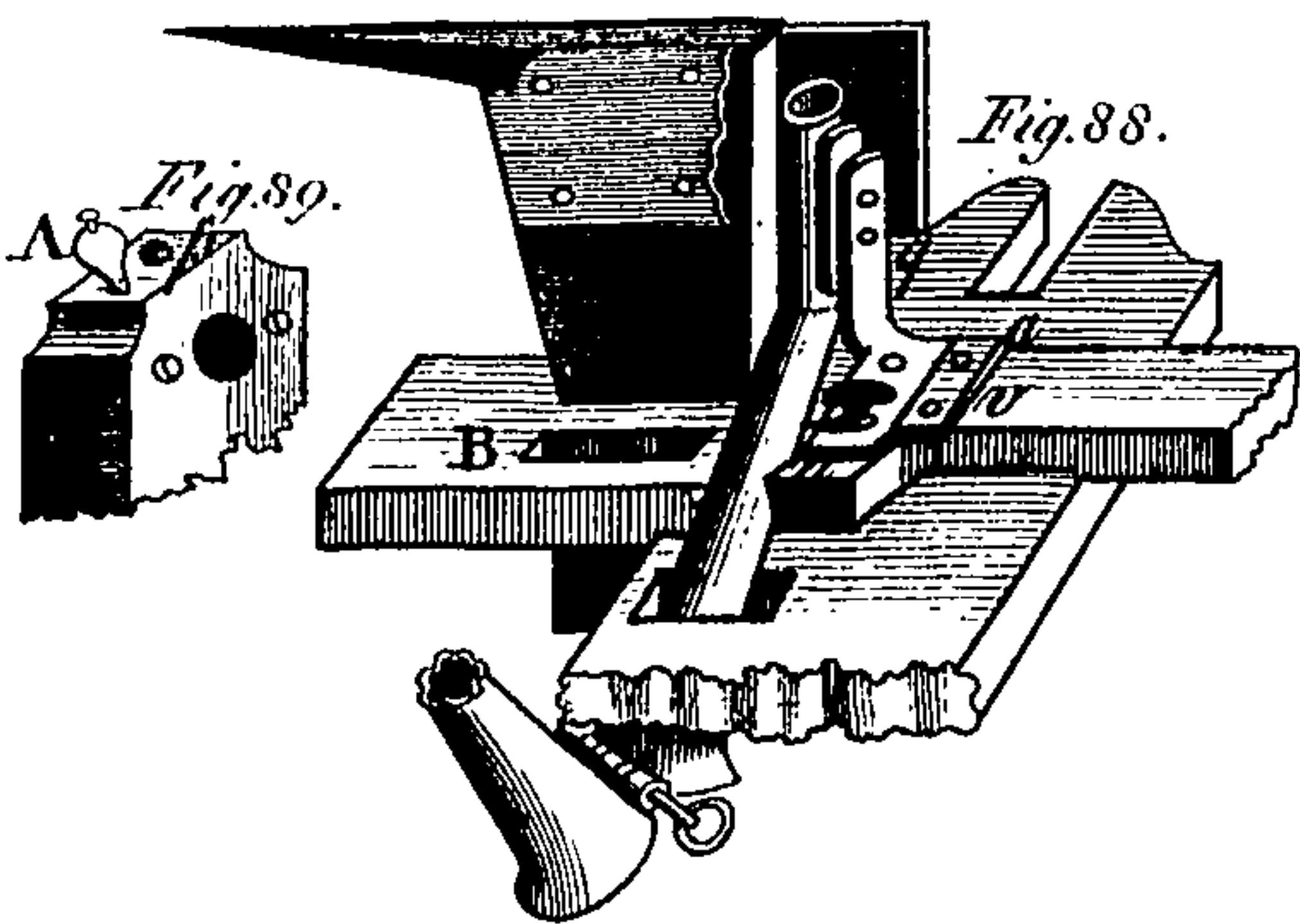
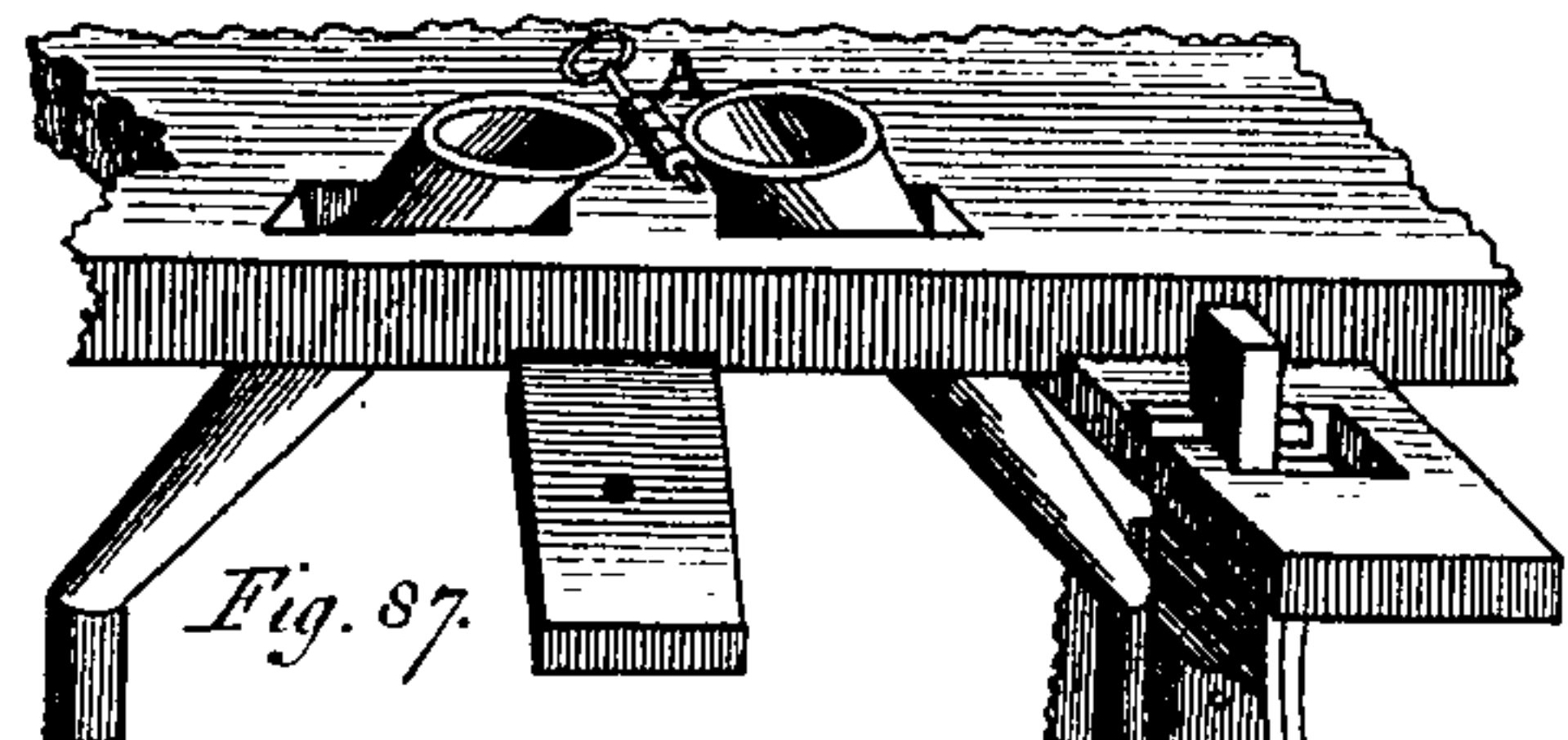
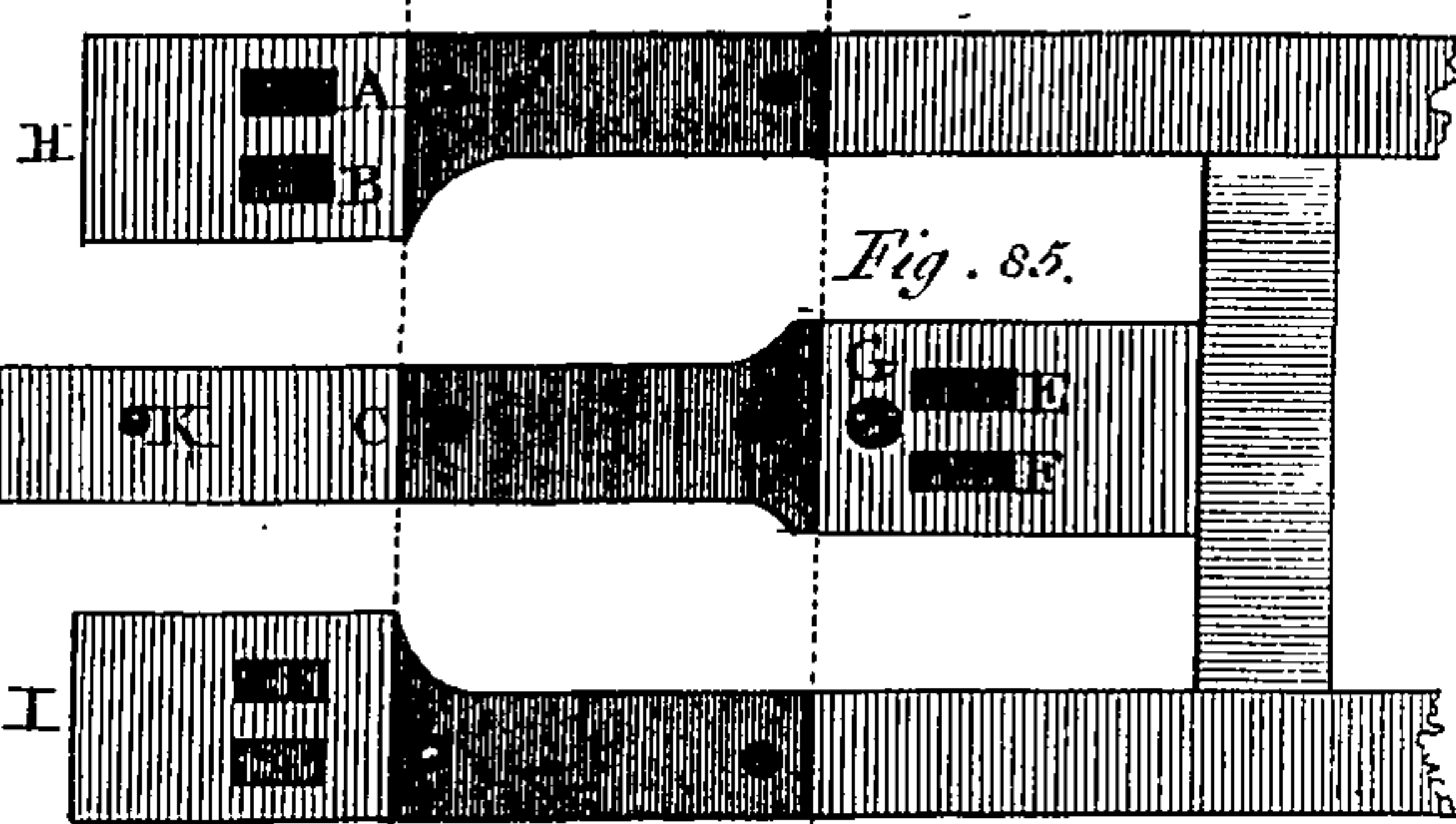
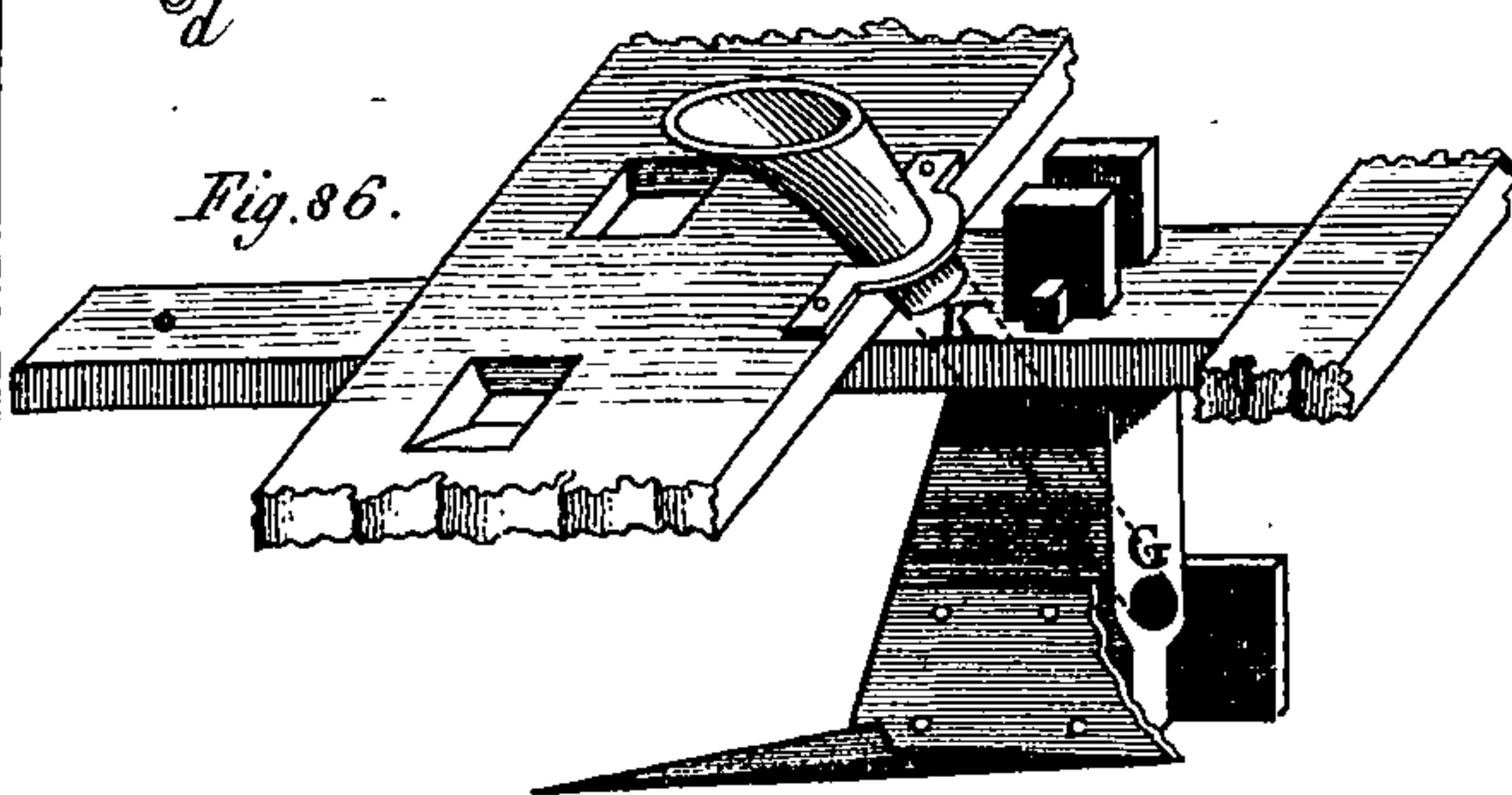
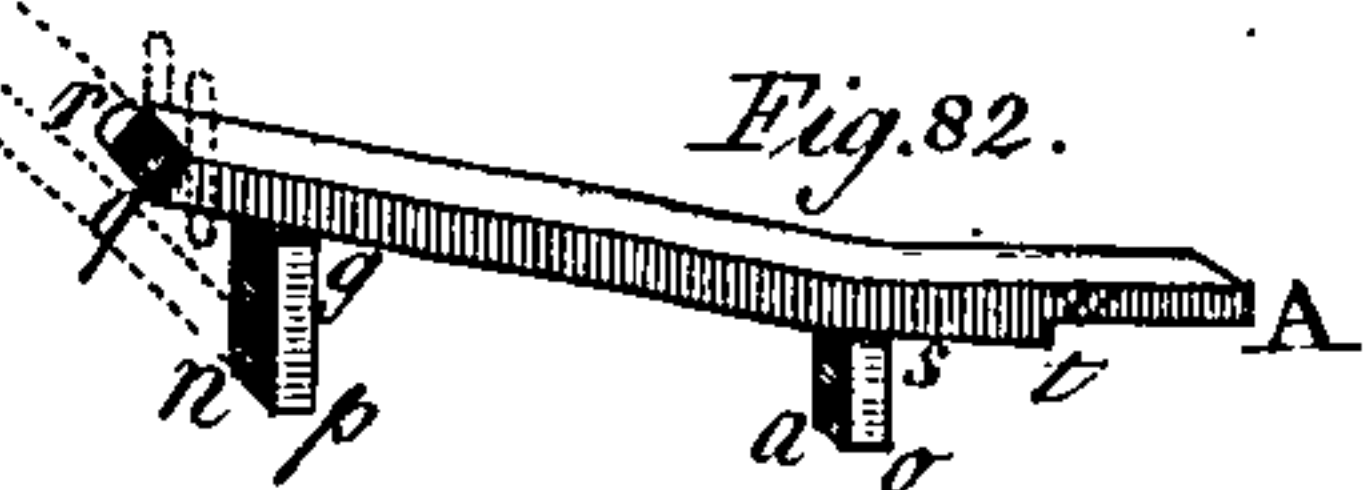
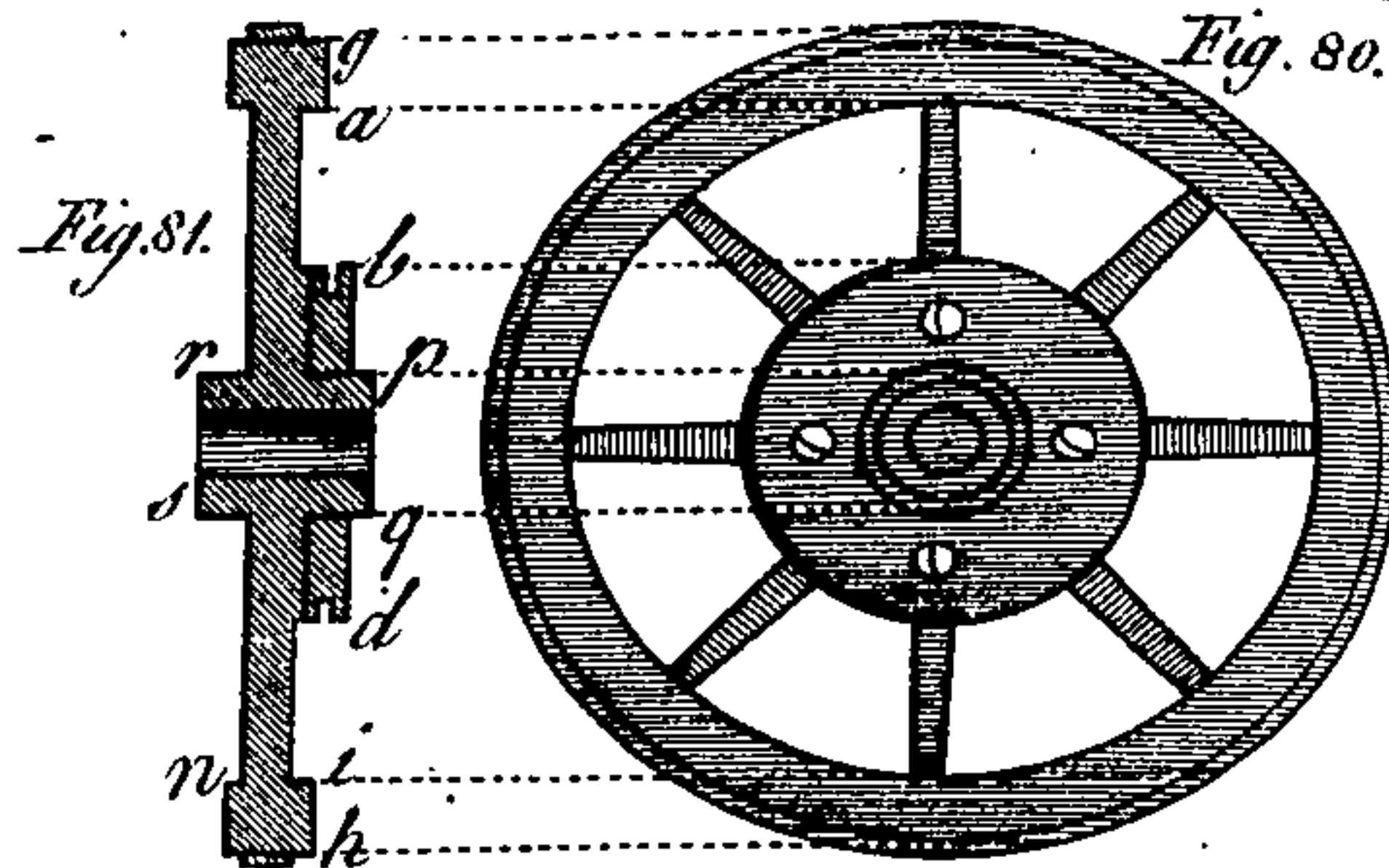
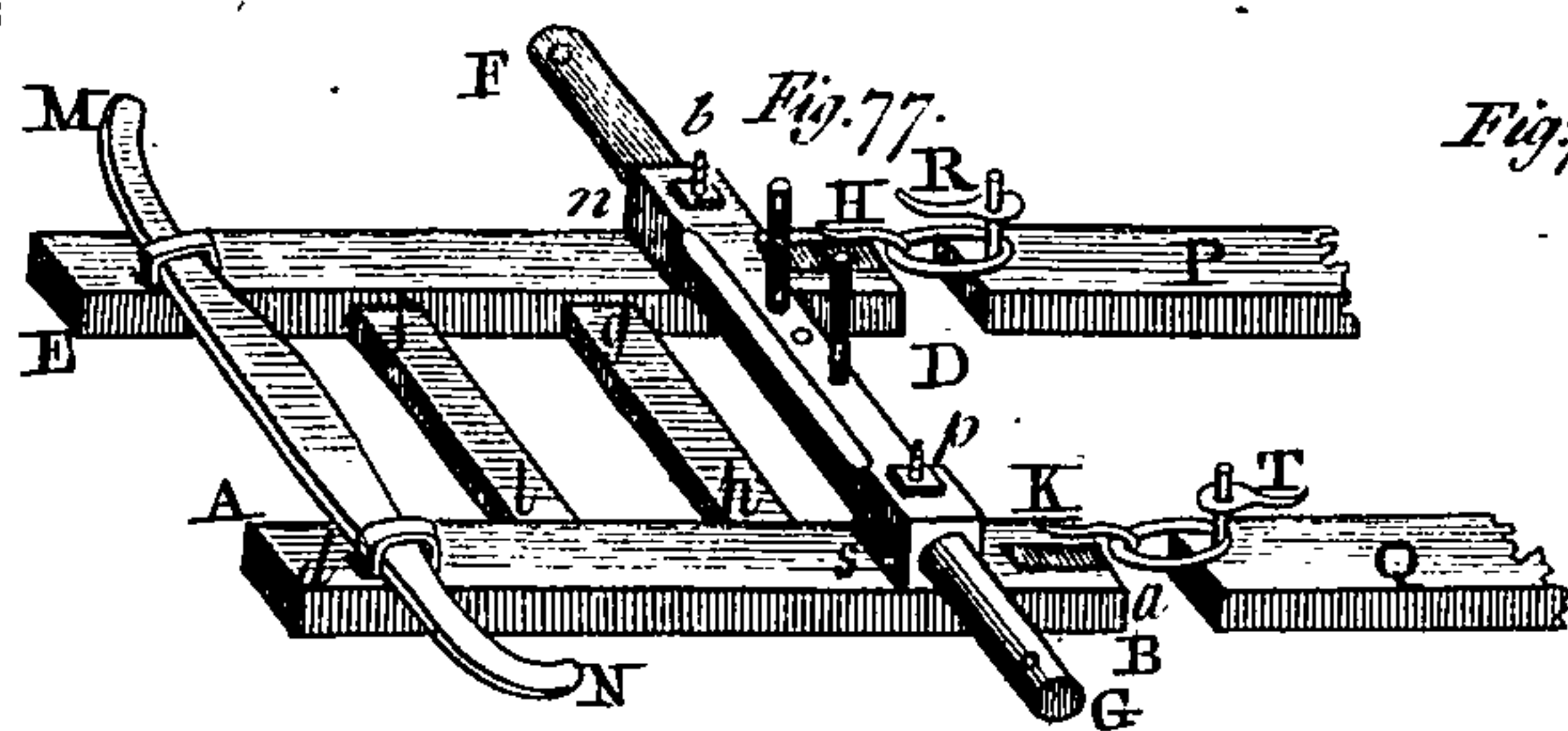
Fig. 67, represents in perspective the hopper which is seen at A in fig. 1, and of which the bottom covers the top of the seed-box. D , (fig. 76.) is the front, and A the right-hand end of the hopper. The boards which form the ends A and B are three quarters of an inch thick; those of the sides D and C are seven-twelfths of an inch thick; and the thickness of the cover is five-twelfths of an inch. The sides and ends, which are at right angles to each other, and to the bottom, are joined together by dove-tail tenons; and the bottom is joined to the ends A and B by tenons which go into mortises in these ends, as may be seen on the line b, g . The four tenons G, H, E, F , enter into the mortises Q, R, S, T , in fig. 24, of which the dimensions have been given. Those dimensions fix the length g, e , or k, d , of the hopper (fig. 76.)

Its breadth from outside to outside, at a, k , or b, g , is seven inches; and its outside depth k, g , or d, e , is eight inches and a half. The height of the legs of the hopper, from the line b, l , where it rests upon the upper surface of the table, to the line b, g , which is the under surface of its bottom, is determined by the distance between the top of the seed-box and the top of the table: it is here eight inches and a sixth. In the middle of the breadth of the two legs, are two openings, N and P , rounded at their top, to let through them the iron axis which bears the cellular cylinder, and keeps the seed-box steady under the hopper. These two openings are seven inches high, and one inch and three quarters wide. The hopper is fastened to the table by two hooks, one of which is seen entire at L, N, M , and part of the other at P, Q . Each of them moves upon the rivet L , just above the opening of the foot, and is bent from thence to N to make room for the passage of the axis; after which it hooks into a ring M and Q , fixed upon the table, but not mentioned before.

Towards D is a square opening, an inch and a half wide, cut immediately above the bottom, and through which the hopper may be emptied. This opening is shut by a small plate of iron or brass, which turns like a latch upon a screw n , which fastens it at that end, whilst the other end r is slipped down to the small piece of brass or iron v, x , which is fastened to the box by a screw at x , in such manner, that the pricked part of the latch, near r , is covered by the end v of this last small piece, which is bent for that purpose, so as not to lie quite close to the box, and the edge r, q of the farther part of the latch rests upon the edge x of this small piece.

Of the Fore-Carriage, Plate XIV.

Fig. 77, is a perspective view of the fore-carriage without its wheels. It is seen with its wheels in fig. 1, Plate X. Fig. 80 represents a geometrical plan of the inside of one of the wheels of the fore-carriage, which is seen at t fig. 1, Plate X. and fig. 81, Plate XIV. represents a section of it. P and Q (fig. 77.) are the two fore ends of the beams, to



to which the fore-carriage is fastened by hooks and rings.

In fig. 77, *a d*, and *D E*, are the two exactly similar pieces which are seen at *S s* and *V r* in fig. 1. Their length *a d*, (fig. 77.) is two feet eight inches; their breadth *d A*, is two inches and two thirds, and their thickness is two inches. They are parallel to each other, and connected by two traverses, *g, h, f, l*, of which the ends are tenons pinned into mortises in the pieces *D E, a d*. These two traverses are omitted in fig. 1, Plate X. in order to render that drawing the more simple. The length of these traverses, exclusive of their tenons, is two feet, their breadth is two inches and a quarter, and their thickness one inch. These two traverses are perpendicular to the two other pieces. Their distance from each other, between the farthest outside edge *g h* of the one fig. 77, and the farthest outside edge *f l* of the other, is seven inches and a half. The edge *g h* is one foot six inches and a third distant from the two ends *B* and *D*.

F G is an axle-tree, of which the middle part *n s* is two inches and seven-twelfths square, and of which the upper angles are cut off as in the drawing. The square shoulders of the two ends *s n*, from whence the spindles proceed, project a very little beyond the outside of the pieces *D E*, and *a d*, in order that the nave of the wheels may not rub against these pieces. The spindles *s G, n F*, are eight inches and a third long, and one inch and five-twelfths in diameter. This axle-tree is placed upon the pieces *D E, a d*, parallel to the traverses *g, h, f, l*, in such manner that the distance from the lines *s n* to the ends *E* and *A*, is a foot and a half. This axle tree is fastened to the two pieces *D E, a d*, by two iron pins and nuts, *b q*, an inch and a sixth square, of which the screw, which is seven-twelfths of an inch in diameter, has a head an inch and a half in diameter, which lies close to the under surface. This screw is represented with its nut in fig. 68. Upon this axle-tree are fixed two wooden pins, five or six inches long, and five-tenths of an inch, or a whole inch in diameter. These pins are perpendicular upon the upper surface of the axle-tree; the space between them is four inches, and this space is in the middle of the length of the axle-tree. This axle-tree is pierced perpendicularly between the two pins, to admit another pin, which will soon be spoken of.

The two wheels, which are placed at *F* and *G*, are exactly alike. Fig. 80, represents the inside of one of these wheels, with a pulley fixed round its nave, and fastened to its spokes by four screws, each of which goes through the pulley and one of the spokes. This pulley is seen in profile at *b d*, (fig. 81.) with two of its screws.

The total diameter, *g h*, of each wheel, exclusive of its iron hoop, is two feet and a half; that of the nave *p q* is four inches and one sixth; that of the pulley *b d* is one foot two inches and a sixth; the thickness of the pulley is an inch and one third; its groove, which is cut down square, is two thirds of an inch wide, and two thirds of three quarters of an inch deep. The length *p r*, or *q s* of the nave, is six inches; the thickness of the wheel at *i n* is an inch and two thirds, and at *i b* two inches and a quarter. Of the four hooks *R, H, T, K*, (fig. 77.) which serve, by means of two rings, to fasten fore-carriage to the ends of the beams *P Q*, the two, *H* and *K*, are fastened in the usual way, by nailing them, at their flat end, upon the two pieces of the fore-carriage: but the other two, *R* and *T*, are shaped like a carpenter's square of which one end is screwed upon the beam, in order to facilitate the putting on or taking off the ring. At *T*, this hook is placed in its proper situation for holding the ring: at *R*, it is turned the other way, that the ring may be taken off easily.

Of the Pieces which support the Drill upon its Fore-carriage Plate XIV.

Fig. 82, represents in perspective a piece of wood which supports the drill upon its fore-carriage, when there is occasion to turn it in sowing. This piece may be called the pole. It is seen at *x x d* in fig. 1, Plate X. Its end *A*, (fig. 82.) enters into the two bridles or belts *g r b* and *a c b*, (fig. 26.) which have been spoken of before, and of which one is seen near *d* in fig. 1. Its other end *q r*, (fig. 82.) rests upon the axle-tree (fig. 77) between the two pins, as is expressed by pricked lines in fig. 82, and as may be seen at *x* in fig. 1.

The breadth *q r*, (fig. 82.) of the lower surface of this piece is an inch and a quarter, throughout its whole length, to its end *A*; and its thickness throughout its whole length *q s* is an inch and a half. Its upper angles are taken off from the end *q r* to *s*; but from *s* to *A*, this piece is shaped like the two bridles or belts into which it is to enter.

Its length from *q* to *s* is one foot seven inches and five sixths; and from *s* to *t*, it is two inches and seven-twelfths. At *t*, the thickness of a quarter of an inch is taken off from its under surface, as at *t v*; and from *v* to *A*, its length is five inches and five-twelfths. It is the length *s A*, that goes into the two belts or bridles *g r b*, and *a c b*, (fig. 26, Plate XI.) and the notch or shoulder *t* is made in order to insert a wedge whenever it is necessary to make the end *q r*, (fig. 82.) rest upon the middle of the axle-tree, in order to convey the drill the more easily to any distant part, without putting it upon its hind-carriage. This wedge saves the seedsmen the trouble of holding up the handles of the drill so high as he would otherwise be obliged to do, to make the end *q r* of this piece (fig. 82.) rest upon the axle-tree. It is by a help of this piece, that the seedsmen, when he comes to the end of each bout of the drill, is enabled very easily to turn it in order to begin another, by lifting the drill up by its handles; for as the end of this piece rests upon the middle of the axle-tree, he makes the drill follow the fore-carriage, which is drawn by a horse; and as the distance, in this case, is but five or six feet, there is no occasion for his making use of the wedge. By this means the drill is turned conveniently, and without any loss of time.

The lines *A v, t, s* are even: but *q s* is inclined at *t s*, and makes with it an angle *t s q* of 166 degrees. *s a* and *g n* are two square pins, fastened by tenons into the middle of the breadth of the under surface *r q s*, perpendicularly to the lower surface *t s*. The pin *s a* is placed near the bending *s*, and the distance between the edges or lines *s a* and *g n*, is fourteen inches and two thirds. The breadth *a o* and *n p* of these pins, is an inch and a quarter: their thickness is two thirds of an inch; the length of *s a* is three inches and a half, and that of *g n* five inches. This pin *g n* is rested against the axle-tree *F G* of fig. 77; and the other, *s a*, (fig. 82.) is placed near the table of the drill. The use of these two pins is only to hinder this piece of wood from slipping out of the two belts before described.

Fig. 83, represents in perspective the piece of wood which supports the drill upon its fore-carriage, when it is placed upon its hind-carriage, in order to be removed from one place to another. This piece neither is, nor can be, seen in fig. 1, which represents the drill in the state of actual sowing, and without its hind-carriage. The end *A*, (fig. 83.) goes into the belts *e f, g h*, (fig. 21.) before described, like which it is shaped; and the end *B*, (fig. 83.) rests upon the axle-tree, (fig. 77.) between the two pins. This part of the axle-tree is covered before and beneath by a slip or hook of iron *B E C*, (fig. 83.) which is nailed under the end of the piece *A B*, as in fig. 84. The axle-tree, the bar, and its hook, are traversed by an iron pin, *D E*, (fig. 83.) and *d e* (fig. 84.) which passes through the hole in the axle-tree, between the two pins, (fig. 77.) The length of this piece, *A B*, (fig. 83) is three feet and four inches: its breadth is two inches and a half, and its thickness is one inch and a third. The pin *F G*, which is suspended here, is put into the ring or bridle *L*, (fig. 22.) and goes through the hole immediately underneath it.

Of the Hind-Carriage.

This hind-carriage is so simple that it would be needless to give a drawing of it. It consists only of two common wheels, unshod with iron, two feet eight or nine inches in diameter, set upon a very simple axle-tree, in the upper surface of which are two holes, into which are put the two pins before-mentioned, which are under the beams of the drill. One of them is seen at *f b*, (fig. 3) and likewise at *Δ*, (fig. 1.) Plate X.

It is necessary to fix, by proper marks, the respective places of the several screws and mortises of the whole machine, in order that when it is taken to pieces and put together again, none of these pieces may be misplaced, or any of the helixes (or spiral lines) which the flat-headed screws have formed in the wood, be spoiled.

It is better to make the teeth of the harrow bend a little more

more than those before described; and represented in fig. 5, Plate X. They should bend so that the point *e* of the tooth may project about four inches beyond the pricked line *f*.

Figures 85 and 86, Plate XIV. compared with Figures 2 and 31, Plate X. and XII.

The mortise A, in fig. 85, is the same as that which is marked Q in fig. 2. But the end of each beam should be made about two inches wider on the inside, and a second mortise B, (fig. 85.) should be cut through it, similar and parallel to the former, and at the distance of five-sixths of an inch, or an inch from it, that the share may be fastened in the one or the other, according as it may be found proper to place the two fore-shares nearer to, or farther from each other, in order to sow the rows closer than they would be by the situation of the mortises Q and R, (fig. 2.) but then the pipes which answer to the back of these two shares should be fastened in the manner which will be explained hereafter.

The middle piece K L, (fig. 2.) should project beyond the table, from C to D, (fig. 85.) about nine inches or a foot, and the belt or bridle L, (fig. 2.) should be suppressed. This same piece should have, in its parts E F, (fig. 85.) nearly the same breadth as the end of the beams H, I; and two mortises, E, F, instead of one, in which the share, thicker than was said before in its upper part, is to be fastened by two tenons and a key. The pipe which terminates behind this share, instead of passing sideways, as in fig. 31, will go straighter and more easily through the hole G, (fig. 85.) which is seen at K, (fig. 86.) and from thence through the thickness of the share, which will be pierced for this purpose from K to G. The sole of this share, from this hole to its bottom, will be of the same thickness as was mentioned before.

Figures 87 and 88, Plate XIV. compared with Figures 29 and 30, Plate XI.

The upper opening, *f d, h o*, (fig. 29.) of the two foremost pipes should be joined by a good hinge A, (fig. 87.) well soldered to them, and of which the pin, ending with a ring at one end, may easily be taken out. By means of this hinge, these two pipes may be set closer together or farther asunder, like the legs of a compass, and be fitted to the different situations of their shares. The fastening of the lower end of these pipes will be nearly the same as was described in fig. 30; with this difference, that instead of bending the square *k i g* of that figure only at *i*, upon its upper surface, and making its part *k i* run lengthways of the beam E F; here fig. 88 is twisted as it were in the bending, in order that the part *s n* may lie across this beam, and lengthways of the table. In this case, if the share A be put into the mortise B, the parts *s n* must be slipped farther, till the hole *s* can be fastened at *n*, by the thumb-screw which is at *n*: and as this part, being held only by a single screw, might be apt to loosen and jog, a piece or slip of iron, *a v*, is permanently fixed at its edge, so as to keep it tight in either of its situations. The screw *n* fastens in a nut sunk into the upper surface of the beam, where this nut is permanently fixed, and covered by the table. There should likewise be two holes in the other part of the square, towards *q*, to serve for the two different situations of the share. The pipes of the shares are more easily made round, as is here represented, than square, as was directed before.

Figure 89, Plate XIV. compared with Figure 35, Plate XI.

Instead of the small groove *n*, (fig. 35.) in the brass cylinder, intended for introducing a little oil to that part, a more simple way will be to bore a perpendicular hole *p*, (fig. 89.) through the head of the standard, down to the spindle; and this hole may be covered by a small plate A, made to turn upon a screw or rivet.

Figures 90, 91, 92, 93, and 94, Plate XIV. compared with Figures 50, and 53, Plate XIII.

As the three pipes or funnels, G, H, M, (fig. 53.) embrace at their upper opening only a small part, *f, t*, (fig. 30.) of the cellular cylinder, some grains may chance to be lost on the side where this cylinder is not covered from *d* to *f*. To prevent this inconvenience, they may be made

so as to embrace the whole lower semi-diameter *d f t*; of the cylinder in the manner represented in fig. 90, 91, 92, 93, 94.

The first funnel, which is seen geometrically at A, B B, (fig. 90.) is represented in perspective, and of a small size, in fig. 93; where its corresponding parts are marked with the same letters, *a, b b*. This is the funnel M of fig. 53. The second large funnel; of which a part appears at D, (fig. 90.) is seen entire and in perspective, in fig. 92, where the same part is marked *d*. This is the funnel H of fig. 53. Two scutcheons *g* and *p* are soldered to this funnel, and fasten it, by screws, to the fore and hind inner surfaces of the box, as at P, G, (fig. 90.) The third funnel, which does not appear in fig. 90, and which is like the first, is represented in fig. 91. This is the funnel G of fig. 53. These three funnels are made separately, of very thin plates of brass, bent, and well soldered; and are afterwards firmly riveted to each other, side to side, as in the perspective, (fig. 94.) They are so tightly joined, that the scutcheons *g p*, (fig. 92 and 93.) are alone sufficient to hold them all in their proper places.

Figures 95 and 96, Plate XVI. compared with Figures 66, Plate XIII.

In the representation of this part in fig. 66, the valve *e f* is actually closed by its spring *a b*, to the cover *d c*, and in this situation it is shut: but when the corn presses against this valve, and forces it into the situation *a b*, (fig. 95.) a grain may jump so as to get between the valve and the cover, and thereby hinder the valve from closing again; so that more corn would continue to run out. To guard against this accident, each valve must have a small tongue *p* immediately below the cover, and the cover must be bent in that place, to receive the tongue when the valves close. Both of these are represented separately in perspective, in fig. 96.

Fig. 97, Plate XIV. compared with Figures 50 and 51, Plate XIII.

Instead of the index *m*, (fig. 50.) and the graduated opening M N, (fig. 51.) an easier and more simple way will be, to fasten the end A of a graduated limb or border of a circle, A B, (fig. 97.) to the bin, in such a manner that its other end B may project through a hole in the front of the brass box. This will mark exactly the situation of the bin.

Figure 98, compared with the Figures 82, 85, Plate XIV. 21, 26, Plate XI.

When the middle piece is lengthened, as at C D, (fig. 85.) there is no occasion for the ring or bridle L, (fig. 2.) and *f k*, (fig. 26.) or for the pieces *s a* and *g n*, (fig. 82.) and then the pole A, of this fig. 82, will pass through the belt A, (fig. 98.) and through another belt B, which last goes round it and the piece D. This belt is fixed by two screws under the piece B D. The pin C, which penetrates into the table, will complete the fixing of this pole. The hole K, (fig. 85.) receives the pin F G (fig. 83.) which goes through the two pieces C D, (fig. 85.) and A B (fig. 83.)

M. de Chateauxvieux's Instructions concerning the Manner of using his DRILL PLOUGH.

This drill is represented in fig. 1, Plate X. with all its parts put together, in a state fit for working. When the thongs which encompass the grooves of the pulleys Q P of the axis in fig. 1, and those of the fore-carriage *u t*, are stretched properly, and the hopper is filled with corn, a horse is to be harnessed to the spring-tree bar, and an intelligent man, who can walk a good pace, should guide this horse, which should be a mild tractable creature.

"The seedsmen will hold the handles of the drill, in order to direct it: and he will warn the guide whenever he deviates from the straight line in which he ought carefully to keep. He will also observe from time to time whether the distribution of the seed is not stopped by some unexpected accident; for he can see the end of the pipes through which the grain should drop; besides which, the corn makes a little noise in passing through the pipes, and he may easily hear it. The seedsmen will take particular care that the

the thongs do not slip out of the grooves of the pullies; and if they do, he will replace them instantly: but this accident is very rare; nor, indeed, does it hardly ever happen, unless the thongs are new, and have not yet been sufficiently stretched. It is proper to observe here, that we have tried hempen ropes, and small iron chains; but thongs of leather are much better than any other thing.

"Care should be taken that the seed-corn be free from grit, dirt, or little stones; for either of these might damage the valves of the bin. If the corn has been steeped in lime-water, as is the practice of some farmers, in hopes of preserving their crops from smut, it must not be sown till it is so dry that the grains will slip easily over one another.

"The seedsmen will be particularly careful to replenish the hopper before it is quite empty.

"He will oil the spindles of the axis once or twice a day; observing, that they require most frequent oiling when the drill works in dry ground, which sends up a very fine dust: and he must cleanse the spindles and the pipes in which they turn, every morning, by rubbing off the old oil, and putting on new. He will also, from time to time, cleanse the spindles of the axle-tree of the fore-carriage, and rub them with soap. If any rain happens to fall during the time of sowing, he must wipe the drill very dry, as soon as he has got it home, and particularly about the axis, to prevent its rusting. It is even highly proper to have a leather covering to put over the table and all the parts upon it, and likewise over the standards, the axis, and the hopper. It is easy to conceive the proper cut of this covering.

"The prudent husbandman should always have with his drill, a small box, containing a hammer, a pair of pincers, a turn-screw, thongs, ropes, nails, iron rings and buckles, a little bottle of oil, and other such like things, in order that, if any of them should be wanted in the field, he may not lose time by being obliged to send home for them.

"The seedsmen will observe, when he is going to sow, not to leave the wedge *t*, (fig. 24, Plate XI.) under the pole, in order that the end *c*, (fig. 1, Plate X.) may not press upon the axle-tree of the fore-carriage. The only use of the pole, at the time of sowing, is to turn the drill when a second bed is to be sown after the first is finished, and so of others. It is easy to conceive, that if this end of the pole should make the drill rest upon the axle-tree, it might often happen, that, by its being thereby too much subjected to the motions of the fore-carriage, the stones or clods which the wheels may meet with, would, by raising them higher than the general surface, throw the shares out of the ground, or at least occasion the furrows to be shallower in those places, things which ought by all means to be avoided.

"We have represented but one spring-tree bar, in fig. 1, because we think a single horse may be used, without any inconvenience, when the ground is not too much loaded with wet: but if the land be too full of water, two horses must be put to the drill, which, in that case, must have a double bar, the manner of ordering which is too well known to need any description. Each horse will then go in a furrow, and they will not poach the bed, as would be the case in wet land, if the drill was drawn by only one horse, whose steps are determined by the middle of the bed.

"For want of horses, oxen may be used, and the sowing may be performed equally well.

"It is proper to observe, that the quantity of seed distributed by the drill is exactly the same, whether the horses or oxen go fast or slow. If, for example, one bed is sown in ten minutes, and twelve or fifteen minutes are employed to sow another, of equal dimensions, neither more or less seed will be dropped in one than in the other; because the revolutions of the cylinder, (fig. 39.) are invariably regulated by those of the wheels of the fore-carriage, whose circumference, be it turned quick or slow, will always describe a line of equal length, and the cylinder turns exactly with these wheels. The only difference that can arise from the greater or less speed of the horse, is the gain or loss of time: but the quantity of seed sown will be constantly the same, so long as the drill remains set in the same manner.

"The greater or less goodness of the soil, its having been well or ill prepared for sowing, its state of dryness or humidity, and several other circumstances which should be carefully attended to, will oblige the husbandman sometimes to vary the quantity of seed. The drill is accordingly made to distribute more or less, by the means before-mentioned,

of placing the bin nearer to, or farther from the cellular cylinder, by turning the screw *L*, (fig. 50, Plate XIII.) By setting the bin farther off, a greater quantity of seed is dropped; and by bringing it nearer, a less proportion is sown. It will be easy to find the proper distance at which to fix it, in order to its giving out exactly the desired quantity of seed.

"Though this method affords a pretty wide latitude, it may sometimes not be sufficient. This is a case which will very seldom happen, and which we have not yet met with; but if it should any time take place, the drill may easily be made to distribute still more or less seed, by changing the pullies of the axis, (fig. 39, Plate XII.) for others of a larger or smaller diameter, which will either accelerate or retard the motion of the axis, in proportion to their size.

"We will suppose, for example, that the pullies are but of half the diameter of those before described. It is evident that these smaller pullies will make the axis turn round twice, where it turned but once with the former, and that double the quantity of seed will consequently be dropped on the same length of ground. By the same rule, pullies twice as large, will turn the axis but half the number of times, and but half the quantity of seed will of course be let fall in the same space. The proportion of the seed sown may likewise be increased or diminished by a greater or less number of cavities in the cellular cylinder; and the changing of this cylinder is soon and easily performed: but, as was said before, there will very seldom be any occasion for these alterations.

"The furrows opened by the shares of the drill, and in which the seeds are deposited, should be of different depths, in different cases; and this may be effected by means of the rings which fasten the drill to its fore-carriage at the hooks *R H*, *T K*, (fig. 77, Plate XIV.) For general use, the diameter of about three inches, from inside to inside, will be sufficient for these rings, and then the furrows are made about three or four inches deep. They will be opened deeper by using rings, about four inches in diameter; and it is immaterial whether they are round or oval. With smaller rings, the furrows will be made shallower; and their depth may also be diminished, by making the horse draw with longer traces, or by using a lower horse.

"If very shallow furrows are wanted, or only just the surface of the ground is intended to be opened, the wedge *t*, (fig. 24.) must be put under the pole. In short, a little practice will soon shew the husbandman how to manage this drill in every respect, and make him thoroughly acquainted with all that is necessary to be known in regard to the distribution and proper covering of the seed, which last part is perfectly well performed by the teeth of the annexed harrow.

"If any thing should still seem obscure to those who have read attentively, and studied the description of each part of this drill, let them but set actually to work, and their ideas of it will soon be perfectly clear. Each part taken separately, may be made with great ease: their sizes, shapes, and proportions, are pointed out in such manner, that no workman of common understanding can mistake; and when the parts are constructed, there can be no difficulty in putting them together, if the foregoing directions are but observed.

Description of a Harness to yoke Oxen one before another, Plate XIV.

"The utility of being able to put oxen to this drill, in such manner as to make them go one before another in the furrow, without treading upon the places which are to receive the seed, first put me upon contriving a harness proper for these cattle: for I was not satisfied with those I had seen in different countries. Two of my teams of oxen, harnessed in my new manner, have worked the whole year; several persons have adopted the method; and I am more and more pleased with it. The harness is very simple, and very light, and does not subject the oxen to any irksome confinement.

"Fig. 99 and 100, represent the whole of this harness, that is to say, its plan and a view of it. Fig. 99 shews it to be composed of a yoke *A*, which the ox bears upon his head, and which is there fastened to his horns by long thongs. The rest of the harness is of leather. The piece *B*, is the principal part, and that by which the ox is to draw

draw. It rests against his neck, a little below the withers, and sits extremely close to the neck when the ox draws. If it is made of double leather, there is no occasion for the piece of leather D, which serves only to strengthen it when it is single. The thong C fastens in the buckle Q R, which is fixed to the yoke by another thong. The use of these is to hinder the large piece of leather B, from rising above the withers, when the ox tosses his head, or raises his neck. Care should be taken not to stretch the thong C too much, for the ox must not draw by it.

"The thong E E, with their buckles to lengthen or shorten them, serve to make the oxen draw by the yoke, by putting them through the large iron buckles F F, and the leather buckles G G, which must be nailed to the yoke. The length of these thongs is suited to the purpose for which they are intended.

"My traces are made of ropes, and I find them convenient. At one end of them is part of a leathern trace, about fifteen inches long, like the end of the harness of a coach horse. This end is put through the large buckles F F, where it is fastened by the tongue a a: so that the trace may easily be shortened or lengthened."

The best sort of harness for oxen, is the same that is used for horses. In this manner, the oxen are enabled to exert their strength to much more advantage, than in yokes, and bows, as has been proved by experience; and that two oxen can, in harness, perform as much work as three of the same strength in yokes. They are not so speedy as horses, and therefore not so proper for harrowing, and other business that requires a quick motion: but for a hard steady draught, and in harness, will do their work as well as horses, allowing them some more time.

DRILL-RAKE, an instrument invented by M. Vandusfel, for drilling pease, &c.

This instrument is chiefly calculated for light grounds, in small inclosures, not exceeding four or five acres. It is a sort of strong plough-rake, with four large teeth at a a, b b, (Plate XV. fig. 1.) a little incurvated, as represented in the figure. The distance from a to a, and b to b, is nine inches. The space, or interval, between the two inner teeth, a and b, is three feet six inches, which is sufficient room for the cultivator or hoe-plough to move in, if conducted with care, before the pease have branched much. To the piece of timber c c, forming the head of the rake, are fixed the handles d, and the beam e, to which the horse is fastened.

It is evident, that when this instrument is drawn over a piece of land made thoroughly fine, and the man who holds it bears upon the handles more or less according to his discretion, four channels or small furrows f, g, h, i, will be formed; that the distance between the furrows h i, and f g, will be nine inches: and that the interval e, or space contained between the furrows g, h, will be three feet and a half. It is also evident, that these distances may be preserved with great truth, provided the teeth a, a, return (when the ploughman comes back, after having ploughed one turn, or a bout, as they call it) in two of the channels formed before, marked b b; so that though he cuts four drills at the first bout, yet, in effect, he only forms two drills each turn, because there are always two drills to be passed over twice, or re-ploughed, being, in fact, not much more than guides, or marks of directions. Yet even this small work of supererogation repays itself, because it makes the drills more open, distinct, and clear.

If the first four channels, formed at one motion by this instrument, are straight and true, all the lines in the field will partake of the same regularity. It will therefore be proper to mark out this first trace of the drill-rake by exact measurement, fixing into the ground, at every distance of ten feet, little flat sticks, labelled with paper; which being finished, the rest may be left to the ploughman.

When the ground-plot of an acre is thus formed into drills (which may be completed in four hours, by one ploughman, a horse, and a boy to lead the horse) you must send two or three women and children into the field in order to sprain the pease, or scatter them by a single motion of the hands; at a certain distance one from another, into the channels. Use no harrow, which will be apt to draw the seeds out of the lines; but cover them with the flat part of the head of a hand-rake, and press them down gently.

The great excellence of this drill-rake consists in its simplicity; for after the measurement of the parts is once

laid down, the meanest carpenter and smith in England can either make or repair it; and if the first four inches formed by it are true, the rest of the lines or rows must be geometrically exact, which is an elegance none can feel, but such as take delight in correct husbandry. *Essays in Husbandry, Essay II. p. 212.*

DRILL-ROLLER. The late lord Orford put in many acres of barley, pease, &c. with a machine not long invented in Norfolk, which has done much work so well, that many have been made, and are highly approved. It is a roller about seven feet long, around which are cutting wheels of cast iron, that turn round each independently of the others, around one common cylinder, weighing about a ton. It is drawn by four horses; the cutting wheels being moveable, may be fixed at any distance, by means of washers; but the most common and favourite distance is four inches. I enquired, but in vain, for the inventor of this machine: it was improved by a Mr. Sillis, at Hertford Bridges, near Norwich.

The mode of working it is this: a layer being ploughed which the owner intends for setting or dibbling, this roller is used to save the expence. It is drawn across the furrows, and cuts the whole field into little drills, four inches asunder; the seed is then sown broad-cast in the common quantity, and the land bush-harrowed; by which means the seed is deposited at one equal depth, as in drilling; that depth a better one than in setting, and the crop rises free from the furrow-seams, which are the ill effects of common broad-cast sowing on a lay, ploughed once. Lord Orford's crops, sown with this roller, I viewed with great pleasure: they are perfectly regular, and of a beautiful appearance. This machine promises to banish dibbling. *Young's Annals, vol. XII.*

DRINKING CISTERN. In his Rural Economy of the Midland Counties, Mr. Marshall makes the following observation:

"In an open yard, belonging to one of the first managers of the district, I saw a drinking-cistern on an admirable plan. It is formed by a watertight wall, raised high enough above ground, to prevent the cattle from stepping into it, and low enough to let them drink freely. The brick-work, which forms a cistern about four feet square, is guarded by a post at each corner, with rails passing from post to post, over which rails the cattle drink. It is fed by a covered pipe (of pipe bricks) reaching to a large drinking-pool, at some distance from the yard; so that while this is full (which it is in winter) the cistern is so likewise to the brim. If it overflow, (which it generally does at that season) a waste-water pipe conveys the surplus out of the yard.

"Cisterns of this kind, when they can be formed at an easy expence, are much preferable to pits, in farm-yards."

DRINKING-POOLS. Mr. Marshall, in his Rural Economy of Norfolk, says, "In this country there are three species of artificial drinking-places:

- "Standing pools,
- "Artificial rills,
- "Field wells.

"**STANDING POOLS**, or the art of pond-making, ranks among the most useful arts in Rural Economy. In many high situations, no other expedient can be practised with propriety: rills cannot be raised, nor wells sunk and worked, but at too great an expence for the purpose of watering stock.

"On the hills of Surry and Kent, ponds are made to hold water tolerably well with chalk beaten firmly together.

"Experiments have, it is said, been tried with chalk upon the Yorkshire Wolds without success; owing, probably, to the too great hardness of the Wold-chalk. A soft chalk is no doubt fittest for this purpose.

"In Norfolk, I apprehend, they have been formerly made with marl. In all countries where unfathomed beds of clay are common, drinking-pools sufficiently retentive, may, at a small expence and without much art, be formed, and are in general sufficiently abundant.

"But the art of making retentive pools with clay, in loose absorbent soils, is a recent discovery which has been hit upon in this district; in which it has made a rapid progress, and is now in universal practice among farmers of every class. Indeed, for a country like this, where upland soil is kept principally in grass, it may well be considered as the most valuable discovery which has lately been made in rural economy.

"Francis and Robert Gardiner, well-diggers and fish-pond makers, of Driffeld, are entitled to much more than the credit of this discovery. The York Agriculture Society voted them a premium of ten pounds: were the nation to grant them ten thousand, it would not be more than they merit."

DRONE, the male bee, one that makes no honey. See the article **BEES**.

DROPSY, a disease incident to horses, and generally called the water-farcy. See **WATER-FARCY**.

DROPWORT, the name of a perennial weed common in pasture lands, having winged leaves; the divisions of which are all regular, and sharply indented about the edges. The flowers are white, growing in a bunch like an umbel. Its roots are very remarkable, consisting of a bunch of knobs hanging upon threads: from whence it has the name of filipendula, and dropwort. The flowers have an agreeable smell.

DROUGHT, dry weather, want of rain. It also signifies thirst, or want of drink.

DUB, a pool, or pond of water.

DUCK, the name of a well-known fowl, very necessary for the husbandman's yard, as they require no charge in keeping; for they live on lost corn, snails, &c. for which reason they are very proper for gardens. Once in the year they lay a great number of eggs, especially a sort of duck which turns up its bill more than the common kind. When they sit, they require no attendance except they have a little barley or offal corn near them, that they may not straggle far from their nests to chill their eggs. They are reckoned to be better hatched under a hen than a duck; because while they are young, the hen will not lead them so often into the water. Some reckon it very proper to cut off the feathers from their rumps; because when their tails are wet, it often occasions their drowning. As to the fattening of them, you may do it in three weeks time, by giving them any kind of corn or grain, and plenty of water. Ground malt, wet either with milk or water, is best. *Mortimer's Husbandry*, vol. I. p. 257.

DUN, a colour partaking of brown and black.

DUNG, the excrements of animals, putrefied vegetables, &c. used in improving land.

Dungs are intended either to repair the decay of exhausted worn-out lands, or to cure the defects of other soils, which are as various in their qualities, as the dungs used to meliorate or restore them. Some lands are too cold, moist, and heavy; whilst others are too light and dry. To answer this, some dungs are hot and light, as that of horses, sheep, pigeons, &c. Others again are fat and cooling, as that of oxen, cows, hogs, &c. And as the remedies which are used, must be contrary to the distempers they are to cure, so the dung of oxen, cows, and hogs, should be applied to lean, dry, light earths, to make them fatter and closer; and hot and dry dungs to cold, moist, and heavy lands.

Dung has two peculiar properties. The one is to fatten the earth, and render it more fruitful; and the other, to produce a certain sensible heat, capable of causing some considerable effect; which last is seldom found but in the dung of horses and mules, while it is newly made, and a little moist.

Horse-dung, the least fat of any, is the most fiery, if taken fresh as it falls, and the most apt to excite a sudden fermentation; for which reason it is then fit only for the hot-bed. When this heat is past, it may be spread on fields where we would have a rank grass to spring: but it should not by any means be admitted into the garden, or where we would wish to have good roots, unless the ground be very stiff, cold, or wet, and then too it should be well rotted, lest instead of correcting the soil, it leaves couch, and other pernicious weeds, worse than the disease itself; the seeds of hay, and of other plants, which horses eat, coming oftentimes entire from them: for those vegetables which cattle chiefly eat, commonly spring up from their dung; as long knot grass from this beast; short, clean, and sweet pasture from sheep and cows; the sow-thistle from swine. Ground mucked with horse-dung is always the most infected of any; and if it be not perfectly consumed, it makes your roots grow forked, fills them with worms, and gives them an unpleasant relish: but if laid on at the beginning of winter, and turned in at spring, it succeeds sometimes with pulse.

Horse-dung is greatly improved by being mixed with its opposite, cow-dung, which is cold and fat; and this mix-

ture is considerably meliorated if mixed with a proper earth, with mud, or with ashes and urine. Cow-dung alone is the worst of all dungs to endure wet, because it is the most easily dissolved. But either of these dungs, either singly, or mixed as above, should not be used till it is old; nor should it be laid abroad, exposed to the sun and wind, as is the practice of several injudicious farmers, who let it lie spread on their field-lands during three or four of the summer months, till the sun and air have exhausted all its virtue: whereas, if it be laid in heaps, mixed with earth, and left in that state till it be rotten, it will be the sooner brought to a proper temper, will produce a sweeter grass when laid on pasture grounds, and will go much farther than in the common way when spread before the plough for corn, of which it will then greatly promote the growth.

Mr. Miller says he has frequently seen new horse-dung buried as it came from the stable in very cold, moist land, and always observed that the crops have succeeded better than where the ground was dressed with very rotten dung.

Sheeps-dung and deers dung are nearly of the same quality, and are generally esteemed the best of all dungs for cold clays. Some recommend beating them into powder, and spreading them very thin over autumn or spring crops, about four or five bushels to an acre, in the same manner as ashes, malt-dust, &c. are strewed. But this light dressing does not last long. The most common way of conveying it upon the land is by folding of the sheep themselves upon it, by which means their urine is saved as well as their dung, which ought to be turned in with the plough as soon as possible, that it may not lie exposed to the heat of the sun. In Northamptonshire, they think it best to fold sheep after July, and to fold them the latest upon dry land. In some parts of France, where they likewise fold their cows and oxen, the place of folding is changed twice every night. In Flanders, they house their sheep at night in places spread with clean sand, about five or six inches thick, which being laid on fresh every night, is cleared out once a week. This mixture of sand and dung makes an excellent dressing for strong land; for the dung and urine of the sheep is a very rich manure. M. Quintinie thinks it the greatest promoter of fruitfulness in all sorts of ground. This method of folding sheep in a covered fold, and of mixing their dung with earth, sand, &c. according to the nature of the soil it is intended for, is likewise, very properly recommended by Mr. Mortimer; who adds, that he has known vast crops of rye upon barren lands that have been old warrens, well dunged by rabbits; and large oak and ash upon the same, though the soil was very shallow.

Next to sheeps-dung, the preference is generally given to that of swine, one load of which will go as far as two loads of other dung. The laying it on too thick may perhaps have occasioned the old mistaken notion of its breeding more weeds than any other dung: for all dungs will make weeds shoot up: whether they contain within themselves seeds of those plants, not so thoroughly digested by the animal as to be deprived of their vegetative power, as may sometimes be the case, or by the additional fertility which they communicate to the earth. This dung is best when carried from the sty directly to the field, where it is a rich manure both for corn and grass, especially the latter, and for almost any sort of land. Hot sands and gravel are particularly benefited by it; and it is reckoned a very great fertiliser of fruit-trees. Many good husbandmen prefer this dung before most ordinary sorts of manure, and to take great care not only to have their hog-yards well paved and paved with pebble, or other stones, or with chalk, which is much the best; but also to increase the quantity of the dung as much as they can, by throwing into the sty all the straw, fruit, roots, beans, plants, weeds, &c. which are the refuse of the garden, with the offals of the kitchen, and every kind of trash; all which is not only very good for the hogs, themselves, but increases their dung to such a degree, that ten or twelve swine have yielded sixty or eighty loads of excellent manure in a year. Some notable farmers will make their hog yard produce them an annual profit of twenty or thirty pounds. Mr. Worlidge thinks this the best of dungs to prevent or cure the canker in trees; and Mr. Mortimer esteems it best for manure, when mixed with horse-dung: for which reason he advises placing the hog-sty as near the horse dung-hill as can conveniently be. The farmers in Staffordshire frequently sow on poor light shallow land, a small white pea, which they never reap, but turn in as many hogs as they think the crop will fatten, and let them lie upon it day and night. The dung

and urine of these animals enrich the land so much, that it soon acquires a thick sward, and continues to be good grazing ground for several years.

In this light, of reaping a double advantage from the manuring of land, the author of the new System of Agriculture advises husbandmen to sow ten or fifteen acres of their ground with turnip-feed, a little before they sow clover, which he thinks is best done in September: then, towards the beginning of March, to take the best opportunity to buy three hundred sows, all such as will farrow in about a month. Let little sties, formed of boughs and reeds, be made for them in the most convenient parts of the clover ground, either in the corners, or under the hedges of these fields; and let the sows be kept up, and fed daily with the turnips which were sowed the autumn before. At first, it will be necessary to take the trouble of boiling them, tops and all, and of giving them in the troughs with the water not yet cold: they may afterwards be only scalded; and in a week or ten days the swine will eat them raw, with the greatest greediness and pleasure. In the beginning, or towards the middle of April, these sows will farrow: after which they must not be fed with turnips any longer than till the clover is pretty high, when they and their pigs may be turned in among it. It is impossible for one who had not seen it, to imagine how eagerly the swine will graze on clover, which increases their milk to such a degree, that the pigs shoot forward at a double rate, and as they leave off sucking, they too take to feeding on the clover, by which they prosper so fast, that by the end of October, every pig will fetch twenty or five and twenty shillings, in any market. The treading of great cattle is apt to break the stalk of clover grass, and they spoil, by trampling it down, a much greater quantity than they eat; but swine are never hurtful this way; and if there be any fear of their rooting up the ground, that may be easily prevented by a ring in their noses; though our author says, he never knew a hog break up an inch of clover. They graze upon it with more pleasure than they could root.

Human ordure is a very fat and hot manure, full of fertilizing salts, and therefore extremely proper for all cold four soils, especially if it be mixed with other dung, straw, or earth, to give it a fermentation, and render it convenient for carriage. Some do not like to use it on account of its bad smell; and others imagine that it gives a fetid taste to plants; but in this they seem to carry their delicacy rather too far. It is used with great success in many parts of France, all over Flanders, and, I believe, not less profitably round about London. Mr. Bradley says, it is kept in pits, made on purpose, in foreign countries, till it be one, two, three, or four years old: that of four years old is accounted the best; that of three years tolerable; but the others not so fit for use; and that the persons concerned in these pits pay great regard to the place from whence they have it, preferring that which comes from towns where the most flesh is eaten, as the strongest and richest manure. It certainly should not be laid on too new, nor in too great quantities, because it is of a very hot nature, but when that heat is tempered by age, putrefaction, and a due mixture with other soils, it becomes a rich and excellent manure. Perhaps it may owe great part of this richness to the urine with which it is mixed; for though human urine be destructive to vegetables, whilst it is new, by reason of its burning sal-ammoniacal spirit, as Glauber terms it, yet, as in many other moist things, subject to putrefaction, time will correct that defect, digest the urine, take off its fiery quality, and so alter its nature, as to render it an extraordinary fertiliser of every kind of soil. Columella certifies, that old urine is excellent for the roots of trees. Mr. Hartlib commends the Dutch for preserving the urine of cows as carefully as they do the dung, to enrich their lands, and instances a woman he knew near Canterbury, who saved, in a pail, all the urine she could; and when the pail was full, sprinkled it on her meadow, the grass of which looked yellow at first, but afterwards grew surprisingly. Similar to this is what Mr. Bradley relates, as of his own knowledge. Human urine was thrown into a little pit constantly every day, for three or four years. Two years after some earth was taken out of this pit, and mixed with twice as much other earth, to fill up a hollow place in a grass walk. The turf which was laid upon this spot, grew so largely and vigorously, besides being much greener than the rest, that by the best computation he could make, its grass, in a month's time, was above four times as much in quantity as that of any other

spot of the same size, though the whole walk was laid on very rich ground. The author of the English Improver is therefore very right in saying, that human urine is of great worth, and will fatten land more than is generally imagined by our farmers, whom he advises to take all opportunities of preserving this, and every sort of urine for their ground, as carefully as is done in Holland.

The dung of all poultry is of a very hot nature, full of volatile salts, and therefore extremely proper for cold lands, being light of carriage, and a little of it going a great way. It is most commonly used for distant grounds, where it is sprinkled on wheat or barley, after they are come up, or upon the latter at the time of sowing. Mr. Mortimer thinks forty bushels sufficient for an acre. It is used to most advantage when dried and powdered, and is very efficacious in keeping frost out of the earth. Its effects are sudden, but they do not last long. Hens dung is very rich, though not so hot as pigeons dung, nor is it so easy to sow, because it hangs more together, neither can it be so easily collected. The opinion that goose dung is rather hurtful than beneficial to corn or grass, is an ancient error, as is proved by Mr. Worlidge, who says, he was credibly informed that a flock of geese having made a track across a field of wheat during the winter, and nibbed the corn clear from the ground in their daily passage in such a manner, that the wheat upon it proved the next year much finer than any other part of the field. He also mentioned a field which had been given to the town of Sutton in Northamptonshire, for feeding geese, whose dung rendered it one of the richest pastures he ever saw, inasmuch that all sorts of cattle fed on it very greedily; nor could we hear from any of the inhabitants, that so much as one beast received the least injury from it. He adds, that his own horses, kept in a piece of pasture on which geese lay very much, eat the grass barest where the fowls had dunged most, and that he never found it do them any hurt, except making them too fat.

Perhaps the reason why the dung of geese has been said to occasion barrenness, flowed from observations where it had been laid too thick; for being of a hot fiery nature, it will, if laid on in too large quantities, destroy the grass; but if spread thin in the winter, it will prove a very rich and valuable manure, especially if mixed with cooling earth, and left for some time to putrefy.

DUNG-HILLS, heaps of dung collected in the yard, and other places, belonging to a farm.

They are made up of the dung of different animals, of different kinds of straw, and other vegetable substances; and they have frequently different animal substances in their compositions. See MANURE.

Compost, or compound dunghills, are a collection of different matters, as earth, mixed with dung from an ordinary dunghill, lime, and other manure.

Some persons make dung-hills of this kind, and are of opinion, that the dung and other manures with which they are compounded, are thereby made to enrich a greater quantity of land, than if not mixed with earth; and besides, do not produce the bad effects which sometimes are produced by dung, when taken directly from a dung-hill, and laid upon land.

It will not be amiss that we enquire into the advantages of this kind of dunghill, which will be a means not only of recommending them, but also of pointing out the most proper method of constructing them.

The first thing to be enquired into, is the advantage arising from the mixing lime, marle, or other manures, with the earth and dung. Lime, as it is a dissolver of all vegetable and animal substances, when mixed with dung, will help to dissolve it; and as it communicates an absorbent power to earth, will enable the earth with which it is mixed to attract the vegetable food in greater plenty from the air. But in order to make it produce these effects, it is necessary to mix it with dung and earth: for if the lime is laid in a kind of stratum above the dung, and below the earth, it will absorb the water that falls upon the dung-hill, and thereby will prevent the dung from receiving a sufficient quantity of water to make it putrefy; and will also occasion such a heat as to burn the dung, and render it useless; and besides, can have but little influence in dissolving the dung, and communicating to the earth its absorbent quality. If the lime is laid above the earth and exposed to the air, it will be attended with the same consequences: it will absorb the water; and though it will attract the vegetable food from the air, yet will be of no more use for this end, than if spread upon

as much land as the surface of the dung-hill extends to.

The same thing may be said of marle, if used instead of lime; but if marle is used instead of earth, it is probable that the compost will become very rich; as the marle has a very strong absorbent quality; and would be greatly exposed to the influence of the air. A much smaller quantity than is used in the ordinary way, it is probable, would be found sufficient, and its effects would be sooner discovered. If this is tried, it will be necessary to carry the dung to the marle-pit, and there form the dung-hill; for marle is so heavy a body; that it would be too expensive to carry it first to the dung-hill; and then to the field.

The advantage of mixing dung with the earth is next to be considered. This, it is probable, is the principal advantage of the compound dung-hills, and that the advantages arising from lime are but trifling. They are often made without lime, and their effects, it is said, are equally good.

Dung, in the ordinary dung-hills, has its vegetable food sometimes washed away by rain, when it falls in large quantities. Now this is prevented by the earth in the compound dung-hill, which absorbs the water, and all the vegetable food which it carries from the dung.

It is very bad management to suffer the water which falls immediately upon dung, to drain from it wastefully; but infamous, to suffer that which is extraneous to drain through it; though the latter is too frequently the practice.

In the ordinary dung-hills, the dung on the surface, it is generally supposed, loses a part of its vegetable food, which is exhaled by the sun, or carried off by the wind. This is prevented by covering the dung with earth in the compound dung-hill.

But it is probable, that the compound dung-hill receives its principal advantage from the earth being exposed to the influence of the air; and if this be true, the more absorbent that the earth is which is used, and the larger that the surface of the dung-hill is, in proportion to its bulk, and the quantity of dung contained, it will be the richer.

This directs us to the proper method of constructing it, to make it long and narrow, with as many divisions in it as can be made conveniently; for thereby a larger surface is exposed in the same quantity, and the more vegetable food acquired.

Mr. Marshall recommends dung-hills to be made not less than 14, nor more than 18 feet wide, as this size will admit room for two men behind, and one on each side. If it is narrower, the men at the wheels have not sufficient employment; if it is wider they have too much, nor can they reach the cart without moving their feet; and making a step takes up as much time as throwing in a shovel-full of compost. The sides of a dung-hill should not be upright, nor too high, that the men may stand on the steps to fill. Perhaps one rod wide, and a quarter of a rod high, when settled, is the best form of a dunghill.

It is proper to observe further, that earth should always be in the bottom of the dung-hill, to receive any of the juices of the dung which the rain may carry downward; that the dung should be immediately covered with earth, to prevent the juices from being exhaled, or carried off; and that the earth should be exposed for a considerable time, before any more dung is laid on, that so it may receive all the benefit from the air which it is capable of, before it is covered.

This kind of dung-hills is made with least expence upon the field for which the dung is intended. The head-ridges are commonly high raised, by the turning of the ploughs upon them, and contain the richest earth in the field. These are very proper places for the dung-hills. The earth is at hand, and can easily be thrown upon the dung.

Those that treat of dung-hills of this kind, commonly recommend earth as opposite as possible to the nature of the soil upon which the dung is to be laid. They recommend clay for a light soil, and light earth for a clay soil. But these the farmer cannot always command; and though he can, will frequently find it very expensive to carry them. It is probable, that there is not so much in adapting the earth of the dung-hill to the kind of soil, as persons at first sight are apt to imagine. It is certain that there cannot be so much in it as to answer the expence of fetching the earth. It is true, that in many farms, there are different soils, and therefore the dung may be carried to a soil different from the soil of the field for which it is intended; there

the dunghill may be formed, and from thence carried to the field; but still this is an additional trouble and expence; and therefore this method is not to be followed, till, upon a comparative trial, the advantages are found to do more than answer the expence.

It is a practice in some parts of Scotland to lay clay upon clay land. This practice, it is said, succeeds very well, which makes it probable that it is not very material what kind of earth is used for the compound dung-hill, provided it is of the absorbent kind; and, therefore, the farmer need not be anxious about getting earth different from his soil, but may make his compound dung-hill of the earth of the field which he intends to manure.

Dung, and other manures are very important articles in farming: but though they are universally used, the manner of their operation upon land, whereby it acquires a greater degree of fertility, is but imperfectly known. It is, however, generally agreed, that they ferment in the soil, whereby it is opened and pulverised. Manures are of different qualities, which adapt them to different sorts of land; but by mixing them together, as in composts, they are correctives of each other, and by that means become a more general manure, than any one of them can be singly; and their jarring qualities seems to be a means of prolonging their fermentation in the earth, which is one of the acknowledged benefits of manure.

In regard to mixing and preparing composts, it is frequently recommended, and commonly practised by farmers, to place the several materials in layers, six or eight inches, and sometimes a foot thick: but when they are laid so thick, especially clay, or strong earths, the fermentation in the compost is seldom strong enough to penetrate such thick layers of strong close earth: and if it does not when the compost heap is turned, these layers come out whole as laid in; they receive but little benefit by the fermentation, and require almost as much labour to break and mix them as they would have done at first. It is therefore much the best way to break the strong earth and other materials at first, and to employ several labourers to throw them upon the compost heap in such manner as to mix them well at first. By this method a fermentation quickly commences, the whole is intimately mixed and incorporated; so that much less turning than common is necessary, and the compost is ready for use in a much shorter time. It comes out of the heap in such a condition as farmers desire to have it, that is, it is dry and crumbly, and fit to spread equally upon the land. And if the owner finds the compost too dry in the heap, he may make holes with a pole, from the top to near the bottom of it; which holes being repeatedly filled with the running of a dunghill, or other liquid manure, it will spread and penetrate through the whole body of the compost, renew the fermentation, and improve the quality of the manure.

With respect to the quality of the earth to be used for composts, where several sorts can be had at nearly the same expence, there is little doubt to be made that some are preferable to others. All writers on agriculture, ancient and modern, agree in recommending the superinductions to be of a different quality from the land to be improved; to lay sand and light earths upon clays and strong land, and the contrary; and, as experience has shewn this to be the most beneficial way of improving land, there is little room to doubt of the propriety of observing the same method, in making choice of some earths, preferably to others, to mix in composts suitably to the kinds of land to be manured. The dung and other putrescent parts in such compositions, are dissolved and lost in a short time: but the earths, consisting of hard solid parts, remain, and become a part of the soil.

Farmers, especially if they live in countries that do not abound in cattle, may be apt to ask, where they are to get sufficient quantities of dung necessary for carrying the practice of agriculture still nearer to perfection? M. de Fourbilly answers this question, by pointing out the following method of making an artificial manure.

"Before the winter sets in, says he, that is about the middle of November at farthest, husbandmen should cleanse all the yards, and out-lets belonging to the farm-house; lay them smooth, and, if necessary, dig away a little of their surface till it is about a foot lower than the floor of their buildings; then if they have any common or waste land, let them bring from thence fern, thistles, and other coarse weeds, cut down in full sap, at which time they are best, or occasionally as they are wanted, and lay a bed of them,

about two inches thick, upon the places thus prepared. If weeds cannot be got, coarse wheat or rye straw may be used in their stead, in beds about half as thick. A layer of earth, about six inches deep, should be spread upon this bed of weeds, or straw. Earth of a quality proper for the improvement of the soil intended to be manured is undoubtedly the best; though any earth, which in this case the farmer will dig as near to the house as he conveniently can, is preferable to the mistaken practice of paring off the upper soil, or turf, of the nearest common or waste land, to mix with the artificial manure: for when poor ground has lost its surface or sward, it long remains a barren spot, before a new soil, capable of affording root and nourishment for grass, can be formed upon it. If no proper earth lies nearer at hand, the farmer may take off the surface of any part of his ploughed ground which lies too high, and is not at too great a distance. But, as much as possible, he should adapt the earth mixed with this manure to the nature of the land for which it is intended.

"This bed of litter and earth should be let lie about a fortnight, during which time all sweepings and filth of the kitchen and house should be thrown upon it, that nothing may be lost, which can be converted into manure. The wetness of the season, and the passing of men, cattle, and carriages, over this bed, will greatly contribute to rot it; to complete which, let the farmer turn in all his cattle of every kind, and drive them backward and forward over it, after rain has fallen. This will soon render it a kind of coarse mud mixed with litter, which may be cleared away at the end of another fortnight. If it be too liquid, as it often is in rainy seasons, it should be laid up in little heaps, upon the same place, till it be drained. Let it then be carried to a sufficiently capacious hole, or pit, dug for the purpose in or near a corner of the farm-yard. This pit must be in a dry place; for no manure should ever be laid in water, which would wash away its unctuous parts, destroy its heat, dissolve its salts, and even lessen its bulk considerably, if it run off elsewhere. One load of stable and other dung should be mixed with every two loads of this artificial compost, as it is laid in the pit. The next day another bed of litter and earth may be spread in the yard, &c. as before; and, being managed in the same manner, will be fit for carrying to the dung-pit in about another fortnight. Thus two supplies of this artificial dung may be had every month, during the whole winter, and part of the spring.

"This work will not be expensive: every body, even women and children, may be employed at it, and it is done at a time of the year when labourers are least wanted in the field. It may be continued in the summer: though the beds do not rot near so soon in dry weather; two or three months being sometimes requisite then to bring them to a proper state, in the above method. However, this may be considerably hastened, and much improved, by bringing cattle to lie upon them in the night, unless they are in folds. The earth and other substances of this manure will be greatly enriched by their dung and urine, before it is carried to the stercorary.

"As this last made dung will not be sufficiently rotted by the next sowing season, the best way is to lay it in a separate pit, to mellow, for the ensuing year: and it will be still better, if kept two years. The other dung, made in a wetter season, and more thoroughly putrefied at first, should remain about six months in the pit to ripen; and be wetted now and then in dry weather. During this time, it heats, ferments, and acquires an excellent quality. It may be made to suit any soil, and agrees with many lands better than pure dung taken from the stall or stable, than which it is milder, less fiery, and more lasting. Farmers who have not a large yard belonging to their house, may make this compost in any other place that best suits their convenience; and the poorer sort of peasants may do the same. By mixing with it a third part of other dung, they triple their quantity of manure." *Memoirs sur les Desfrichemens*, p. 78.

This easy and profitable method of making artificial dung is likewise recommended by the ingenious author of the *Dissertation on Agriculture*, published in the *Memoirs of*

the truly laudable society established at Berne, for the Improvement of Rural Economy.

"There are, says he, two ways of meliorating land. One of them may be called natural, and the other artificial. The former consists in a well proportioned mixture of two or three different kinds of earth, the result of which is a new sort, more favourable to vegetation; and the latter in dung.

"Dung consists of animal or vegetable substances, either actually putrefied, or in a state of putrefaction. It operates two ways upon the earth: first, by conveying nourishment to the plants which grow in it, as the air and water also do; and secondly, by opening its pores and separating its parts, by a kind of fermentation, till at last it is itself converted into a kind of fine black mould.

"The only way to have plenty of this useful matter, without much expence, is by a mixture of straw or litter with the excrements of animals. Manure may be obtained from every part of animals or vegetables; but a quantity sufficient for a large extent of ground would cost too much. I therefore shall not here speak of sawdust, tanner's bark, ashes, foot, linen or woollen rags, shavings of horn, &c. of which quantities can be had only in the neighbourhood of populous towns; but shall content myself with pointing out the means of increasing dung in countries distant from great cities.

"Agriculture affords an ample field, and very abundant matter, for the most useful of all experiments. Nothing would contribute more effectually to its improvement, nay, to the reducing of it to fixed and certain rules, than for proper persons to try upon different pieces of ground, of similar size and soil, some of the principal methods pointed out by the most intelligent in this art, and compare the issue of their trials, and the several incidents attending them, during a course of years. This is particularly wanted in order to determine the effects, and the quantity most proper to be used, of different manures. To this end, two or three fields for experiment might be set apart, to be cultivated exactly according to a well-chosen and well-digested plan. An exact account should also be kept of every occurrence, disbursement, and produce. Regularity is the soul of all business. Such journals, properly methodized, would give us a clear insight into rural economy, and set order, assiduity, and frugality in so advantageous a light, that every one would be forced to acknowledge them to be the source of riches, and as such would be induced to practise them." *Tome II. Part III. p. 651.*

Another way, and often less expensive, of providing manure is, instead of fallowing and resting the land, at certain intervals of time, to sow it thick with the seeds of the most succulent plants, such as pease, tares, buck-wheat, &c. these ploughed into the land, when in full sap, make an excellent dressing to it, equal to dung, and make it fit to yield good crops of wheat. Red clover is also excellent for this purpose, sown with barley or oats in the spring. It will yield a good mowing crop, and afterwards a crop fit to be ploughed in, as a dressing for a crop of wheat to succeed.

For more particulars respecting dung, see *WHEAT*.

DURZ'D, or *dorzd out*, an epithet applied in the northern counties to corn beaten out of the ears by the wind turning it in the field, or other accidents.

DWARF-OAK, the name of a shrub common in many parts of North America, where it is planted for making hedges and fences. It grows very fast, and becomes so thick by cutting with sheers, that hardly a bird or mouse can creep through it when in full perfection. The acorns are sown in rows or drills, where the hedge is proposed to be made, which admits of being made of a considerable height. Such a fence as this would be a screen from the winds in winter, as well as a security to the inclosure, and therefore a hedge of this kind would be very useful here: and the plant would, perhaps, on further examination, be found capable of being serviceable in some other ways. *Museum Rusticum*, vol. VI. p. 293.

DYER'S-Weed. See the article *WEED*.

E.

EADDISH, or *Eddish*, roughings, or grafs growing among the stubble, after the corn is cut.

EARING, or *Aring*, ploughing, tilling, cultivating.

EARNING, cheese-rennet.

EARS of an horse, should be small, narrow, straight, and the whole substance of them thin and delicate : they ought to be placed on the very top of the head, and their points, when stiled, or pricked up, should be nearer than their roots.

When a horse carries his ears pointed forwards, he is said to have a bold, hardy, or brisk ear ; also when a horse is travelling, he should keep them firm, and not (like a hog) mark every step by the motion of his ear.

To cure a pain in a horse's ears, first cleanse them well, for fear the horse should run mad, and then put in some honey, salt-petre, and very clean water : mix the whole together, and dipping a linen cloth therein to attract the moisture, continue the application till the cure is effected.

To take out any thing incommodious in a horse's ear, put in an equal quantity of old oil and nitre, and thrust in a little wool : if some little animal has got in, you must thrust in a tent fastened to the end of a stick, and steeped in glutinous rosin ; turn it in the ear, that it may stick to it.

If it be any thing else you must open the ear with an instrument, and draw it out ; or you may squirt in some water ; and if it be a wound, you must drop in proper medicines to cure it.

EARTH, the ground, consisting of different modifications of terrene matter.

The earth, which generally presents itself first to the eye, is no particular kind of soil, but, usually, a mixture of the soil underneath, with every adventitious substance, either purposely brought to, or accidentally lodged upon it. From these causes, this superficial earth, commonly called mould, grows and increases yearly in depth ; oftentimes to such a degree, as to form even considerable eminences, especially where there has been a fall of woods and trees, such as birch and beech, which, not being of a constitution to remain long in the ground without rotting, as fir, oak, elm, and some other timber will do, are pretty soon reduced into mould as soft and tender as that in which they were sown or planted.

This surface-earth, and also the natural under-turf earth, to the depth of about a foot, is generally the best and sweetest, being enriched with all that the air, dews, showers, and celestial influences can contribute thereto : for that earth is best, and it is the same with water, which is most exposed to the influences of the sun and air. The fatness of the under-turf earth, drawn up to the surface by the kindly warmth of the sun, spends but little of its vigour in the grafs and tender verdure which it produces, provided no rank weeds be permitted to grow and perfect their seeds ; but maintain its natural force, and is therefore, of all uncultivated moulds, the most grateful to the husbandman.

As the rest of the subjacent earths approach this in virtue, so are they to be valued. Of these there are several kinds, distinguishable by their several constitutions. The best of them is black, fat, and at the same time porous, light, and sufficiently tenacious, without any mixture of sand. It rises in pretty large pieces, and falls into dust, of its own accord, after a short exposure to the air ; but without crumbling altogether into dust, which is the defect of a less perfect sort.

This excellent black mould is fit for almost any thing, without much manure. The farmer is not always so happy as to meet with it : or if there be a small depth of it, other less fertile soils lie underneath, such as clay, gravel, sand, &c. which require different treatment, according to their various qualities. These soils often appear on the surface ; and may be said to be almost barren, till brought by art to answer the purposes of the husbandman. In clays and stiff soils, the component particles have too

close an adhesion to admit the roots of plants with the ease requisite for them properly to seek their food : and, on the other hand, sand, and soils of a light nature, are too loose to give the proper stability to plants, or to retain the mixture necessary to convey their nourishment into them. It will therefore be right, first, to shew how these extremes may most properly be corrected, and then point out the means of keeping the superficial mould in constant heart, to use the language of farmers.

EARTH-BOARD, that part of a plough which turns over the earth. See the article **PLOUGH**.

EATING off wheat in Autumn. See **WHEAT**.

EAVES, the edges of the roof that over-hang the walls of a building.

EAVES-GUTTERS. The troughlets made use of to catch rain-water dripping off the eaves of roofs, are usually formed by nailing two narrow slips of board together : but eaves-troughs made in that manner are liable to warp, and become leaky at the joint ; the bottom ; the most essential part.

Indeed they are pretty universally hollowed out of one triangular piece of wood, with a round-mouthed adze. A piece six to eight inches square, slit diagonally, affords two triangular pieces fit for this purpose. The hollowing is not a work of so much labour as theory may suggest. They are usually made of deal. Gutters thus made are stiffer, and more easily supported, are less liable to warp, and much less subject to leak than those made in the usual manner.

EDDER, the small shoots of ash, hazle, oak, &c. used for binding the tops of hedges.

EDDISH, the same with eaddish. See **E**ADDISH.

EEDGE, the extremity of a border.

EEDGE-GROWN, come up uneven, not ripening all together.

EDIFICE, a fabric, a building.

EFT, a newt, or evet.

ELBOW, a name given by horsemen to the hind-part of the fore-leg, pointing towards the brisket.

ELDER, fuel for fire.

ELDER, the udder.

ELDER, is also the name of a well-known tree, and is often used in making fences, which may be done by taking elder-sticks, or trunchcons, ten or twelve feet long, and sticking them in the bank sloping both ways, so as to form a kind of chequer-work. By this means a fence may be sooner raised than by any other, as the elder is a very quick grower. The wood when large is very useful for turners and mathematical instrument-makers, being nearly equal to the best box, and for many uses surpassing it. *Mortimer's Husbandry vol. I. p. 7.*

ELM, the name of a tree too well-known to need any description, being common in almost every part of England.

Elms are very proper to be planted in hedge-rows, upon the borders of fields, where they will thrive much better than when planted in a wood, or close plantation, nor will their shade be very injurious to whatever grows under them ; but when these trees are transplanted out upon banks after this manner, the banks should be well wrought and cleared from all other roots ; otherwise the plants, being taken from a better soil, will not make much progress in these places. About Michaelmas will be a good time for this work, for the reasons before assigned ; but when they are planted, there should be some stakes fixed in by them to which they should be fastened, to prevent their being displaced by the winds ; and part of their heads should be taken off, before they are planted, which will also be of use in preventing their being easily overthrown by winds ; but by no means should their leading shoots be stopped, nor their branches too closely cut off ; for if there are not some shoots left on to draw and attract the sap, they will be in danger of miscarrying.

These trees are also proper to plant at a distance from a garden or building, to break the violence of winds, for which

which purpose there is not any tree more useful ; for they may be trained up in form of an hedge, keeping them cut every year, which will cause them to grow very close and handsome, to the height of forty or fifty feet, and be a great protection against the fury of winds : but they should not be planted too near a garden, where fruit-trees, or other plants, are placed ; because the roots of the elm run superficially near the top of the ground to a great distance, and will intermix with the roots of other trees, and deprive them of nourishment. Nor should they be planted near gravel or grass walks, which are designed to be well kept, because the roots will run into them, and send forth suckers in great plenty ; which will deface the walks, and render them unsightly.

But, for large gardens, where shade is required, there is scarce any tree so proper for that purpose, being easy to remove, when grown to a considerable size ; so that a person who is willing to have his plantations for shade, in a short time, may procure trees of one foot circumference in their trunk, which will be in no danger of succeeding, provided they are removed with care. And these will take root, and grow again, almost as well as young plants, which is what few other sorts of trees will do ; but then they should be such trees as have been thus regularly trained up in a nursery, and have good roots, and not such as are taken out of hedge-rows, as is by some practised, which seldom rise with any tolerable roots, and consequently often miscarry ; and this has been the occasion of so many plantations of these trees failing : for although some of them may live a few years, yet few of them are of long duration, and they rarely increase much in their stems, but frequently grow hollow, their heart decaying first ; so that they are supported only by their bark or shell, for a few years, and the first severe winter, or very dry summer, they are generally destroyed.

In planting of these trees, great care should be taken not to bury their roots too deep, which is very injurious to them, especially if they are planted on a moist loam or clay ; in which case, if the clay is near the surface, it will be the best way to raise the ground in an hill, where each tree is to be planted, which will advance their roots above the surface of the ground, so that they will not be in danger of rotting in winter with moisture.

When these trees are propagated by suckers taken from the foot of old trees, they are commonly laid into the ground very close in beds, where, in dry weather, they may be frequently watered, to encourage their putting out roots. In these beds they are left two years ; by which time, those that live will be well rooted, though a great many of them generally die ; then they should be transplanted into the nursery.

There are some who raise the witch elm from seeds, which it generally produces in great plenty, and are ripe in April. These should be sown upon a bed of fresh loamy earth, and gently covered ; in dry weather they should be watered, and if the bed is shaded from the violent heat of the sun, it will be of great service to the seeds, for I always observe the plants to come up better in the shade, than when exposed to the sun. When the plants come up, they should be carefully cleared from weeds ; and after they have stood two years in the seed-bed, they will be fit to plant out into the nursery.

Sometimes the common English elm will produce seed ; but it is not so constantly fruitful as the witch elm which seldom fails to produce great quantities, when they have arrived at due maturity : which seeds will fall to the ground, and when they light upon a spot which is not disturbed, the plants will come up in great plenty.

The timber of the common English elm is generally preferred to the rest ; though that of the witch elm is often as good, and is the largest tree, when planted on a kindly soil ; but the Dutch elm affords the worst timber, and never will grow to the stature of either of the other sorts ; so that this should not be cultivated for the timber ; therefore the best way to be sure of the kinds which a person would chuse to propagate, is to have a nursery of stools, in order to furnish layers ; for when they are grubbed up from hedge-rows, there will often be many sorts intermixed, especially if the people who go about to gather them, furnish them ; because they take them indifferently wherever they can procure them ; so that when they are planted out thus blended together, there will be a considerable difference in their growths, which will deface the plantation. *Miller's Gard. Dict.*

ENEMIES of Fruit-Trees. See ORCHARDS.

ERSH, the stubble after corn is cut.

ERGOT, a sort of stub, like a piece of soft horn, placed behind and below the pastern joint.

ESCALLION. See the article SCALLION.

ESPARCET, the same with saintfoin. See the article SAINTFOIN.

ESSE, a provincial word used in Cheshire, to signify ashes.

ETCH, the same with erth. See ERSH.

EVERLASTING PEA, or broad-leaved chickling-vetch, a perennial plant, which grows naturally in some parts of England, is easily cultivated, and the root yields every year a great burden of excellent provender.

These are great inducements for encouraging the cultivation of this plant, which seems adapted to any soil.

" I sowed three years ago, says a writer in the Museum Rusticum, a rood of land, light, and but poor in quality, with this seed : this work was done early in the spring, the land being prepared as for barley.

" I sowed it not in the broad-cast way, as I should have found much more difficulty to keep down the weeds ; but I caused a slight furrow to be drawn the length of the land with a light plough ; and when the seed was thinly sown, or rather dropped into this, another was drawn at a foot distance, in which the seed was dropped in like manner.

" An interval, or fallow space, was then left at least two feet wide ; then two more rows of the vetches, till the whole land was sown. I must observe, that I covered the seed by means of a light harrow with wooden tines, drawn backward and forward across the land.

" When the plants came up, I had them well hoed, to clear the ground of weeds ; and when they grew a little strong, they were set out with the hoe to about a foot distance in the rows, that they might have room to spread and branch.

" The first year they yielded no great quantity of fodder, but they have since made me ample amends.

" The second spring they came up very strong and vigorous, branching out much ; and when I turned a couple of hories in to feed, they were very fond of it, eating it very greedily, though they were taken out of a good natural upland pasture.

" This last summer the land was almost entirely covered, and it yielded a great deal of seed indeed. For experiment sake, I caused a few rods to be mowed just before it flowered, and it made good hay, sweet, without being sticky.

" Before I conclude, give me leave to observe, that when I had cut a few rods of the everlasting pea, to make into hay, a small quantity of it was, by accident, spread thin upon the ground, so as to receive the full action of the sun's rays : this was in a manner spoiled, becoming quite dry, insipid, and brittle, and almost all the leaves dropping off ; but the remaining part, which was dried either in small cocks or thick swarths, made excellent hay. I am, however, persuaded that the last method is by much the best." *Museum Rusticum, vol. I. p. 468.*

EWE, the female sheep. See the article SHEEP.

Mr. Ellis, in his Treatise on Sheep, has given us the following secret, which he positively asserts will make ewes take ram at any time of the year. " Separate, says he, six or more of your ewes from the flock, and give to each half a pint of strong ale, or the same quantity of good October, mellow, silky beer, and not that which is sharp by staleness ; and for giving it in the easiest and safest manner, you may run the ale or beer through a funnel into the ewe's mouth ; and when the ewes have been all thus served, put them into a proper place, not too large, nor too narrow, that the ewes may be confined with one or more rams, that have been a little better kept than ordinary for this purpose. Out of six ewes, that I have known to take ram in this manner, not one of them has failed proving with lamb. By the above method, and the assistance of a sufficient number of hands, an hundred ewes may be thus dosed with strong drink, and if rams enough are provided, they will all presently take ram." *Ellis on Sheep, p. 297.*

EXERCISE, a proper agitation given to an animal body, in order to produce salutary effects.

Exercise duly given to horses that are well fed, is not only the best means of all others to prevent ill habits, but to preserve them in a perfect state of health : for exercise converts the food into good and wholesome nourishment, it

it promotes the circulation of the blood, and all the glandular discharges, so as greatly to enliven the body, and to make way for fresh supplies of aliment. It invigorates the spirits, gives strength and firmness to the muscles and sinews, and enables a horse to endure labour. And when exercise is given abroad, in an open free air, it adds greatly to a horse's vigour, and prevents any disposition to putrid coheions in the blood, which a close stagnated air often produces, and this especially when horses are young, and their appetites strong; for indeed when horses grow old, their appetites are more moderate, and rest is oftentimes more agreeable to them than labour. Nevertheless, exercise is, more or less, absolutely necessary for all horses, young or old: for we may observe, even old horses, when they lie much still, though they are not apt, as young horses, to turn directly sick, and fall into fevers: yet as their blood grows poor, and languid with age, they become subject to many infirmities; as swellings of their sheath and bellies, with other dropical symptoms, and sometimes to obstinate eruptions on their skins, which exercise in a proper degree often prevents.

Horses, by their natural activity, are every way suited to exercise and labour, and in that respect are more useful than any other of the brute creatures; only it depends on us, how they are to be treated, both for their own preservation, and our benefit; and their food ought always to be proportioned according to their exercise. But the time and manner of a horse's exercise is also to be regarded; for if he happens either to be worked at an unseasonable time, or beyond his strength, it will be more injurious to him than if he had not been worked at all. Therefore this general caution is always needful, viz. never to ride a horse hard, or put him upon any violent exercise when he hath been newly fed, and has his belly full of meat or water; but should be moved out at first gently, and he will naturally mend his pace, as his food and water begins to assuage; when his rider may urge him on to further speed, as his business may require.

I need not tell any one, that when a horse is hot with riding, or any other sharp laborious exercise, he should be cooled by degrees, this being known to almost every stable-boy, from custom and use, though it is often neglected through ignorance or idleness, or done with little judgment. And, therefore, when a man has travelled hard upon a journey, or when horses have been driven hard in a coach or chaise, it is not sufficient, after they come to their baiting place, or to the end of their day's journey, to walk them about in hand for half an hour or more, which is usually done, but their pace should also be slackened for a mile or two before they come in, and after that, should also be walked some time in hand, that they may cool gradually before they are brought into the stable, with a thin cloth laid over each, if they have been used to it. This is the safest way with young horses, that have been kept well, and have worked but little. And when such horses come late to the end of their day's journey, or when the weather is so bad, that they cannot be walked about in hand, they should then be well rubbed all over their bodies and limbs, till they are quite cool, without taking off their harness and saddles, and then clothed; for when all the smallest blood-vessels are replete and full, as they must unavoidably be in all strong, and especially in long continued exercise, and the blood extremely heated, and running like a torrent, any sudden chill or damp will produce stoppages and obstructions, where the vessels are the most minute and small, or wherever there is the greatest weakness and relaxation, sometimes inwardly in the lungs, sometimes in the liver and kidneys, and sometimes in the stomach and guts, and other membranous parts; and this is usually followed with inward pain, and inflammation, or with great dullness and heaviness, which, in the end, often produce many untoward disorders; or if the limbs happen to be weak and relaxed, the blood and juices will soon drop down and stagnate there, so as to produce swellings, and sometimes ulcerations, that are troublesome enough to remove, especially in those that have been little accustomed to such kind of labour; for habit and use, in continued exercise, alters the case very much, because that strengthens and invigorates the nerves and sinews, as we observe in some hackney or job-horses, which are so seasoned to their work, that scarce any thing can hurt them. Indeed some of the job horses, that we see endure so much labour, are naturally strong and very hardy, and have at first been carefully managed by their owners, who are not able to

bear the loss of cattle, as gentlemen or men of fortune; and, therefore, we see them generally both begin and end their work with great coolness; and when they chance to meet with horses that they find unable to go through their hard work, they usually make their business only a mere play, that they may not loose their flesh, until they can dispose of them to the best advantage. Another necessary caution for the preservation of our horses, is never to feed them too soon, after they have been heated with exercise. *Gibson's Farriery, vol. I. p. 182.*

EXPERIMENT, a trial of any kind; an essay made in order to discover an uncertain, or unknown effect.

For the several experiments made on wheat, barley, &c. see the proper articles WHEAT, BARLEY, &c.

EYE, the organ of sight in an animal body; or that which represents objects to the mind.

The goodness or badness of the eyes of horses is a thing wherein the best judges are sometimes mistaken; for most people regard the clearness and transparency of the eye, which indeed ought to be considered: but it is worth observing, that horses, before they are six years old, have not that transparency in their eyes which they arrive at afterwards, because, while they are young and growing, their juices are viscid and balsamic; so that their eyes look thicker or clearer, in proportion as their blood and juices happen to be more or less in a good state. The same may be observed in all horses that have colds, when the vessels of the eyes are full: the eyes at that time look thick, and sometimes inflamed; and a blow on the eye, or a bite will have the same effect, when there is not the least danger of blindness.

It is not, therefore, always the clearness of the eye that denotes its goodness; but a man is also to form his judgment from other indications, particularly from the form and manner of the eye, which includes not only the body of the eye, but the eye-lids, eye-brows, and all the parts belonging to it. Many good-eyed horses have a heaviness in their countenance, with a lowering brow; yet great numbers of this aspect go blind with cataracts when they are about seven years old, or between seven or eight, and sometimes later. These are the most suspicious where there is a bunch or fullness between the upper eye-lid and the eye-brow, with a fullness round the under eye-lid; so that the eye appears as if it was environed in a ring. Such horses are often fleshy about the head and jaws, which, upon every cold, or rather slight accident, exposes them to defluxions in their eyes.

When the eye is extremely flat, or sunk within its orbit, it is always a bad sign, even though there be no defluxion or humour upon it: a small pig-eye is none of the best, nor a large goggling eye. The one often perishes for want of nourishment, occasioned by some defect in the nerves or the arteries that supply it with blood; the other by being too much exposed to accidents, and by having too great supplies of nourishment.

That eye is almost always weak which is of a longish oval figure, especially when the two corners are narrow, like the shape of an almond. When the coat or membrane, that rises from the under part of the eye happens to be large and thick, so as to press the eye-ball, and the caruncle or kernel on the inward corner next the nose is spongy and moist, though there is sometimes a remedy for this defect, yet such horses in the end generally go blind.

When the eyes are bad, the muscles or movers of the eyes are generally weak: so if the eye looks dead and lifeless, the best way of trial is to hold up the horse's head, in the same manner as when a drench is to be given, which will draw the eye upward; and if it remains there, fixed and immoveable, or has a languid motion, it is a pretty sure sign the eye is bad. And this trial will, for the most part, hold good, whether the eye be moist or dry.

Some regard the colour of the eye, which, however, is different, according to the difference of colour in horses; and indeed we are so far to regard the colour, that if the iris or circle that surrounds the pupil or sight of the eye be distinct, and of a pale variegated cinnamon colour, it always denotes a good eye. For the iris is always most distinct, where the humours of the eyes are most clear and pellucid; and those horses have the best eyes, which in colour resemble the eyes of a sheep or a goat; but few horses arrive to that perfection of colour and transparency, till they are at least six years old or upwards. On the other hand, if the iris or circle round the pupil be of a dark muddy colour, and does not appear distinct and variegated,

tinged, till one approaches near the eye; and if the narrow sky-coloured verge, which we observe more or less in most horses on the outside of the iris, happens to be of a milky hue, it is no good sign. Nevertheless, wall-eyed horses have, for the most part good eyes.

Some, in examining the eyes, have a regard to the colour of the horse, which I take to be no sure way of judging; for as there are good horses of all colours, so there are good-eyed horses of all colours. The grey, especially the pigeon or dove-coloured grey, are the most suspected; also the iron-grey, and the dun, &c. But I think I may say, from experience, that whatever colour is the most common among the horses, so as to exceed in number, abounds most with bad eyes: and I have observed as many bad-eyed horses among the black coach breed as any other.

Most people, in examining a horse's eyes, lead him under a gateway, or some shade, that they may see perfectly the colour and transparency of the eye: but the best way is to observe his countenance when he comes first out of a dark stable into a strong light; for if he has any weakness in his eyes, he will wrinkle his brow, and look upwards to receive more light; and if the pupil at the same time be large, it is a bad sign; and therefore the best way is to look to a horse's eyes first in the shade, to observe the dimensions of the pupil; and if that lessens upon his coming out into a strong light, it is almost an infallible sign that the eye is good.

Some suspect all horses that startle to have bad eyes: indeed many bad eyed horses are apt to startle: but a horse that starts and looks upwards, lifting his feet high when he moves, as if afraid to touch the ground; such is more likely to have bad eyes than one that startles; for many horses startle merely out of fear, and I imagine not a few from some defect in vision, viz. from seeing objects indistinctly at some distance; in all which cases the eyes may be strong and durable, though many fancy them to be weak. But if a horse frequently startles when no object is before him that might cause him to startle, we may then suspect his eyes to be but indifferent.

Upon the whole, that eye is generally good where the

eye-lids are thin, where the outward coat or tunicle of the eye is also thin and delicate, where the caruncle next the nose is small and dry, where the eye is transparent and sprightly, when a horse has a bold resolute look, and takes notice of objects without fear. On the other hand, when a horse moves his ears backwards and forwards, and seems surprised at every noise or motion of the hand, when he raises his feet high, is uncertain in his walk or step, and unequal in his goings, when his eyes appear full and swollen, with a fleshy circle round them, or when they are sunk or flat, or of a longish oval figure, when the outer coat is thick, and covers a great part of the eye-ball, and the glands or kernels of the eye are spongy and moist; all these denote the badness of the eyes, and are often the forerunners of blindness. *Gibson's Farriery, Vol. I. p. 14.*

EYE of a tree, a small pointed knot to which the leaves adhere, and from which the shoots or sprigs spring forth.

EYE, among gardeners, implies the small bud or shoot inserted into a tree.

EYE-LID, the membrane that covers the eye.

If the eye lid of a horse is wounded and cut through, and the cut divides it so as the lips part one from the other, it ought to have a stitch with a straight needle, such as the surgeons use for superficial wounds, and not to be drawn too close, but just so far as to bring the edges together; and this is yet the more necessary, when the eye-ball happens to be wounded through the eye-lid, that there may be room for the discharge of the matter. I have observed that the eye-lid requires but one stitch; for when there are more, and these pursed together, as the farriers generally do, and the lips drawn close, such stitches will break in twenty-four hours, and leave the wound in a worse condition than it was at first.

The proper dressing for wounds of the eye, is honey of roses, and tincture of myrrh, viz. one dram of the tincture to an ounce of the other. The best way of using it is to dip a pledgit of lint in this mixture, made warm, and applied to the wound, for tow and hurds are too harsh for the eye. This dressing may be repeated once a day, until the wound is healed up and cicatrised, and it will seldom fail of success. *Gibson's Farriery, Vol. I. p. 320.*

F.

FALLOW, land ploughed, but not sown, being left to rest after the years of tillage.

If the farmer finds that one summer's fallow does not entirely answer the purpose of dividing and loosening the earth, it is his interest to continue it with another. M. Tull confirms this, by instancing a poor man, whom necessity compelled to take this method, because he could not get seed for his ground after he had tilled it the first year. The consequence was, that his crop was worth more than the value of the land it grew on. Mr. Maxwell too mentions another, who, from a like necessity, followed the same course upon almost his whole farm, had such a crop as enabled him to pay many debts, and, by continuing the same practice, came in a few years to be in a condition to purchase the farm.

When the husbandman intends to break up any piece of land, the first thing necessary, is carefully and judiciously to examine the surface of the ground, and its depth. If the surface be covered with a thick, strong, fibrous turf, and the mould underneath sufficiently deep, his best, and indeed the only right method of proceeding, is excellently well directed by the marquis of Turbilly. But, if on the contrary, the upper mould should be shallow, or so thin turfed as not to be fit for burning, he must observe whe-

ther his soil be of a strong, or of a light quality. Under the former of these are included all deep, hard clays, of what colour soever: all stiff binding earths, and such as, after being exposed to the sun, or frost, grow hard and stony; with such as chop and cleave upon their surface in the heat of summer: and under the latter are ranked (the repetition may be excusable here for the sake of perspicuity) all sandy, mouldering, gravelly, mellow soils; all loose and open earth, of what nature soever; all such as are not sticky, but will soon dry after rain; and, instead of lying in great lumps after ploughing, are easily apt to dissolve, and crumble into mould, not being subject to bind by the heats in summer, or frost in winter.

If, upon examination, the soil is found to be of the stiff kind, particular care must be taken to turn down its surface in the latter end of autumn, that what fibrous roots there are in it may be more effectually rotted against the summer ploughing; and that the earth may be mouldered, or mellowed, by the winter's frost and rains.

When ploughed land is intended to be fallowed, it should likewise be ploughed in the autumn, as soon as the seed time permits, and laid as rough as may be, especially if it be a stiff soil, that the winter's frost may mellow it.

In the spring, the farmer should take the earliest opportunity

portunity that his spring crops may admit of, to give his fallows a second ploughing across the former; after which, the ground should be well harrowed, not only to break the clods, but to pull up such roots as are not yet rotted, that they may be gathered into heaps and burnt. It is essentially necessary that this, and all the following ploughings and harrowings be performed in dry weather; because, as the purpose here is thoroughly to loosen the mould, special care should be taken to avoid everything which might counter-act that intention. The farmer cannot wish for a greater benefit to his husbandry, than moderate showers after each fallow, to bring the seeds of every weed to vegetate; in order that, being turned down by several ploughings, they may be the more effectually destroyed.

It seems needless to mention when the future ploughings should be given, because the farmer should take every opportunity of repeating both them and the harrowings, in full confidence that he cannot over-do it, especially in strong soils; in which he may also be equally certain, that he cannot err in ploughing too deep: for it is of great consequence, not only that the roots have a sufficient depth of mould to penetrate in, but also that the cold clay be removed to as great a distance as possible from the surface; because by its retaining the water, the roots of plants are chilled and killed, especially in the winter, when they reach such stagnating wet. If any manure is applied to alter the quality of the soil, it cannot be laid on too early in the summer, that the ploughings may the more effectually mix it with the earth; but if only compost be used for enriching the soil, it need not be spread till just before the last ploughing.

Mr. Marshall says, if a summer-fallow be thoroughly clean from root-weeds, it is certainly most eligible management to sow it with the seeds of some quick-growing herbage, in the wane of July, or beginning of August, to be ploughed-in for wheat in the wane of September: but to lay up a fallow in the beginning of July which is not perfectly cured of its couchiness, is very indifferent management.

Authors give directions for ploughing land into many different forms, mostly arising from the different natures of soils, but too often from the particular long established custom of countries, the reasonableness of which is not always sufficiently considered.

Where there is a descent for water, all lands should be laid flat, because, in that way, the rains will undoubtedly give a more equal nourishment to the crop, than when they are raised in ridges. The practice of laying light soils into narrow ridges, for wheat, is certainly owing to want of attention; and even in strong land ploughed for winter fallowing and sowing, we are much inclined to think that the best way would be, instead of single bouts, or narrow ridges, to make the ridges very broad, and lay them up high: for if the ground is level, the water will lie in the parting thorough, and, by soaking into the sides of the ridges, make it so poachy, as to render it very unfit to be worked, till late in the spring, unless the season be very dry; or, if there is much descent, great part of the best soil will be carried off. For the same reasons the sides of hills should always be ploughed almost, but not quite, horizontally, that the parting thorough, lying open, may serve for drains to the water: besides which, the ploughing of such declivities in this sloping manner is by much the least laborious both to men and cattle. The furrow here should always be drawn oblique, as Columella directs, sometimes a little toward the higher, and sometimes toward the lower part of the hill, so that the direction may be altered in each subsequent ploughing.

The erroneous opinion of those who imagine that the surface of the ground is considerably enlarged by ploughing it into high ridges, and that it therefore affords a larger space for the growth of plants, is thus judiciously refuted by M. Duhamel.

"The produce of a sloping surface is not greater than that of a plane equal in extent to the base of the slope: for as the plants grow perpendicular to the horizontal base, there is no point of the slope which does not answer vertically to a point of that horizontal base: therefore supposing the furrows of a piece of ground ploughed in broad lands to be six inches deep, and the ridges six feet wide; the slope from the bottom of the furrow to the middle of each ridge will be one foot in six, which is indeed considerable: but still the surface of the ridges will be to that of their horizontal base, only as seventy-six are to seventy-five: a

small advantage; especially when compared to a sixth part of the ground, which is taken up by the furrows, and in which no corn is sowed."

Another, and that very essential advantage of fallowing, not yet sufficiently insisted on, is the destruction of weeds, which are one of the farmer's greatest enemies. By weeds, we here mean every plant which grows spontaneously in the field, without having been purposely sown, and which it is not the husbandman's intention to cultivate. All these should be rooted out. It would be needless to enumerate them after this general definition; and perhaps equally so to observe, what every husbandman must know, that cockle, daniel, fox-tail, wild poppies, wild vetches, wild oats, dog's grass, colt's foot, melilot, knot-grass, thistles, and charlock, are the most hurtful species of these noxious growths, and the most difficult thoroughly to extirpate.

To prevent the increase of weeds, they should be destroyed before their seed is ripe: but that is not possible in lands which are ploughed in the common way; because, as they grow intermixed with the corn, and ripen sooner than wheat, their seeds sow themselves; neither can they be extirpated by resting the land; for the seeds of some of them will remain sound several years in the earth. If a field in which there are many poppies, or red weeds, as they are called in some places, be sowed with saintfoin, scarce a poppy will appear the second year: but when the saintfoin is ploughed up, even at the end of nine years, the red-weed frequently appears a-new, which can hardly be owing to any other cause, than that its seeds have remained sound in the earth during all that time; for very few of them, in proportion to the quantities which spring up, can have been brought from the neighbouring grounds, or in dung. This is confirmed by an experiment which M. Duhamel made. He ordered the earth, with which a ditch had been filled fifteen or twenty years before, to be dug out, and spread upon a piece of ploughed land. Several plants, of different kinds from any that were in the field, sprouted up in the place where this earth was laid. Consequently they were produced by seeds which had remained sound in the ground, during the fifteen or twenty years that this earth had lain in the ditch.

This is an important reason for ploughing thoroughly all lands which are fallowed; for it is certain, that as numbers of seeds shoot up during the fallow, repeated ploughing will destroy many of them. But there are several kinds of plants, such in particular, as wild oats, and fox-tail, the seeds of which do not sprout till they have remained two or three years in the earth; nor will culture make them grow sooner. Such, at least, is M. Duhamel's opinion, as well as that of several other very ingenious gentlemen, though it must be confessed, that some late experiments seem to contradict it, and to shew that the seeds of those plants which he says require being three years in the ground before they will grow, were only buried so deep, in the case he mentions, as not to be able to vegetate, which they afterwards did when laid within reach of the influences of the air, rain, dew, &c. If so, though the increase of weeds may be prevented for several years, by ploughing, cutting, pulling them up, &c. yet it is evident, that the repeated ploughing of fallow lands, far from immediately destroying these kinds of weeds, will rather help them to grow, when their seeds are brought within a proper distance from the surface, and their time of sprouting is come. But then, allowing that some of their seeds may be thus brought up by each ploughing, for a while, it cannot be long before all of them will have sprouted, after which the ground may be kept quite clear, with proper care.

Husbandmen have not yet found a more effectual method to destroy weeds, than by sowing the ground out of season; that is to say, by sowing oats the year that barley should be sowed. It has been experienced, that by this means, some kinds of weeds have been destroyed, which, appearing only every third year, never shew themselves, in the usual rotations, but amongst wheat. But the farmer loses a crop by this means, and still has so many weeds left, that he is obliged to hire people to weed his corn. This is done two ways.

A number of women place themselves, in a row, and, with a hoe made for the purpose, cut up all the weeds they see, such as thistles, blue-bottles, poppies, &c. But many of these, when young, frequently escape their notice; in which case the hoeing must be repeated when they are grown

grown larger; and the smaller weeds, such as wild vetches, wild oats, darnel, knot-grass, fox-tail, young poppies, &c. which are at least as hurtful as the other, remain in the field. Besides this, in cutting the weeds, it is scarce possible not to cut down some of the corn; and the roots of the thistles and other biennial plants which are cut, produce two or three new stalks in lieu of the old one; by which means the evil is increased.

The other method of clearing corn, is by hand-weeding it; but this is seldom practised by farmers, because it is too expensive: and indeed the women and children generally employed to do this work, most commonly pull up a great deal of corn with the weeds; so that, what with that, and with their trampling, and dragging their bags of weeds over it, they frequently do more hurt than good, especially if the earth be moist.

The surest way to destroy weeds, is to continue ploughing while the corn grows: but this can be done only in the new husbandry.

Weeds may be ranked under four general classes: first, such as have creeping perennial roots: secondly, such as grow in cold wet soils: thirdly, such as are of a large succulent body: and, fourthly, such as having small seeds, or seeds which ripen before the corn, sow themselves. Each of these require a different treatment.

The first sort cannot be destroyed but by repeated summer fallows, by which their roots are cut, and turned up to be withered by the sun and winds, after which they are dragged out by harrows, and should be burnt. This, repeated as often as a farmer conveniently can, especially during a dry season, can scarcely fail to have the desired effect. Colts-foot, which is propagated by the root, and is a very pernicious weed, may likewise be destroyed by sowing the ground with rye-grass, or any plant which, coming up early in the spring, shade and smother it; for that will kill it in a few years. The second kind are destroyed by draining the earth of its superfluous moisture, and by manuring it with lime, ashes, gravel, shelly sea-sand, and other proper correctives for such soils.

The third are extirpated by cutting them down when in full sap and vigour: for the sap being thereby suddenly interrupted in the course of its circulation, stagnates in the roots, and putrefies there. A few weak lateral shoots may be made; but if they are likewise cut in the same manner, the roots will putrify intirely by degrees, and instead of annoying, will become a manure.

The fourth class can be destroyed only by frequent fallows, and constant cutting, or rather ploughing them down before they run to seed. Some, for instance, the wild oats, may be mowed for hay: but it is much more beneficial to the land to plough them in: because, by that means, instead of being exhausted by frequent crops, it is manured by those enemies to useful grain.

Mr. Marshall, in his *Rural Economy of Yorkshire*, vol. I. p. 361, says,

"There are several species of weeds which cannot be overcome without fallowing. Weeds which propagate their species by suckers from the root, are invigorated by a single plowing, which, by giving a fresh supply of air and openness to the soil, gives freedom to the suckers; while the mere seed-weeds being destroyed in the operation, the suckers are left in full possession of the soil: and whoever attempts to lessen the number of such weeds with the hoe, is unacquainted with the practice of husbandry.

"The continuance of a fallow, and the number of plowings requisite, depend on the season, and on the number and the nature of the weeds to be destroyed. If the spring season be found insufficient to effectuate the purgation, take the summer, and even the autumn, the winter, and the ensuing spring, rather than crop an under-worked fallow, which is but little superior to a single plowing. One stirring towards the close is frequently more valuable than two or three plowings at the outset. To begin a fallow without continuing it until its intention be fully accomplished, is throwing away labour unprofitably."

Fallowing is an important operation in agriculture; the beneficial effects of it consists in three particulars. 1. The repeated cultivation of the lands, the most effectual method of extirpating weeds: if they are annual weeds, the seeds of them are encouraged to grow, and the next ploughing buries and kills them. And if they are large perennial weeds, the earth being loosened by the tillage, the large weeds are then easily pulled out by harrows, and then dried and burned. 2. The land is opened and pulverised to a

great degree of fineness, by the repeated tillage; and, 3dly, by the turning of the mould often; a new surface is every time exposed to the atmosphere, whereby the soil is impregnated through its whole substance, with the fertilizing particles that enrich the earth. No person of observation, conversant in agriculture, can doubt of this effect of the air or atmosphere, enriching of well cultivated land that is exposed to it, and is abundantly proved by the new husbandry.

From this description of the benefit of a good fallow, it will be evident, that the common fallowing is far short of answering the purposes of good fallowing. Three, or sometimes four ploughings of land, where the furrows are turned over almost whole, and couch, and other rank weeds are suffered to grow up for feeding sheep, do not deserve to be called good fallowing, as not one of the ends of good fallowing are attended by such slovenly culture.

Thorough good tillage, in whatever manner performed, is greatly beneficial to land; but one of the most effectual methods of fallowing, is to lay the land up in high, narrow one-bout ridges, which are easily cultivated with a plough, that has a doubled finned share, and a double mould board. The share of such a plough being entered in the middle, and drawn along through one of these narrow ridges, splits it in the middle, turns the mould equal to the right and left, and ploughs one of them at one draught; and the mould of each ridge, is thus raised into a new ridge upon the former furrow. The ridges are sometimes harrowed down, which will well mix the mould, and pull up the large weeds and roots, and then the ridges are raised again as before, across the former ridges, if that can be conveniently done, if not, the new ridges, if they do not stand exactly where the others did, will be composed partly of the earth that may have been misfired by the former ploughings, and the land will by that means be all tilled to an equal depth.

By this way of ploughing, the ridges are tilled, each at one furrow, and if they are three feet broad, would, in common ploughing, require four furrows to plough them on level ground, and time in proportion, to do the work. The mould in this way, is also made so fine and light, that two horses will commonly plough as much ground as three or four can do, when it is out of tilth, and bound together by weeds. The tillage should be performed when the earth is dry, and repeated as often as the weeds spring up: for they should not be suffered to grow large, much less to run to seed.

The farmers cannot by common fallowing extirpate the weeds, and clean the land well in one year, and few of them are willing to fallow another year. But in this method of fallowing, the weeds may be conquered in one winter and summer, and when once the land is made clean, it may be kept so, by a proper change of crops, and the hoeing husbandry.

Mr. Young, in his *Annals of Agriculture*, vol. IV. inserts the following letter, from A. Songar, esq. his imperial majesty's consul in Great Britain. "Some correspondents of yours having requested to know whether summer-fallow, or constant crops, be most advantageous in the management of arable land, I think it may be proper to mention the course of crops which are pursued in the province of Ghjara d'Adda:

"First year. Plough once for wheat after maize; which wheat is harvested before the end of June; the land is then dunged and ploughed for millet, or panick; which second harvest comes in September.

"Second year. Break up for winter fallow; and ploughed again once in the spring, and sown in May, with the largest kind of maize; harvested in September.

"Third year. Plough once for wheat; with which wheat clover is sown in the spring; and dunged in autumn.

"Fourth year. Tender clover mown twice, sometimes three times for hay; and watered when wanted.

"Fifth year. Ploughed once for wheat; and after the wheat is harvested, ploughed for millet, or maize of smaller kind.

ANOTHER COURSE.

"First year. Plough once for wheat; and after the wheat is harvested, plough once more for millet.

"Second year. Plough several times, till the land is very fine and well-manured for flax. The management of it in very high perfection: pulled in June: ploughed and sown with maize; harvested in September.

"Third year. Plough once for wheat, harvested in June, and broke up directly for a fallow, which fallow consists of three

A Fallow-cleaning Machine,
Manchester in Lancashire.

Invented by M^r Aaron Ogden, a Smith at Ashton Underline, near

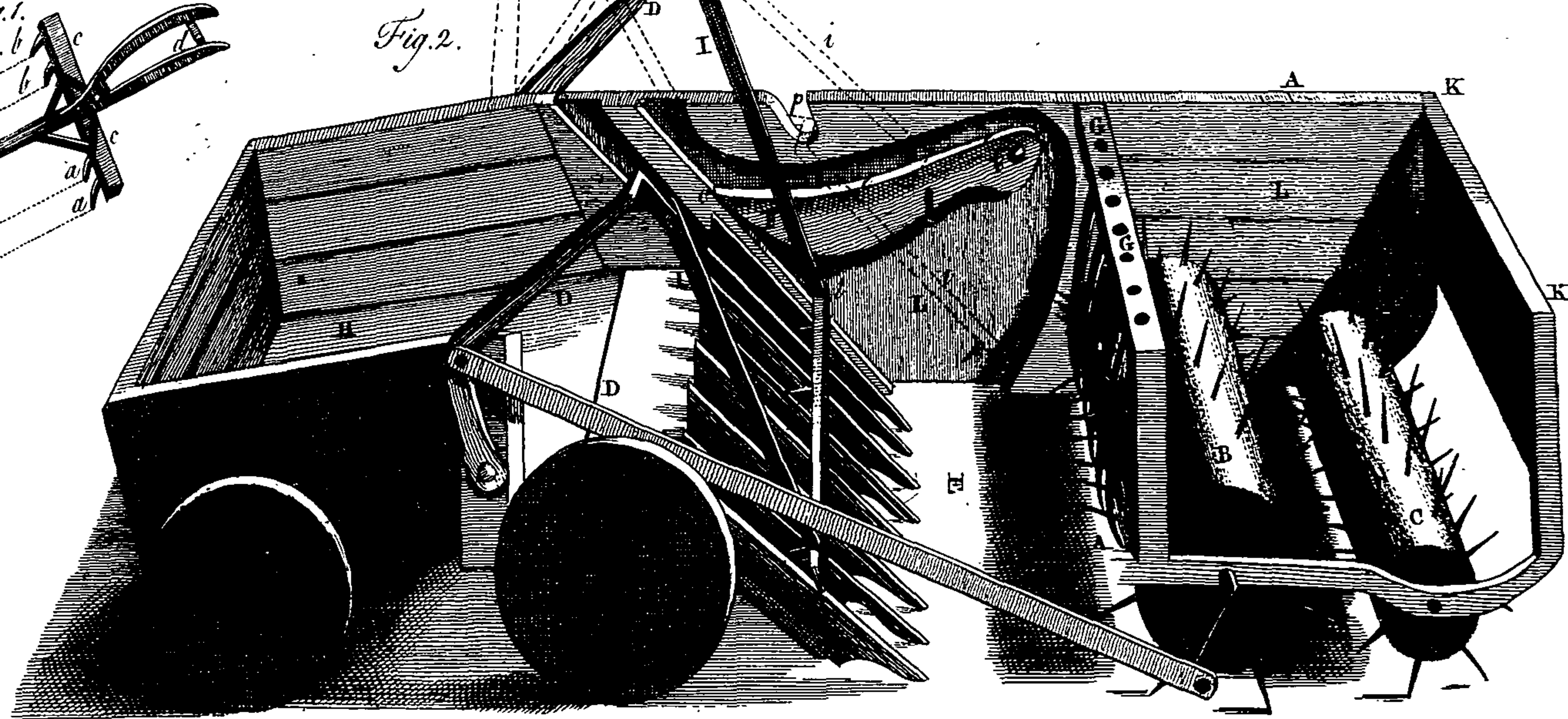
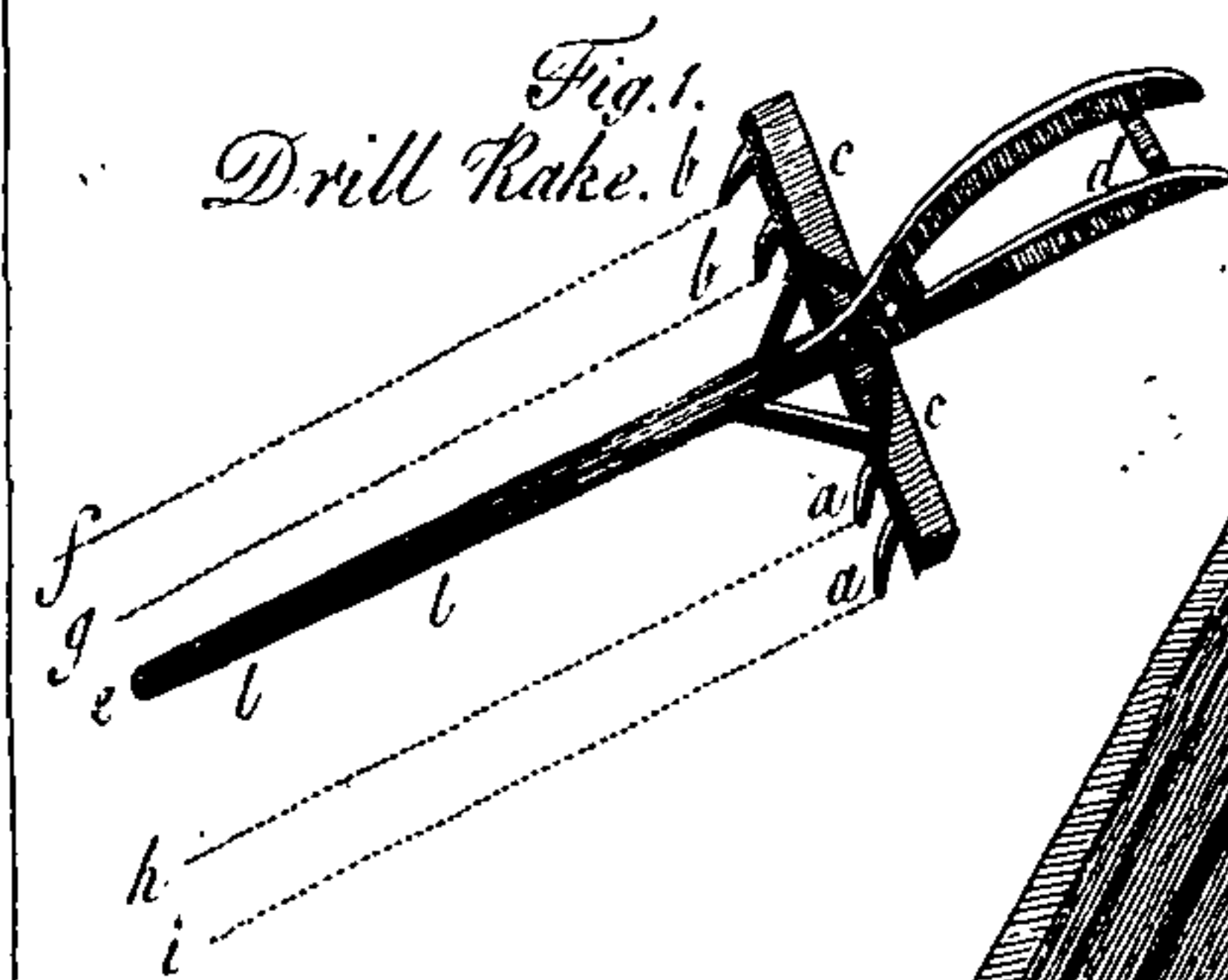
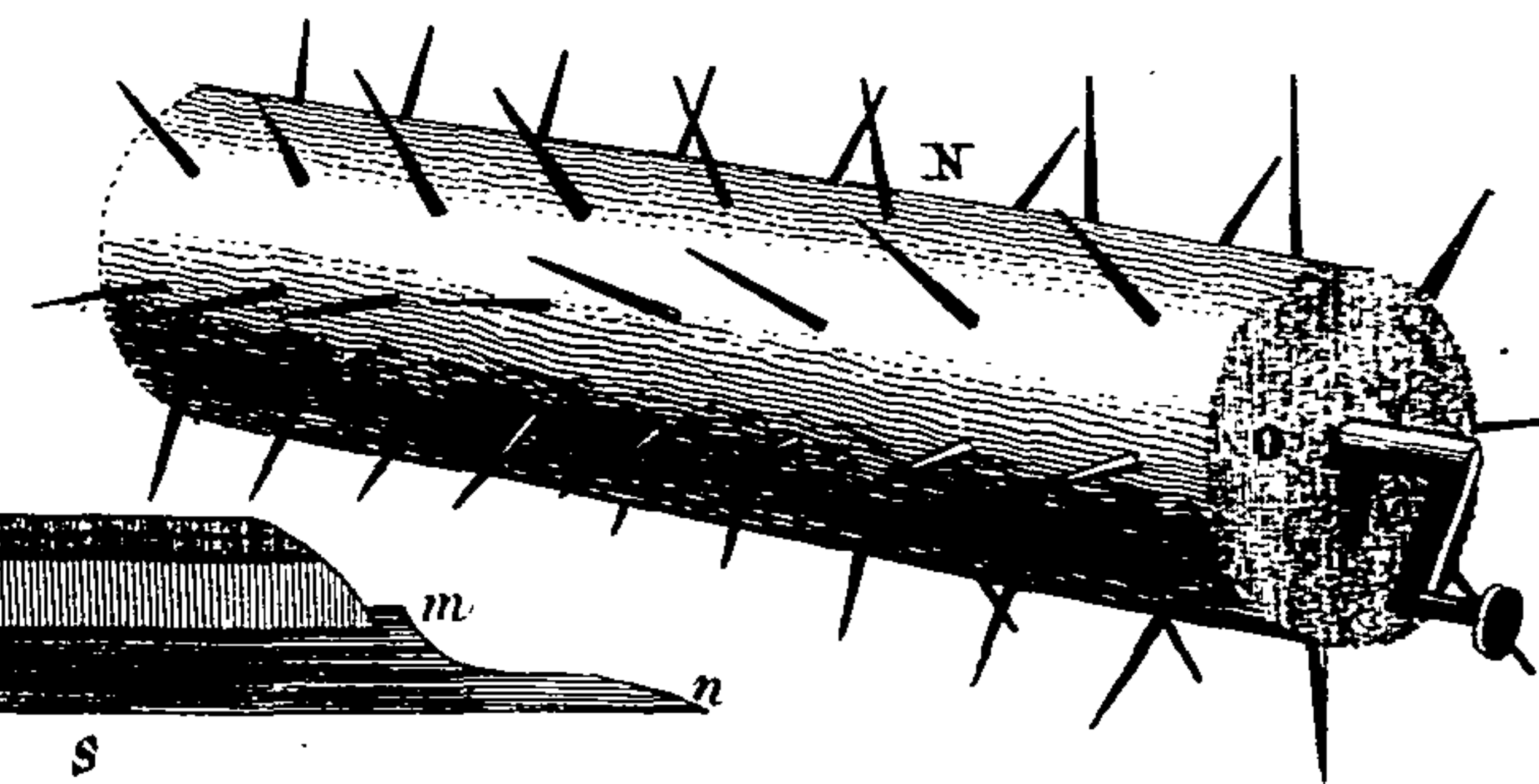
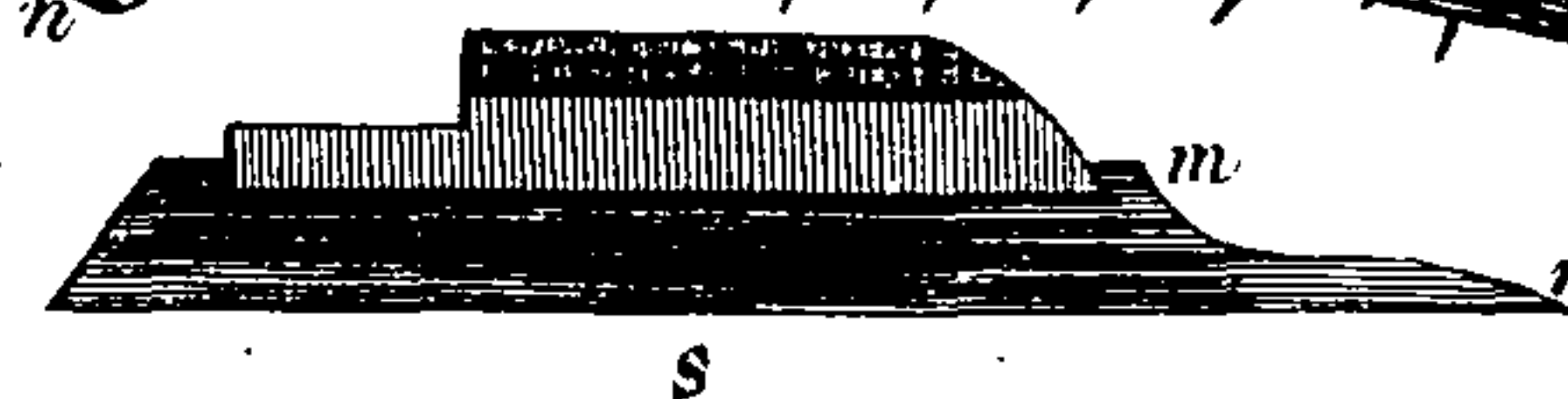
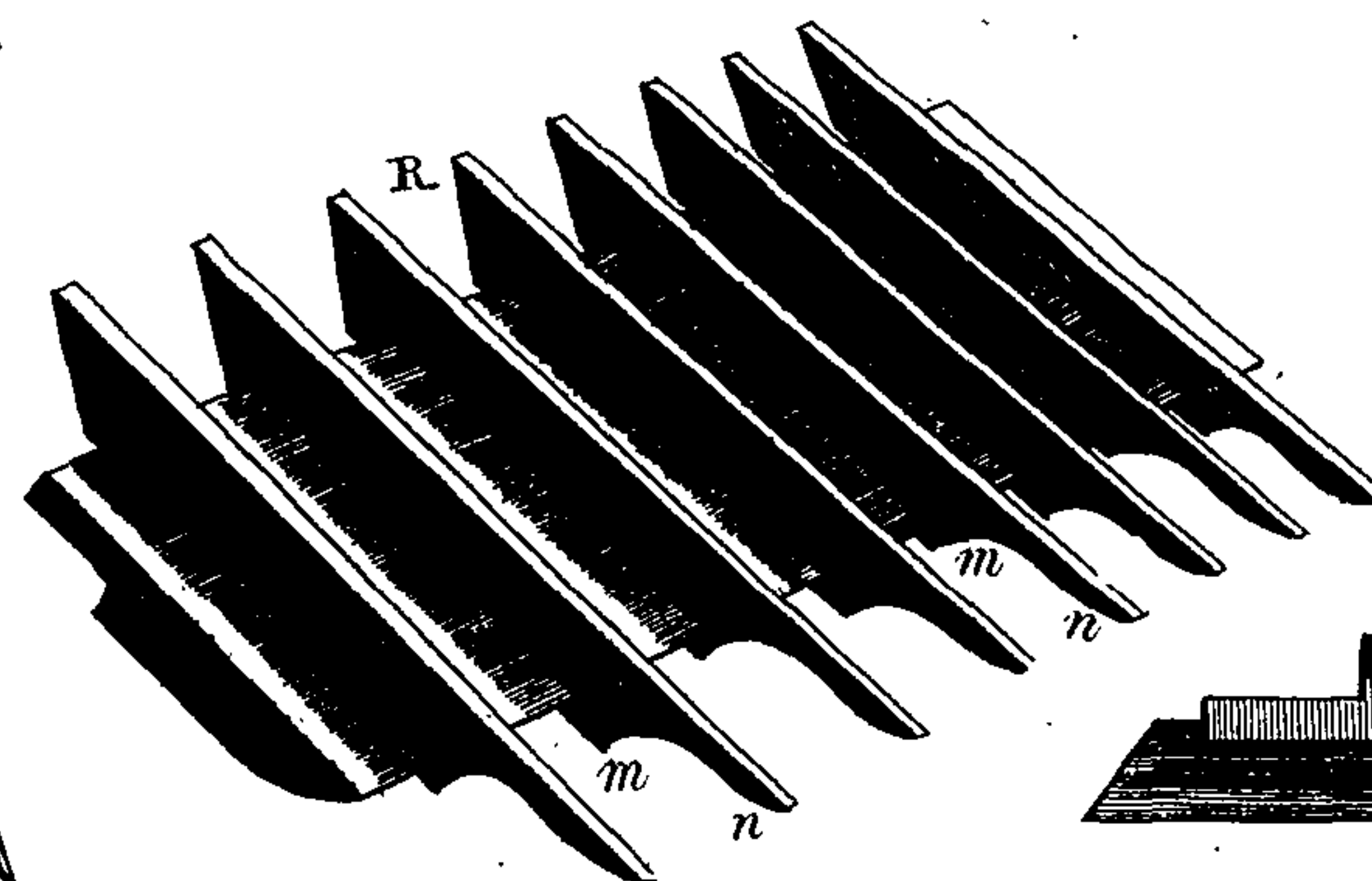
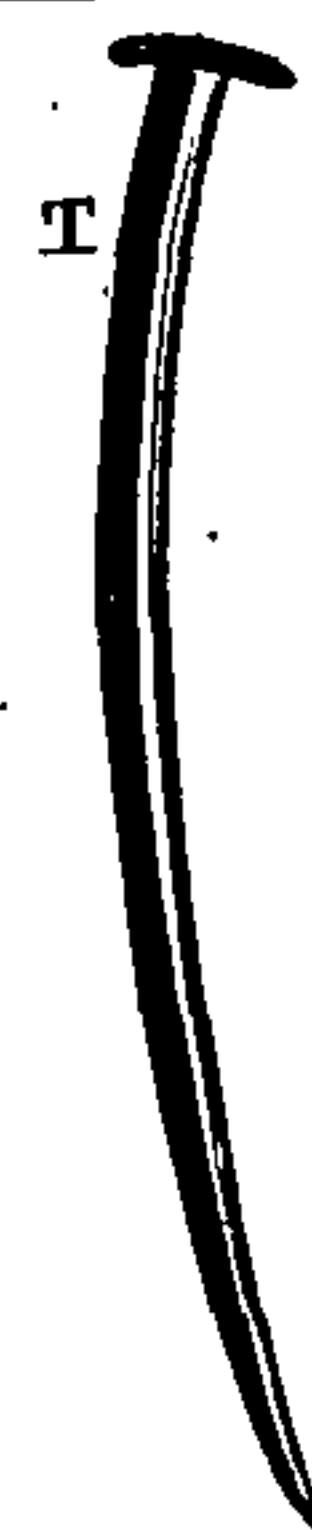
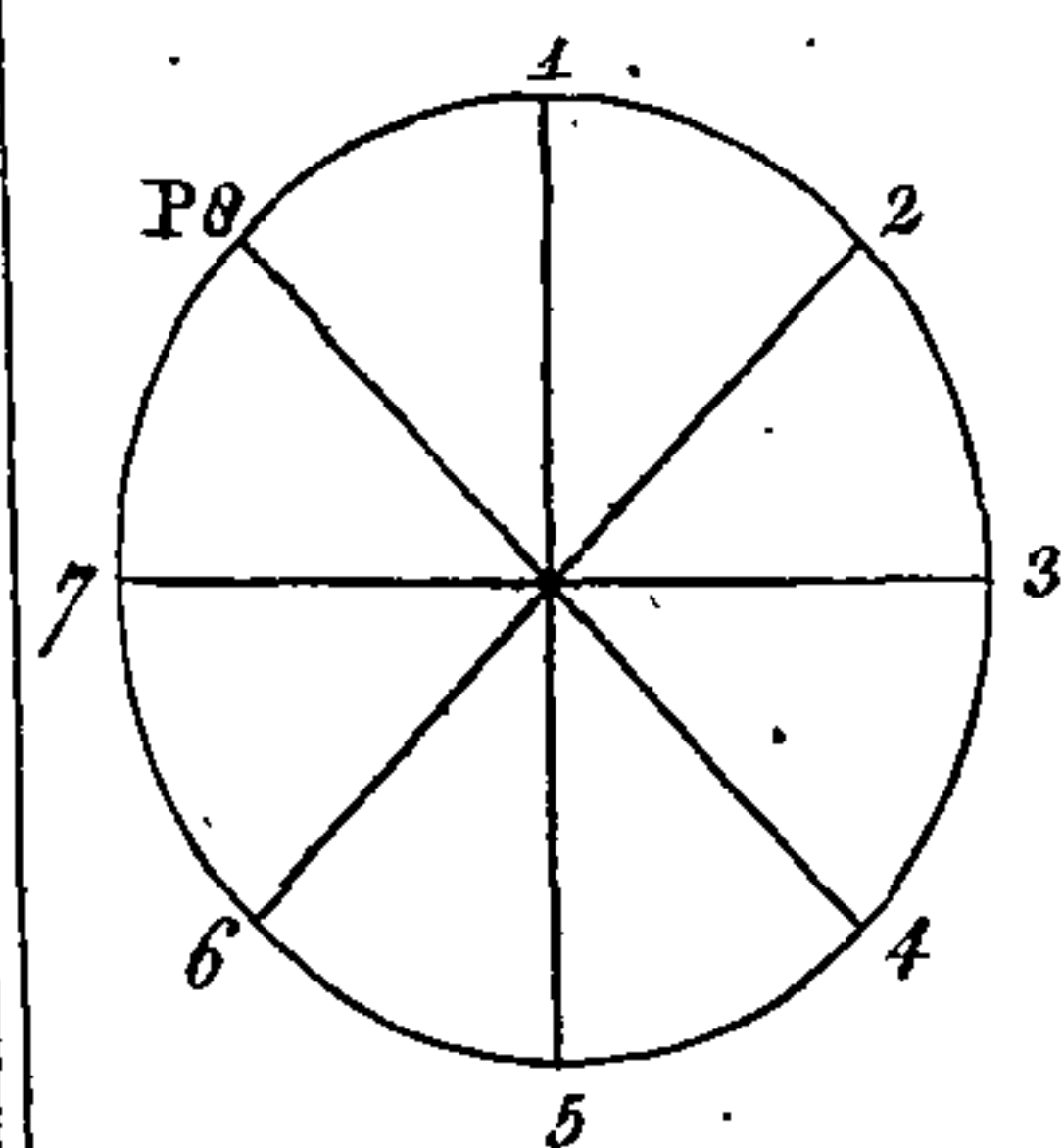


Fig. 3.



Fine Bent

three ploughings ; on the third of which are sown promiscuously cole-feed and lupines, that are ploughed under in autumn for wheat ; which wheat produces better than any other, except that upon clover.

"It should be observed, that millet, every sort of maize, panick, &c. for seed, are hoed ; and flax weeded. And from hence it appears, that we know nothing of what you in England call a summer fallow ; for, on the contrary, we think our land might be covered with some kind of crop ; a due arrangement of which constitutes the best husbandry practised in that part of the duchy of Milan."

Mr. Young also observes that, "this communication is very valuable : here is land in the constant succession of yielding two crops a year, and yet keeping the soil thus incessantly productive, is so far from exhausting it, that its crops are all profitable : this fact is applicable in all climates, and ought to be considered as a striking lesson in England."

FALLOW, also signifies a pale red colour.

FALLOW-CLEANSING Machine, an instrument invented by Mr. Aaron Ogden, a smith at Ashton-under-Line, near Manchester, in Lancashire.

This machine, which bids fair to be of very great use in husbandry for cleansing fallows from weeds, &c. which waste the riches of the soil, will be very easily understood from the drawing we have given of it on Plate XV. fig. 2. Where

A, A, is the frame ; B, the first roller ; C, the second ditto, in which last are two cranks to move the arms D, D, which work the rake up the directors fixed on the plank E. The under side of the lower ends, or shares, of these directors, are sharp to cut the clods, and let them come on the upper side. Each alternate heel of the share is longer than the intermediate one, that they may not have more than one half to cut at once.

At the back of the plank E, are two screws to let it loose, that the directors may be set higher or lower. The shares are to penetrate the ground two or three inches, to raise the quicks till the rake I, I, fetches them into the cart H, where a man must be ready with a muck-hook to clear them backward when gathered.

In the rake I, are teeth for every space of the directors, that stones, &c. may be gathered without damage.

K, K, are two staples, by which the machine is drawn : under them at b, are two hooks, placed low to raise the machine in turning, by the help of the traces ; and the axle-tree of the cart should be fixed upon a pin, that it may turn like a waggon.

F, F, are the triggers to throw the rake behind the roots. The long teeth at G, G, are to cleanse the roller C.

I, I, is the rake which gathers up the weeds into the cart H, and is drawn above the trigger F, by the working of the arms D, expressed by the dotted lines at d d, i i i.

The triggers F, of which there is one on each side, move on the pivots a ; so that when the points b, of the rake I, having been drawn up by the directors E, to the part marked c, the trigger, giving way, permits the rake to pass ; but immediately falling, the rake returns along the upper surface of the trigger marked e, e, and of course falls on the weeds when it comes to the end, a little beyond the pivot a.

The reader will observe that the boarding is taken away on one side, in the plate, in order to give a more perfect view of the inner parts of the machine ; and, in fact, it would, perhaps, be better, if all the boarding, marked L, L, L, was taken away, and frame work put in its stead.

The cart H, might undoubtedly also be made lighter.

The wheels M, M, appear, in the plate, to be made of solid wood ; but there is no necessity they should be so.

At N, is another view of the roller C, by which the disposition of the spikes may be easily comprehended.

Suppose the circle O, described by the end of the roller N, to be divided by four straight lines into eight equal segments, as represented at P. Let the same be done at the other end of the roller, and parallel lines be drawn from one corresponding point to the other, the length of the roller : mark the points with figures 1, 2, 3, 4, 5, 6, 7, 8 ; afterwards draw oblique lines, as from 1, at the end O, to 2, at the other end, and from 2 to 3, &c. on these oblique lines the spikes are to be fixed, at equal distances, in eight circles, described on the circumference of the roller.

The spikes of the small roller B, are fixed in the same manner, except that the diameter being smaller, there are only six instead of eight rows.

R, is another view of the directors, with the plank E, on which they are fixed ; and S, is a section of a part of

the plank, with one of the directors as fixed, in which may be seen the heel m, from whence to the point of the share n, is a sharp cutting edge. See the same letters in figure R.

At T, is one of the long teeth to be seen at G : it is bent towards the roller C, which it serves to cleanse. When the end of the rake b, after rising above c, is pushed, by the motion of the arms D, D, along the upper part e, e, of the trigger F, and comes to the end beyond a ; as it falls, the part of the arm, marked o, rests in the notch p, till it is again raised by the motion of the roller C, with the rake.

The roller C, is to be one foot diameter, the spikes nine inches long, that they may go through the furrow (if the soil should be loose) into the hard earth, the more effectually to work the rake, which otherwise might be so overcharged as to cause the roller to drag without turning.

In the rake-ends b, there should be pivots, with rollers or pulleys on, to go in the groove, to take off the friction ; and they would likewise take the triggers more surely as the rake comes back.

The rake should also be hung so far backward, that when it is fallen, the arms of it may lie in the same plane, or parallel, with the directors, on which it comes up (which will require the frame to be two inches longer in the model.) This will cause the rake to fall heavier, and drive the teeth into the roots, and bring them up without shattering. These teeth must be made of steel, very fine, and so long as to reach down to the plank on which the directors are fixed, that is to say, six inches long (the directors are also to be made six inches broad above the plank.) The rake-head should also fall a little before the crank is at its extremity, which will cause the rake to push forward to let the teeth come into the roots. The rake-teeth must drop in the same plane with the roller and wheels, or on the surface of the earth. No more space should be given from the roller C, to the long teeth, at G, G, than that the rake may just miss the spikes of the roller C, and fall on the places before mentioned.

As the first roller B, was intended to cleanse the second C, more than any other use, it may be omitted when the machine is made in large, as Mr. Ogden has lately found that the long teeth at G, G, answer the end alone, and this renders the machine about a sixth part shorter.

Now, to suit any sort of earth, there should be to each machine three planks, with directors at different spaces, to use occasionally : in the first, the spaces between the directors should be eight inches wide, in the second six, and the third four. This will answer the same end as having so many machines.

As there may be some objections to the rake not leaving the roots when it has brought them up, Mr. Ogden has several methods of cleansing it ; but as he would make it as simple as possible, he chuses to let it be without them at present : but suppose it should bring some roots back again with it, it will probably lose them before it gets back to the extremity ; whence they will lie light, and be of but little detriment to the others coming up.

Mr. Ogden would have the first machine made four feet six inches wide, the teeth divided into equal spaces, the out-sides into half spaces.

FAN, an instrument for winnowing corn. See the article **THRASHING**.

FAN GOME-CORN, thin or light corn, that which has but little bulk or solidity.

FARCY, or *Farcin*, a distemper to which horses are too often subject. It is a disease of the blood vessels, generally following the course of the veins, and when inveterate, thickens their coat and integuments.

At first one or more small swellings, or round buds like grapes or berries, spring out over the veins, and are often exquisitely painful to the touch ; in the beginning they are hard, but soon turn into soft blisters, which, when broke, discharge an oily or bloody ichor, and turns into very foul and ill-disposed ulcers. In some horses it appears on the head only ; in some on the external jugular ; in others on the plate-vein, and runs downwards on the inside of the fore-arm towards the knees, and very often upwards towards the brisket ; in some the farcy shews itself on the hind parts, about the pasterns, and along the large veins on the inside of the thigh, rising upwards into the groin, and towards the sheath ; and sometimes the farcy makes its appearance on the flanks, and spreads by degrees towards the lower belly, where it often becomes very troublesome.

When the farcy appears on the head only, it is easily cured, especially when it is seated in the cheeks and forehead, the blood-vessels being here small ; but it is more

difficult when it affects the lips, the nostrils, the eyes, and kernels under the jaws, and other soft and loose parts, especially if the neck-vein becomes chorded. When it begins on the outside of the shoulder or hips, the cure is seldom difficult; but when the farcy arises on the plate-vein, and that vein swells much, and turns chorded, and the gland or kernels under the armpits are affected, it is hard to cure; but more so when the crural veins within-side of the thigh are chorded, and beset with buds, which affect the kernels of the groin, and the cavernous body of the yard. When the farcy begins on the pasterns or lower limbs, it often becomes very uncertain, unless a timely stop is put to it; for the swelling in those dependent parts grows so excessively large in some constitutions, and the limbs so much disfigured thereby with foul sores and callous ulcerations, that such a horse is seldom fit for any thing afterwards, but the meanest drudgery: but it is always a promising sign, wherever the farcy happens to be situated, if it spreads no farther. It is usual to affect only one side at a time, but when it passes over to the other, it shews great malignancy; when it arises on the spines, it is then for the most part dangerous, and is always more so to horses that are fat and full of blood, than to those that are in more moderate case. When the farcy is epidemical, as sometimes happens, it rises on several parts of the body at once, forms nasty foul ulcers, and makes a profuse running of greenish bloody matter from both nostrils; and soon ends in a miserable rot.

From this description of the farcy, it will appear how greatly those may be disappointed, who depend on some single specific drink or ball for a certain cure; for the symptoms are sometimes so favourable, that it is easily conquered by a very simple management; and when it arises superficially upon the smaller vessels, it will often go off with moderate labour, without any other means than bleeding. Such instances as these may easily give a reputation to things of no great efficacy, and bring them into esteem: but whoever has acquired any true notion of the farcy, will know that this distemper is not to be conquered but by such things as are fitly adapted to the various symptoms that occur in the different stages of it. To avoid therefore the perplexity that arises from the various complications so usual in the farcy, we shall consider it in its different stages, or degrees, viz. when it seizes only the smaller vessels; when the larger veins are chorded, and the feet, pasterns, and flanks affected; and lastly, when the farcy, beginning on one side only, and breaks out on the other, also, and affects the whole body.

When the farcy makes its first appearance on the head, it rises on the cheeks and temples, and looks like a network, or small creeping twigs full of berries. Sometimes it inflames the eye and sometimes little blisters or buds run along the side of the nose. It arises often on the outside of the shoulder, running along the small veins with heat and inflammation; and sometimes a few small buds appear near the withers, and on the outside of the hip. In all these appearances, the disease being superficial, and affecting only the smaller vessels, is easily conquered by the following method, when taken in time; for the simplest farcy, if neglected, may degenerate into the worst sort.

This distemper then being of an inflammatory nature, and in a particular manner affecting the blood vessels, must necessarily require large bleeding, particularly where the horse happens to be fat and full of blood. This always checks the beginning of a farcy, but is of small service afterwards; and if a horse is low in flesh, the loss of too much blood sometimes proves injurious. After bleeding, let the horse have four ounces of cream of tartar and lenitive electuary; which may be given every other day for a week, to cool the blood, and open the body; and then give nitre, three ounces a day, for three weeks or a month; and anoint the buds and swellings with the following ointment twice a day.

"Take ointment of elder four ounces, oil of turpentine two ounces, sugar of lead half an ounce, white vitriol powdered two drams; mixed together in a gallypot."

The buds sometimes by this method are dispersed, leaving only little bald spots, which the hair soon covers again. When they break and run, if the matter be thick and well digested, they will soon be well: but in order to confirm the cure, and to disperse some little lumps, which often remain for some time on the skin without hair, give the liver of antimony for a month; two ounces a day for a fortnight, and then one a day for the other fortnight; by following

this method, a farcy which affects only the small vessels, may be stopped in a week or ten days, and soon after totally eradicated.

When the farcy affects the larger blood vessels, the cure is more difficult; but let it always be attempted early: therefore, on the plate, thigh, or neck-veins appearing chorded, bleed immediately on the opposite side, and apply the following to the chorded vein.

"Take oil of turpentine in a pint bottle, six ounces; oil of vitriol three ounces; drop the oil of vitriol into the oil of turpentine by a little at a time, otherwise the bottle will burst; when it has done smoking, drop in more oil of vitriol, and so on till all is mixed."

This mixture is one of the best universals in a beginning farcy; but where it is seated in loose fleshy parts, as flanks or belly, equal parts of the oil of vitriol and turpentine are necessary.

Rub the parts first with a woollen cloth; and then apply some of the mixture over the buds, and wherever there is any swelling, twice a day. Give the cooling physic every other day, and then three ounces of nitre every day for some time. This method must be continued till the buds digest, and the chord dissolves; and when the sores run plentifully, the matter digests well, and the lips and edges are no ways thick or callous, you may expect a speedy recovery; yet to confirm the cure, and prevent a relapse, give the liver of antimony or crude antimony, as before directed: and to heal the sores and smooth the skin, dress with bees-wax and oil.

When the farcy begins on the flanks, or towards the lower belly, it often takes its rise from a single puncture of a sharp spur. The pain and smarting is one sure sign to distinguish the farcy from common accidents: the staring of the hair which stand up like a tuft all round the buds or blisters, and the matter that issues from the buds, which is always purulent, and of a clammy greasy consistence, are other certain signs. After bathing with the mixture above mentioned till the ulcers are smooth and healing, should the swelling not subside, to prevent the spreading of the buds, and to disperse them, bathe with either of these mixtures as far as the centre of the belly; and at the same time give a course of antimonials, as will presently be described.

"Take spirits of wine four ounces, oil of vitriol and turpentine, of each two ounces, white wine vinegar or verjuice, six ounces."

Or take the following:

"Take spirits of wine rectified four ounces, camphor half an ounce, vinegar or verjuice six ounces, white vitriol dissolved in four ounces of spring water, one ounce; mixed together."

In the lower limbs the farcy lies sometimes concealed for a great while, and makes so slow a progress, that it is often mistaken for grease, or for a blow or kick; and goes by the general appellation of a humour settled there. In order to distinguish one from the other, we shall observe that a kick, or bruise, is generally attended with a sudden swelling, or a contused wound, which for the most part digests easily; the grease is also a smooth swelling that breaks out above the bending of the pasterns backwards; but the farcy begins on the pastern-joint usually with one bud, and runs upwards like a knotty crab-tree.

Very simple means has sometimes stopped it, before it has began to spread; a poultice with bran and verjuice bound round the part, and renewed once a day, will often alone succeed; and if proud flesh should arise, touch it with oil of vitriol, or aqua-fortis, an hour before you apply the poultice; for when the distemper is local, as we suppose it here, it is to be conquered by outward applications.

When the distemper grows inveterate, and resists the above method, and the vessels continue chorded, Gibson recommends the following mixture:

"Take linseed oil half a pint; oil of turpentine and nitre, of each three ounces; tincture of euphorbium and hellebore of each two drams; the soldier's ointment, two ounces, or oil of bays; oil of origanum, half an ounce; double aqua-fortis, half an ounce. After the ebullition is over, add two ounces of Barbadoes tar."

Rub this into the chorded veins, and wherever there is a swelling, once in two or three days; but if the orifices are choked up with proud flesh, or the skin so much thickened over the ulcers as to confine the matter, in either case it is necessary to make an open passage with a small hot iron, and destroy the proud flesh, after which it may be kept down by touching with oil of vitriol, aqua-fortis

fortis, or butter of antimony. A salve may also be prepared with quick-silver and aqua-fortis, rubbing any quantity of the former with enough of the latter, to the consistence of a liniment; smear the ulcers with this whenever they appear foul, and you will find it preferable to most other eating ingredients.

Our farriers after opening the buds, put in usually a small quantity of corrosive sublimate or arsenic, which they call coring out the farcy; this may answer where the buds are few, and not situated near large blood vessels, joints, or tendons: others use Roman vitriol or sublimate and vitriol in equal quantities: but let it be remembered, that many a horse has been poisoned by these medicines ignorantly used, and in too large quantities, which should be a caution to huntsmen not to suffer their hounds to feed on the carcases of farcied horses, as the greatest part of a pack have been poisoned by that means. I shall now mention some of the desperate methods, and more violent kinds of medicines given by some internally: thus from four to eight ounces of lapis calaminaris, to which two ounces of tutty, finely powdered, is added, with other metallic substances, have been given. Some give a pound of barrel soap boiled in stale beer; with favin, rue, and other herbs of that intention: others go yet further, being determined to kill or cure, by giving drinks prepared with green vitriol, roche-allum, Roman vitriol, oil of vitriol, boiled in chamber-lie, with hemp-seed, hemlock, and common salt. Those who use nothing but the decoctions of juices of herbs, such as wormwood, rue, or elder particularly, stand a much better chance for a cure, if given in time; but when the distemper is grown inveterate, nothing comes in competition with mercurial and antimonial medicines.

The following balls are proper in every state of the farcy, and when the distemper has been in its infancy, before the skin was much defaced, has often cured it in a week or two, by giving them only once or twice a day: but in an old farcy, they should be given for two or three months together.

“Take of native cinnabar, or cinnabar of antimony, eight ounces; long birthwort, and gum-guaiacum powdered, of each four ounces: make into a paste with honey, and form into balls of the size of a large walnut, and roll them into liquorice powder.”

The tediousness of this course has encouraged the giving of mercurials, and indeed, where they are directed with skill, they must be attended with success; the stronger preparations, as the red and white precipitates, and turbith, being combined with sharp saline parts, may be hazardous and injurious, but the latter given in small quantities have been found very successful in such kind of inveterate disorders. Mr. Gibson says, he has given it to a dram at a dose, where the limbs have been greatly swelled; that in forty-eight hours the sores were all dried up, and the limbs reduced; but that it made the horse so violently sick for several days, and scoured him to such a degree, that it could not be repeated.

One would have thought, that the success attending this medicine so suddenly, might have encouraged Gibson to have made further trials in smaller quantities; which, had he done, it is more than probable, he would not have been disappointed: for the grand secret in giving mercurials, as alteratives, is the introducing them into the blood, without operating on the stomach and bowels; and to do this effectually, they must be given in small quantities, and so bridled, as to controul their force on the first passages: taken in this manner, they will mix gradually with the blood and juices, and operate both effectually and safely.

The method I would recommend is as follows: give one scruple, or half a dram of turbith, mixed into a ball, with an ounce of Venice soap, every other night for a fortnight; then abstain a week or ten days, and repeat it again. Should this ball purge, or make the horse sick, mix it up with two drams of philonium, or with four or five grains of opium, or camphor; with these restrictions, it may be given for some weeks; but should the horse's mouth be found tender or sore you must refrain giving, till that complaint is removed by gentle purges; and then return to it again in small quantities; for as the effects of mercurials are very different in the different constitutions, both of horses, as well as men, so the quantity must be varied in proportion to the operation, which is not intended here to be visible, but to work imperceptibly on the blood and juices, correcting them as a powerful alterative. During the whole course, particular care should be taken that he gets no cold.

Two ounces of quicksilver, divided with an ounce of

turpentine, and made up into four balls, with diapente, and gum guaiacum, of each two ounces, and a sufficient quantity of honey, have, for this purpose, been successfully given, one ball twice a week; but gentle purgatives should be interposed, to prevent a salivation, which some horses are very prone to, on taking mercurials, though in small quantities.

Dr. Bracken recommends the knots and chords to be rubbed with the mercurial ointment before they break, in order to disperse them, and, after breaking, to dress the sores with equal parts of Venice turpentine and quicksilver: if by these means the mouth should become sore, treat as above. This method seems to be effectual with proper care.

The following is also recommended by the same gentleman.

“Take butter of antimony, and bezoar mineral, of each an ounce, beat up with half a pound of cordial ball, and give the bigness of a walnut, or three quarters of an ounce every day, for two or three weeks, fasting two or three hours after it.”

As most preparations from antimony are of use in the farcy, so from two drams of antihecticum poterii to half an ounce, may be given with a bit of cordial ball every other day, for some time; for in these obstinate cases the very crisis of the blood must be altered, which can only be affected by degrees, and of course is a work of time. *Bartlett's Farriery*, p. 178.

Water-FARCY. See the article WATER-FARCY.

FARDING-BAG, the first stomach of a cow, or any other ruminating animal.

FARE of pigs, the number a sow bringeth at one time.

FARM, a portion of ground cultivated either by the owner or a tenant.

The ancient writers of husbandry, who lived in warm countries, where the heat and moisture of the air had sensible and frequently very dangerous effects on the health of the inhabitants, were very particular in their directions, for the choice of farms or estates, and of the spots whereon houses should be built, so as to avoid the inconveniences arising from the climate, or from the quality or situation of the ground.

Though the temperate air which we enjoy in this island renders such directions less necessary here, yet as several places in it are remarkably sickly, and as, even in the most healthy situations, many houses and villages are built upon the least healthy spots, it must be of considerable advantage to those who can make their choice, to know what soils and places ought to be avoided; and of such as are already fixed, to be acquainted with the means of correcting these inconveniences which cannot be totally remedied.

Instructions of this kind are now full as necessary in our language, as they were ever in the Greek or Latin, the countries in which English is spoken being more extensive, and more various in their climes, than even the Roman empire was.

The sacrifices of the ancient Romans shew how attentive they were even in the choice of the ground they encamped upon: much more were they so in that of the situation and nature of the place where they laid the foundations of more lasting buildings. They examined the livers of the cattle fed on the spot, when they offered them in sacrifice; and if these were livid or corrupted, they offered others, as the unsoundness of the first might be owing to some casual distemper: but if they were often found to be morbid, they concluded that the air, water, or food, which the place yielded, would have a like effect on human bodies, and therefore speedily left that ground, to search for a better situation. If after repeated trials, they found the livers good, they judged the air and food to be so likewise, and settled accordingly. We may still observe the good effect of this precaution, in the healthy situations of the remains of Roman encampments: for they preferred health to every other consideration.

The Romans had pleasure as well as profit, in view, when they bought or stocked a farm; and therefore they laid it down as a rule, that no degree of fertility should tempt a man to purchase in an unhealthy country, nor the pleasantest situations in a barren one. “Buy not too hastily,” said the wise Cato, “but view again and again the purchase you intend to make; for if it be a good one, the oftener you see it, the better it will please you. Examine how the neighbouring inhabitants fare. Let the country it lies in be a good one; the ways to and from it good;

good; and the air temperate. Let your land, if you can choose your situation, be at the foot of a hill, facing the south, in a healthy place, where a sufficiency of labourers, of cattle, and of water may be had. Let it be near a flourishing town, the sea, or a navigable river; or bordering upon a good and well frequented road. Let the buildings upon your ground be strong and substantial. Do not rashly condemn the methods of others. It is best to purchase from a good husbandman, and a good improver."

Besides the healthfulness of the situation, three other things should be particularly attended to in the choice of a farm or estate; these are the air, the water, and the soil. The air should be pure, and temperate; the water wholesome, and easily come at, and the soil rich.

The knowledge of the healthiness of the air is, as lord Bacon observes, discoverable rather by experiment than by reason or conjecture.

To examine the moisture of the air before a house is built; wool, or a sponge, may be hung up in the place, and afterwards compared with some of the same, exposed in the same manner, and at the same time, in another place. According as they gain more or less in weight, the air is more or less humid.

The air is liable to greater alterations, from heat and cold, in some places than in others; and as that inequality in the air, is an enemy to health, the most equal should be chosen. This is easily determined by the thermometer, and by viewing the situation of the place; for the intermixture of hills and vallies, though pleasing to the eye, may be held suspected as to the lengthening of life, because of the variations of heat and cold.

Open places and champaign countries are judged to be healthy, where the soil is dry, not parched, or sandy, where wild thyme and other oramatic plants grow spontaneously, and which is not otherwise bare, but interspersed with trees for shade. Yet the change of air in travelling, after being accustomed to it, is healthy: whence many travellers have proved long lived; as, indeed, have also such as have dwelt constantly in the same cottage. A ruddy complexion, clear white of the eye, quick hearing, and distinct voice, are set down by Palladius, as marks of the healthfulness of the place where these circumstances are met with in the generality of its inhabitants.

The ancients are particularly attentive to the quality of their water, and to the ease of coming at it. They advised bringing into the farm-house the water of a spring which never dries up; or, if there be no such spring within the farm, to bring running water as near to it as may be; or to dig for well-water, not of a bitter or brackish taste. If neither of these was to be found, they directed large cisterns to be provided for men, and ponds for collecting and retaining rain-water for cattle. They esteemed that running-water to be best for drinking, which had its source in a hill; spring, or well-water from a rising ground, was deemed the next best; well-water in the bottom of a valley was held to be suspicious; and marshy or fenny-water, which creeps slowly on, was by them rightly looked upon as the worst of all.

That water is known to be wholesome, which has no mineral in it, is perfectly clear, has not taste or smell, deposits no slimy sediment, leaves no spots, or incrustation when boiled in copper or brass vessels, and which boils pulse in a very little time. "Rain-water, says sir Thomas Elliot, in his Castle of Health, is the most subtle and pure of any other water. The next is that which issueth out of a spring facing the east, and passeth swiftly among great stones and rocks. The third is of a clear river, which runneth on hard stones and pebbles. There be divers means to try which is the best water; for that which is lightest in poise or weight, is best; also that whereof cometh least scum or froth when it doth boil; also that which will soonest be hot. Moreover, dip linen cloths in sundry waters, and afterwards lay them to dry; and that which is soonest dry, the water wherein it was dipped, is most subtle."

As springs and well-water pass through beds of sand, gravel, or small stones, these clear it of all impurities, unless there be mixed with them substances which are soluble in water. If any mineral is mixed with the water, it is unfit for the farmer's use. If it be hard, it is thereby rendered unfit for washing, and some other culinary uses. This is the kind of water which gives flesh boiled in it a red colour. But even the hardest water may be easily rendered perfectly soft, and fit for any use, by mixing with it a

small proportion of pot-ash, fixed salt, or, for want of these, the ashes of any burnt vegetables.

The animal and vegetable substances which are mixed with stagnating water putrefy, and taint that water. This taint is most effectually carried off by boiling, during which all the putrid particles evaporate: and whatever else remains in it will subside when it is cold. It may likewise be much mended by having air forced through it by means of Dr. Hale's ventilator; or it may be corrected by mixing with it acids, such as vinegar, juice of four fruits, spirit of nitre, vitriol, &c.

When there is neither running nor spring-water, artificial springs may be made in the manner thus pointed out by lord Bacon, who does not indeed say that he had experienced it himself; but it has been repeatedly tried since his time, and found to answer very well: "Upon a hanging ground, where there is a quick fall of rain-water, lay a half trough of stones, of a good length, three or four feet deep in the ground, with one end upon the high ground, the other upon the low. Cover this trough with brakes, to a good thickness, cast sand upon the top of the brakes, and you will see, after some showers are past, the lower end of the trough run like a spring of water." This will continue for a long time after the rain is past, "as if, says that great philosopher, the water did multiply itself upon the air, by the help of the coldness and condensation of the earth and the consort of the first water." A gentleman in France, whose mansion stood on a height far from any water, was advised to make a long ditch, about a fathom deep, in the neighbouring higher grounds, and to fill it with sand; he did so, and it continued to bring a plentiful supply of water, for all domestic purposes.

M. de la Hire observes in the Memoirs of the Academy of Sciences for the year 1703, that rain-water which has been purified by passing through clean sands, and is afterwards collected in subterranean reservoirs, will keep a long while without becoming putrid. He thinks this water the best that can be made use of, either for drinking, or for other oconomical purposes, because it is not impregnated with any mineral, as spring waters sometimes are. The only thing requisite in the construction of such reservoirs or cisterns is, to have a place which will hold water, made of such materials as will not communicate any bad quality to the water, which is to remain there a considerable time. The first water that falls from the roofs of houses when it begins to rain, should be thrown away; as having served only to wash the roof, which, in dry weather, is always covered with dung of birds, and other filth. He rejects snow-water for the same reason; and likewise the water of rain brought by winds which pass over places infected with ill smells, as large cities, links, &c. He computes, that water enough for the use of any family runs off the roof of the house which is inhabited by that family.

The buildings on the farm should be proportioned to the produce, especially as to store-rooms. The expence of building should be such, as that, in case of accidents, one, or at most, two years rent may repair them. The farm-house should be somewhat elegant, to give pleasure to its possessors, and, as Columella adds, to allure the wife to take delight in it. It should be built on the most healthy spot of the farm, in a temperate air, such as the middle of a hill commonly enjoys, where it is neither stifling in the summer, nor exposed to the rage of winds and storms in the winter. It may be seated near a quick running river, if the banks are high, and the channel clear of mud; but if the river is large, care must be taken to situate it so that the winds may carry off the vapours in summer, and the fogs in winter, which otherwise would prove hurtful to the health of men and cattle. The front of the house should be turned from such a river. In a healthy situation, a house should front the south east, which is shaded during the hottest part of the day in summer, and enjoys the morning sun in winter. A house facing westerly will have the morning fogs longer retained, and will be too much heated by the afternoon sun. In an unhealthy situation, the front should be turned toward the north.

In southern climates, where the sun is within a few degrees of being vertical in summer, and yet the country is subject to severe cold in the winter, as is the case of some of our North American colonies, a south front is rather convenient: for in the heat of summer, the sun, being high, passes over the roof from the east side to the west, and

and shines but little, or not all, in at the front windows, and very weakly, because obliquely, upon the front wall. But in the winter, being low, it shines full in at these windows, at a time when the cold renders its cheering presence quite agreeable.

Places in this kingdom intended for defence, before the invention of cannon, were built either on rising grounds difficult of access, or where they could easily be secured by moats filled with water. Villages and farm-houses were most frequently built in vallies, that they might be sheltered from stormy winds; or near brooks or rivers, for the conveniency of water. In general, every means have not been used to provide against the inconveniencies of these situations: though as Mr. Worlidge observes, "were we for the future but duly to observe the best situations of places, and the compleatest methods of building, in such houses as may hereafter be raised, our England would in a few years appear a kingdom beset and adorned with curious and admirable habitations, possessed by noble and ingenious inhabitants."

Houses built on too lofty a situation are exposed to the violence of the winter's storms, and to the scorching drought of the summer: yet we too generally find them without the only shelter their situation admits of, which is wood. The reason of this seems to be, that the inhabitants, finding that trees do not thrive well when they are first planted on dry heights, are at once discouraged. But where the plants are fenced from nipping winds while young, and protected from cattle till they become strong, such ground would be found abundantly favourable to the growth of trees which delight in a dry soil. "These, as Mr. Worlidge expresses it, would yield a cooling, refreshing, sweet, and healthy air and shade during the heat of summer, and very much break the cold winds and tempests from every quarter in winter."

One might be apt to think from the unhealthfulness of low and fenny countries, that moats full of water about houses should be prejudicial to health: yet many facts shew the contrary. In Numb. 310, of the Philosophical Transactions, a particular instance is given of two parishes which were surrounded with a morass, and yet were very healthy. Many houses surrounded with moats are drier than others in a seemingly better situation; for books and furniture are often less apt to grow mouldy in the former, than in the latter. Hence it would seem probable, that the unhealthiness of low marshy countries must arise, rather from the putrefaction of animals and vegetables in slow, moving, or stagnating waters, than from a too great moisture of the air, occasioned by the quantity of water evaporated. Of this Dr. Pringle gives a remarkable instance in his judicious and useful Treatise on the Diseases of the Army, when he says: "Another cause of the moisture and corruption of the air where the inundations made about the fortified towns since the commencement of the war; which were particularly noxious upon letting the water off in the beginning of the summer, after the preliminary articles of the peace were signed. For these grounds, which were once entirely covered, being now half drained and marshy, filled the air with moist and putrid exhalations. The states being made sensible of this, by the sickness that raged at Breda, and the neighbouring villages, gave orders to let in the water again, and keep it penned up till winter."

All physical writers point out the great danger to which health is exposed from a moist and warm air; especially if it be attended with a putrid vapour. Too much care cannot therefore be taken to guard against both. The too great moisture may probably be prevented by collecting all the waste water into deep ditches or ponds. We frequently see that ponds which have no supply of water but from rain, retain water during a very dry summer, when, according to the usual calculations of evaporations, the whole must have disappeared in half the time; from whence it seems more than probable, that the quick evaporation of water, in some cases, must arise from a heat reaching to, or affecting the earth under the water; and that, if care be taken to make the ditches or ponds so deep that the heat of the sun shall not warm the earth at their bottom, the quantity evaporated will be but small, and such will not be prejudicial to the health of the neighbouring inhabitants, if neither animal nor vegetative bodies are suffered to rot in them. The way to prevent this is by keeping the water free from grass, or other impurities, which may give shelter to animals, whose rot-

ting, as well as that of the grass, or of those impurities, communicates a putrid taint to the exhalations. It is in this case necessary, that the banks of ditches, or ponds, be sloped as little as the strength or stiffness of the earth will permit.

Though lofty and bleak situations are too often destitute of trees, villages built in vallies are as frequently too much crowded with them; which must be attended with the inconvenience of not having a free circulation of air, to carry off the moisture arising from the earth, and perspiring from so many trees. The ancients would have built such villages on rising grounds, to avoid the too sultry heat of the summer; or they would have preserved a free circulation of the atmosphere, to prevent the bad effects of a stagnating moist air.

On the first settlement of the English in North America, they imitated our custom of building in vallies, and near rivers; but experience soon taught them, that such places are more subject to the suffocating sultry heat of the summer, and, what they little expected, to a greater severity of frost in the winter, than rising grounds generally are. We have been informed by one of the most curious and intelligent observers of the laws of nature, of perhaps any man on that continent, that the cold there, in their hardest frosts, is found to be so severe in the vallies, to a certain height, as sometimes to kill every tender vegetable, while those on the higher grounds escape. This generally takes place to a regular determined height, above which the Americans now build their houses. If we be allowed to offer a conjecture concerning the cause of this, we should say, that the effect of the cold seems to be limited to the height to which the great moisture of the air arises at that season. In the hard winter of 1739-40, the same happened in this kingdom, when the frost was much less severe in its effect in the hilly countries, than in the low lands.

Dr. Pringle, in his excellent treatise before-mentioned, points out the disadvantages of planting so many trees as there generally are in most parts of the Netherlands. The same practice may be as justly blamed in many of the flat moist countries in England; especially where they border on marshes. Their speedy growth tempts the inhabitants to plant, at the side of their ditches, willows and other trees, which delight in a moist soil; and these not only prevent a free circulation of air, but also perspire a great deal of moisture. Dr. Pringle confirms this by the following instances.

"At Eyndhoven, two battalions of the guards were quartered in the town, and the third lay without, in the peasants houses, all within the compass of a mile; yet what was remarkable, this without the town had always three times more sick in the returns, than either of the other two, notwithstanding one of them had been very sickly the year before in Zealand. Now, the height of the ground being alike in all, the difference in point of health could be ascribed to nothing, but to the greater moisture of the cottages; for in all other points, these corps were equal as in diet, duty, and exercise. A similar case occurred in the cantonment of a regiment of foot, whereof one company being quartered in houses that stood upon a heath, enjoyed a tolerable degree of health, while the rest that dwelt in a wood were remarkably sickly. As a further proof how prejudicial it is to have the air confined by close plantations in so moist a country, it was observable, that the Dutch camp at Gilsen, bordering on our cantonment, but lying on an open heath, preserved a good share of health, while we were at the worst. It was not a little curious to observe, how the agues declined proportionably with the withering and falling of the leaf. At this time less moisture ascends, and by the shedding of the leaves, villages come to be more open and perslated, and of course more dry and healthful. While the troops were very sickly in Zealand, commodore Mitchel's squadron, which lay at this time at anchor in the channel, between South Beverland and the island of Walcheren, in both which places the distempers raged, was neither afflicted with fever or flux, and amidst all that sickness enjoyed perfect health: a proof that the moist and putrid air of the marshes was dissipated, or corrected, before it could reach them; and that a situation open to the winds is one of the best preservatives against the maladies of a neighbouring low and marshy country."

The driest spot in a low, flat, or fenny country should be chosen for a dwelling place. Even where there is gravel

or sand on the surface, care should be taken that the springs do not rise high. Dr. Pringle points out the necessity of this caution, from what he observed in the lower parts of Brabant, "which is a barren sand, where so little water is seen, that, at first sight, the country is deemed dry and heathful: but the appearance is deceitful; for water is every where to be found at two or three feet from the surface: and in proportion to its distance from thence, the inhabitants are more or less free from diseases."

Mr. Worlidge directs, that, in low, moist grounds, cellars should be made under the house, with good ceilings, or rather arched walls; for that this will conduce much to its dryness and healthfulness. The importance of rendering houses dry appears in many instances mentioned by Dr. Pringle: but we shall give only that in his twelfth page. "One quarter of Ghent, called St. Peter's-hill, stands high above the rest of the country; and in this, the barracks, having drains and free air, were quite dry; so that the men who lay there enjoyed perfect health. But the rest who were quartered in the low part of the town, where their barracks were mostly the ground-floors of waste houses without drains, and of course very damp, were all sickly."

The bed-chambers, in such situation, more especially, should be in the driest and most elevated part of the house, and where the morning sun may contribute most to keep them dry. If they are so situated, that the sun does not warm and dry them, they should be frequently aired with fires; the oftener in proportion to the greater dampness of the place: for this has been found to contribute greatly to the health of the inhabitants. We are informed by a gentleman who has experienced it in many instances, that, by this sole precaution, he has preserved several families from the ague, when that distemper was very epidemic in the neighbourhood. How much the dryness of bed-chambers contributes to health is confirmed by what Dr. Pringle observes to have happened at Bruges, where the soldiers that lay in the upper stories kept their health remarkably better than those who were below on the ground floors.

As brick walls render houses drier than those of stone, and of a more equal warmth than plastering, Mr. Worlidge directs, that, "where bricks can be had, the walls should be built with them, as may be done with little cost, if you raise firm and strong columns at the corners of the house, and where it is necessary to support the main beams. You may build these square, and between them raise the walls with the same materials, and work them up together with the corners and columns, leaving one half of the extraordinary breadth of the column without, and the other within the walls, whereby you will save much charge in materials and workmanship, and yet your house will be firm and strong."

We are too little attentive to the situation of houses with regard to rivers; though a judicious choice in this must be of great consequence to the health of the inhabitants. A quick flowing stream, with clean channel and dry banks, will rather add to the beauty and healthiness of a country; but oozy banks, over-run with reeds or other strong coarse grass, should be carefully avoided, as being a shelter to all manner of putrid filth, whence unsalutary vapours must arise. It is a general opinion, that it is safer to dwell on the north than on the south-side of a river; but experience seems to prove the contrary, especially in warm climates. Marshes, which are sometimes overflowed with salt water, are found to be more unwholesome than fresh water marshes. Their neighbourhood should, therefore, be carefully avoided.

The Romans were universally agreed, that it was much better to occupy a small farm than a large one; and laid it down as a rule, that the farmer ought to be stronger than the farm; because in the struggle which will arise between them, if the farm be too strong for the farmer, he must be ruined; that is, if the extent of the farm be such that he cannot bestow a due culture on every part of it, he must be a loser: for, as Columella remarks, "it is certain, that a large tract of land, not rightly cultivated, will yield less than a small space well cultivated."

A judicious correspondent of the editors of the *Museum Rusticum* rightly observes, that the stocking of a farm is a point of great importance, and requires as much judgment and foresight as any other point in husbandry.

"The bad success of great numbers, continues he, is owing to their not having a sufficient sum of money to begin with, which inevitably involves them in difficulties, and reduces their profit on every article of their produce. Their farm is understocked; they sell at a constant disadvantage; their fields are not half cultivated; and in a short series of years, unless some lucky hit sets them up, they grow poor, in spite of all possible industry, judgment, and application.

"Even a low and easy rent will seldom remedy the want of money at setting out.

"The want of judgment, in proportioning the quantity of each particular kind of stock to the quantity and nature of the lands of a farm, is also attended with great loss.

"For instance if a farm requires four horses, or two ploughs, and the farmer keeps only three, or a plough and a harrow, his fields cannot be sufficiently cultivated, even according to the ideas of culture common among farmers; and of course in a few years his lands must be in very bad order, to his great annual loss.

"On the contrary, to overstock himself with horses, is to keep what will inevitably eat him out of a house and home: expences attending them are very great, and if they are not kept constantly at work, their owner must necessarily lose by them. But it will not be amiss to explain myself more particularly on this head.

"I am speaking at present of the practice of farmers, some of whom overstock themselves with horses, without giving their lands extraordinary stirrings on that account. If a farm, which commonly requires three horses, has four kept, and is consequently ploughed and harrowed proportionably more, the farmer will be no loser by his fourth horse; but the case is very different when he is kept without being worked to the best advantage of the farm.

"It is not to be at once perceived how much is lost by not having the number of horses proportioned to the land; nor can this always be done.

"A farmer may find it necessary to keep four horses, and when he has got them, it is a chance but he could perfectly well manage several fields more with them; and when a man has an opportunity of hiring additional fields, then should his judgment come into play, to take no more than his old stock will manage to advantage, unless he has a sum of money ready to make an addition to it.

"The same ill consequences attend either over or understocking a farm with all other cattle: and it would be the farmer's advantage was he always to remember, that three beasts, of any kind, well fed, pay better than four without their bellies full. On the contrary, not to keep the stock necessary, is to submit to a constant loss. Both these sorts of conduct are frequently followed, to the great unprofitableness of farming.

"The proportion of the pasture and arable lands of a farm is of great consequence towards the occupier's making a profit of his business.

"The unprofitable practice of ploughing up pastures, and not laying them down again, which is so universal in this country among farmers, whenever their landlords will allow it, tends perpetually to impoverish them. They are all, to a man, mad after ploughed lands, and would willingly break up every acre of grass in their farms.

"So general an opinion among them would make one think the practice really profitable; but the contrary appears beyond all contradiction to be the truth; I mean, according to the culture at present pursued in this country.

"Two thirds of the land of a farm in a rich country should be grass; and a little one had better all be so. The vast expences of the plough, without doubt, keep many farmers poor, who, if their farms were grass, would not run half the hazard, and enjoy a much better income.

"Particular points of bad management, for want of sense or knowledge, through slovenliness, idleness, or other obstructions, to any profitable husbandry, are not what I mean to speak of here, since they are so very various, and so totally ruinous, that no reasoning can be conclusive, unless all such exceptions are made.

"The improper quantity of land in a farm is often against the farmer's profit.

"Very large tracks, of two or three thousand acres, which

which are common in Norfolk, are too extensive for one farm. It is impossible for one man to cultivate such a quantity of land well: much of it must be neglected, and but little perfectly managed.

"Great profit, indeed arises from most of these farms; but they take a very large sum of money to stock and manage them properly.

"Very small ones, unless the farmer does the whole business himself, are equally liable to objection. The medium, which is ever in proportion, the most profitable, is that quantity of land which will admit of being stocked and farmed without the want either of any addition or diminution. What I mean is this:

"Let us suppose a farm to consist of seventy acres of land, twenty of them grass, and the rest arable, in a rich country, the land from ten to sixteen and seventeen shillings *per* acre; the occupier must keep one servant, and if he does not work hard himself, one labourer all the year, besides some additional help at busy times.

"I know there are many slovenly men, who cultivate (if their management deserves that name) such farms with fewer hands than I have mentioned; but their conduct can be no rule to good farmers. Four horses are also necessary for such a farm.

"Now, for the same standing expences of servants wages, horses, &c. the same number of ploughs, harrows, tumbrils, waggons, &c. &c. one hundred acres, or better, might be farmed with the same proportional profit: in this case, therefore, the tenant of seventy acres loses considerably for want of thirty or forty more. Indeed, we seldom meet with a farm nicely proportioned to the stock on it.

"There are many very evident reasons why farming should prove unprofitable to gentlemen who undertake to cultivate a part of their estates, whether for their amusement or convenience, or, generally speaking, even for profit.

"A very fine Norfolk farm, of a large extent of country, the rent exceeding low, and a gentleman willing to be at the expence of marling, in such a case, there is no fear of a considerable profit, even without perpetual attention: but in common farms, in rich countries, no profit can arise to any gentleman that does not give the business constant attention, and descend to *minutiæ*; which may be too disagreeable for him to submit to.

"What I mean by profit, is not making the rent which he might receive from the tenant without trouble, and without hazard; but that additional sum which is the farmer's profit after his rent and all expences are paid. This is scarcely ever made by gentlemen, who farm either for convenience or amusement; and, excepting grass grounds, I am persuaded they lose considerably by keeping land in their hands. The plea of growing enough for family use of wheat, oats, &c. is a mistaken one; they had better by far buy every article, than have any thing to do with the plough.

"When I am told that farming answers to gentlemen, who I know do not give the farmer's attention to the business, I never believe it, or, at least, am persuaded that no regular accounts are kept. It will not be difficult to produce some good reasons for this incredulity.

"It should be remembered, that the farms which gentlemen keep in their own hands are seldom above fifty, sixty, seventy, or an hundred a year, and not often so much. It is no easy matter for a farmer, with industry, sobriety, and application, to make above a rent profit in such a farm; and I believe but seldom so much. This is, with every advantage of understanding his business, applying close to it, and doing some work (if his farm is small, a great deal) himself: how unlikely is it therefore that a gentleman, who may probably want these advantages, should make near that profit, or, indeed, any at all!

"In the first place, a principal part of his business, his buying and selling, is transacted by his bailiff, or head servant, who must be paid for his trouble. He may be lucky enough to meet with an honest one; but I would never advise any one to let the profit of his farming depend on the honesty of other people. Suspicion, to the open generous mind, is irksome and grating: but the farmer should set out with the maxim of Descartes—to doubt of his very existence, and suppose every man a knave till he finds him honest.

"But there are many inconveniencies, besides these, in trusting to bailiffs.

"The gentleman we must certainly suppose to be ignorant of farming; and he is then, of course, in danger

of having an ignorant servant, without the ability of detecting him. However, the single expence of a bailiff, or a head servant, which are much the same, is too great to be kept constantly for a small farm; and in their absence the gentleman must depend on himself.

"This is palpably no dependence at all; for can it be expected that he will forego his diversions, his excursions of pleasure, the company of his friends, the joys of society, to attend to his farm? I could almost as soon believe, that his wife would renounce an opera or a ball for the pleasure of dancing attendance on her butter and cheese in the dairy. The rural joys of romance are pretty much out of date now; and, alas! there is a great difference between the employment of a farmer's wife in England, and keeping sheep in the plains of Arcadia.

"But to return:

"There are, even in a small farm, a thousand objects which require constant attendance.

"Cattle of no kind will thrive but in the master's eye: every variation of the season to be remarked; the lucky moment for ploughing, harrowing, sowing, reaping, &c. to be caught, and used with diligence and foresight; fences are for ever to be attended to; and, in short, a million of other things, which require constant thought and endless application.

"That single article, the employment of labourers, will alone run away with the profit of the whole farm.

"But surely it appears plainly, from what I have said, that the unprofitableness of farming is scarcely ever owing to the art itself, but to the mistakes of those who practise it.

"As I have been so particular in distinguishing several points by which the followers of it lose, I shall now trespass a little longer on your patience, and give my sentiments on the custom of gentlemen's farming, in other respects than that of profit, to those who are not solicitous about it, and in relation to it, to those whose fortunes will not allow an indifference to such a point.

"It is scarcely possible for a gentleman to live in the country without finding many inconveniences in not keeping a team of farming horses, with waggons, carts, &c. and other implements used in the business of husbandry. While profit is not considered, there will flow a multitude of agreeable circumstances from farming, which will have some relation to almost every particular of a country life.

"In respect of entertainment, what more rational, or more amusing, than country business, without the anxiety of caring for profit! The public good calls loudly to all gentlemen to keep some land in their hands, that experiments may be made, and modes of agriculture pursued, different from the practice of the neighbourhood, for the farmers, at least, to see that their own customs are not the only good ones, and that there are improvements to be made even on their practice.

"All the improvements and new inventions in agriculture come from gentlemen; scarcely one, that I ever heard of, is known to have been discovered by farmers.

"I do not wonder at this; for I think it is natural enough; but the same time, it is a strong reason for gentlemen's farming, whether they make profit by it or not. The extensive use of manures, and introducing a garden culture into the field-husbandry, were the effects, among a hundred other instances, of gentlemen's farming.

"But if the public good was not to be considered, yet the mere amusement of farming to a gentleman of fortune, who has the least taste for country business, must plead warmly for its practice. Such farmers soon make a garden of their estates, at the same time that they improve the value of them.

"What can be more amusing than experimental agriculture? trying the cultivation of the new-discovered vegetables, and all the modes of raising the old ones; bringing the earth to the finest pitch of fertility, and growing plants infinitely more vigorous and beautiful than any in the common tillage; using the variety of new machines perpetually invented, and observing their effects; and, in a small extent of ground, see the growth of an infinite variety of vegetables, unknown in the common practice; perpetually enjoying the neatness of husbandry, that *simplex munditiis* of farming, which gives the most beautiful colouring to every object around, and pleases the refined imagination with the enchanting prospect of all the elegance of nature.

"Those

"Those gentlemen of small fortunes, who if they practice any thing of farming, find it necessary not to be indifferent to profit, have many points to consider.

"Such a one should remember, that though a farm will afford amusement, it will not yield profit without application. A constant attention to every article is highly necessary. He should keep the exactest accounts, and make memorandums of what knowledge he can pick up. For a few years he must employ a bailiff; and he will find that every day and hour will increase his own knowledge, if he is attentive to business." *Museum Rusticum*, vol. IV. p. 264.

Mr. Marshall, in his Minutes of Agriculture, remarks, that public paths are nuisances of arable land. Fields of various soils are very inconvenient. Small stragling fields are extremely disadvantageous on a plow farm. Incontinuity of arable land, robs the farmer of both pleasure and profit. It is inconvenient to have more than one farm yard. If incontiguous arable land be foul and poor, it is barely worth the labour of cultivation. An adjacent common is highly advantageous. Wet land is the bane of farming. It is very unprofitable to hold farms under different landlords. There are many advantages of a ring fence farm. There are great advantages as well as disadvantages, in farms of various as well as in those of uniform soils. A dry loam, culturable by whip-reins, is a most desirable farm. A compost-farm requires more team-labour than a folding-farm. He concludes his remarks with, "do not add farm to farm," he then adds, "dung-yards ought to receive no extraneous water; barn-room is particularly useful in a showery harvest; a distinct chaff-house relieves the barn-floors; and granaries should always be situated under the farmer's eye."

We shall conclude this article with the following

"*Prices of Implements of Husbandry, Corn, and Farming-Work, in the North Part of Hertfordshire, about Hitchin, Baldock, and Stevenage.*

- A waggon complete, from 16 to 20 l.
- A cart complete, from 8 to 10 l.
- A two-wheeled plough complete, with draught-chain, and splinter-bars, or whipple-trees, 3 l.
- A wheat two wheeled sowing-plough, as the same wheels serve for both, 1 l. 1 s. 6 d.
- A foot, swing, or dray-plough complete, 1 l.
- A roller complete, 15 s.
- A five-barred harrow ditto, 17 s.
- A four-barred harrow ditto, 15 s.
- A three-barred harrow ditto, 12 s.
- First ploughing per acre, 6 s.
- Second ploughing per acre, 5 s.
- Harrowing per acre, 6 d.
- Rolling per acre, 4 d.
- Hoeing turnips per acre, 4 to 5 s.
- Hockling, or cutting up and raking haulm, 2 s 6 d. per acre.
- A harvest-man has per month from 33 to 40 s. and his diet.
- A ploughman, for a day's work, 8 d.
- A labourer, 1 s. per day, and small beer.
- Price of threshing per quarter, wheat 2 s. barley 1 s. oats 9 d. pease 1 s. 4 d.
- Price of horses, from 5 to 15 l.
- Price of cows, from 3 to 8 l.
- Price of sheep, from 10 to 20 s.
- Hogs, from 5 to 40 s.
- Wheat per load, 30 to 35 s. Five bushels make a load, and eight loads, or forty bushels, a waggon-load.
- Barley, 24 s. per quarter.
- Oats, 16 s. per quarter.
- Pease, 17 s. per load.
- Thatches, or vetches, 25 s. per load.
- Malt, 4 s. 6 d. per bushel.
- Note. Our bushel is nine-gallon measure.
- Turnip-seed, 3 d. per pound.
- Red clover-seed, 4 d. per pound.
- Trefoil-seed, 2 d. per pound.
- Cinquefoil seed, 4 s. per bushel.
- Wheat-straw, 10 s. per load.
- Barley and oat-straw, 6 s per load.
- Cinquefoil-hay, per hundred, 2 s. 6 d.
- Clover-hay, per hundred, 2 s. 6 d.
- Thatching per square, yelning and serving included, 2 s. 6 d.

A carpenter per day, 1 s. 8 d.

A bricklayer ditto, 1 s. 10 d.

Brick at the kiln, 17 s. per thousand.

Plain tiles, 17 s. per thousand.

Pan-tiles, 10 s. per hundred.

Lime, 6 d. per bushel.

Tiling-lath, 2 s. 10 d. per bunch.

Plastering-lath, 1 s. 5 d. per bunch.

Hurdles per dozen, 8 s.

Faggots, from 6 to 16 s. per hundred.

Making, plashing, and laying live-hedges, and ditching, 4 d. per pole of sixteen feet and a half." *Museum Rusticum*, vol. IV. p. 78.

FARM-YARD, the place adjoining to the farm-house, where cattle are foddered, and several other necessary works, belonging to the farm, are performed.

FARTHING-DALE, or *farding-dale*, the fourth part of an acre of land, now generally called a rood.

FATHOM, a long-measure containing six feet.

FATTENING CATTLE *on grains*. Mr. Marshall, in his Rural Economy of the Midland Counties, says, "that at Burton, several hundred head of cattle, mostly cows, are annually fattened with hay and grains, the produce of the brewery of Burton ale; which being brewed of singular strength, and, in the ordinary practice, little small-beer being made after it, the grains are of a very superior quality. They are mostly used fresh from the vats; sometimes warm, but never hot. When a redundancy happens, the overflowings are laid up in casks and bins covered up with mould. With these stale grains, malt-dust is generally mixed. The usual quantity of fresh grains, a bushel a day; with about half a hundred weight of hay a week. From five to six months is reckoned a moderate time for lean cows to get good meat with this keep." Mr. Marshall also recommends turnips for fattening cattle.

Mr. Young, in his Annals of Agriculture, vol. III. on the subject of fattening cattle, observes, that, "to take hogs half fat, from corn, and put them to potatoes, without checking their progress in the least, is quite a new discovery of Mr. Le Blanc's, and proves the value of it too clearly to admit a doubt. Does not this remarkable fact bring the recollection of another similar one, that of bullocks put lean to turnips doing very badly, but going on rapidly when put half fat to them? thus connected, these facts seem to suggest a general rule applicable to all animals, and totally contrary to all common ideas, which have hitherto directed to improve the food of a fattening animal as he advances; to give him the worst first, then better, and the best at last. The contrary it should seem, ought to be the mode: first to get the hog or bullock half fat as fast as you can with the best food you can give him, and then he will go on and thrive upon any food. Let me observe, that I have often remarked in my own farm yard, that beasts put from grass to straw (and sometimes bad straw) which have been in very good order, have thriven and kept to their looks infinitely better than others that came in quite lean and poor; but according to common notions, the former should fall away upon the change, which is contrary to fact. But let us carry the idea still further, and see if these facts thus connected do not seem to unite with another seemingly very different one. It is Mr. Bakewell's system (and I believe a very just one) that a well made animal, which shews in his form a disposition to fatten, will thrive better upon the poorest food, though changed to such food from better, than an ill made poor animal that never knew any better."

FEABES, or *feaberries*, gooseberries.

FEBRIFUGE, having the power of curing fevers. See FEVERS.

FEBRUARY, the second month of the year.

This is a principal seed month for such as they commonly call lenten grain, and is usually subject to much rain or snow, which is not unseasonable.

Now sow all sorts of grey pease, fitches, beans, and black oats: in dry weather carry out dung, and spread it before the plough, and also on pasture ground: this being the principal month for that purpose.

This is a very proper time for planting trees and quicksets, and also to plash them; to set willows, plants, or pitchers, and also poplars, osiers, and other aquatics; and to lop trees, or cut coppices.

Sow mustard-seed, and hemp-seed, if the spring prove mild: feed your swans, and make their nests where the floods cannot reach them.

Soil such meadows as you cannot overflow, or water; catch

catch moles, and take great care of ewes and lambs where they are forward. *Mortimer's Husbandry*, vol. II. p. 413.

FEED, the quantity of oats, &c. given to a horse or other animal.

FEEDING of cattle. See the article **CATTLE**.

FEET, the bases or supports of an animal.

The knowledge of the feet is of the utmost importance in purchasing a horse. Nor is it enough that the creature have a well-proportioned foot; for if it chance to be thin or weak, the buyer will be disappointed in his expectations; as such a foot is liable to be spoiled in shoeing, by travelling on hard stony ground, by too much drought in hot seasons, or by too much moisture in winter. A thin foot is that where the crust or horn is thin. This may be very easily seen when the shoe is taken off, because the verge all round the sole will appear thin; and where it is so, a horse will wince with the least touch of the pincers. The heel and frog are also apt to be soft and tender to the touch, and by reason of the weakness natural to such a kind of foot, it often turns awry, and one point of the heel stands higher than the other.

FELL, the skin or hide of a beast.

FELLING, the act of cutting or hewing down.

When any tree is intended to be cut down for timber, the first thing to be taken care of is a skilful disbranching, or lopping off, such limbs, as may endanger it in its fall, many trees being frequently spoiled for want of a previous care of this kind; and therefore in very large arms, chop a nick under them close to the bole, and then meeting it with downright strokes, it will be severed without splitting. Take care also to cut the tree as near the ground as possible, unless you design to grub them up, the doing of which will be of advantage both to the timber and to the wood; for timber is never so much valued, if it be known to grow out of old stocks.

M. de Buffon has very justly observed, that the trees intended to be felled for service, should first be stripped round of their bark, and then suffered to stand and die upon the spot before they are cut. For by this means the sappy part, or blea of the tree, becomes as hard and firm as the heart; and the real strength and density of the wood has been proved, by many experiments, to be greatly increased by it.

FEN, a general name for boggy, moorish, or marshy land, generally overflowed with water. See the articles **Bog**, **DRAINING**, **MARSH**, and **MOOR**.

FEN, is also the name of a very pernicious distemper to which hops are subject. It consists of a quick growing mould, or moss, which spreads itself with great rapidity, and occasions dreadful ravages in the hop grounds. See the article **Hops**.

FENCE, a hedge, wall, ditch, bank, or other inclosure, made round fields, woods, gardens, &c.

No forest trees should be admitted into the hedges that divide fields, as their shade, and wide extending roots, are found very injurious to corn, grass, and even to the hedge itself. But in countries where, instead of hedges, the fences are chiefly made of rough flakes of stone, piled dry every one upon another, or a little earth thrown in between them, to fill up the chasms, a plantation of trees within these walls will hide their deformity, and give a warmth which cannot be expected from such walls.

The most usual way of inclosing land is with a ditch and a bank set with hawthorn, crabs, black thorn, holly, or white thorn, commonly called quick. Mr. Miller's instructions in this respect are very full, and contain among others, the following directions:

"It will be proper before planting, to consider the nature of the soil, and what sorts of plants will thrive best in it; and also what the soil is from whence the plants are to be taken: for if the ground they are taken from be better than that into which they are to be put, it will be more difficult to make them grow. Those which have been raised on the spot near the place where they are intended to be set, will always do best, if they are to be transplanted; and the next to them will be such as are taken from a nursery.

"I would recommend the white thorn, the black thorn, and the crab, for outward fences to good ground: but I do not approve of intermixing them.

"The white thorn is the best quick to plant, because it is the most easily procured, is very hardy and durable, and may be rendered the closest of any fence, by proper

clipping. It, therefore, is preferred to all others for outward fences, or for the division of fields, where they are exposed to cattle, &c. It may be raised either from sets or from seeds. The former is the most common way of propagating it: for the latter, which may very properly be sown where the hedge is intended to stand, do not rise till the second spring. The white thorn will thrive on almost any well loosened soil, except the driest gravel or sand.

"The black thorn and crab make very good fences, and are to be raised in the same manner as the white thorn: but if the kernels of apples or crabs be sown, it is best to sow the pomace with them; for they will then come up the sooner, that is to say, the first year.

"The black thorn is not accounted so good for fences as the white thorn, because it is apt to run more into the ground, and is less certain as to the growing: but, on the other hand, its bushes are much better, and more lasting, than those of the white thorn, or indeed any other shrub, for dead hedges, or to mend gaps: nor are they subject to be cropt by cattle, as the others are. The richer the mould is, the better the black thorn will prosper: but it will grow on the same sort of soil as the white thorn.

"The holly makes an excellent fence, and is preferable to all the rest; but it is difficult to be made to grow at first, and is a slow grower. However, when it does grow, it makes amends by its height, strength, and thickness. It delights most in strong ground: but will grow upon the driest gravel, even among rocks and stones. It is raised from sets, or berries, like the haws of the white thorn, and lies till the second spring before they come up. These two are best sown in the place where they are intended to stand. They should be well weeded, both before they come up, and afterwards, till they are grown to such a size as, of themselves, to kill the weeds.

"French furze will make good hedges upon dry sandy banks, where few other plants will grow; but they must be kept very clean at the bottom, and never suffered to grow too high: nor should they be clipped either in dry weather, late in autumn, or early in the spring; because the cutting of them at those seasons is apt to make them die in patches, which is irrecoverable; as no new shoots will here ever proceed from the old wood.

"Alder planted on a bank, the side of which is washed by a river or stream, will make an extraordinary fence, and preserve the bank from being undermined by the water; because the alder is continually putting forth from the lower roots, suckers, which are of great advantage where the current of the water washes away the earth.

"If there is to be a ditch along the hedge, that ditch should be at least six feet wide at top, three feet deep, and only one foot and a half over at the bottom, that each side may have a proper slope; for where its sides are dug too perpendicular, they are very apt to fall in after a hard frost, or heavy rain: and if the ditch is made narrower than here directed, it will soon be choaked up in autumn, by the falling leaves, and the growth of weeds; nor will it be a sufficient defence for the hedge against cattle.

"When the bank at the side of this ditch is to be planted with quicks, the sets ought to be about as thick as a goose quill, and their tops should be cut off within four or five inches of the ground. They should be fresh taken up, straight, smooth, and well rooted. Part of the turf taken off the surface of the ground where the ditch is to be dug, should be laid, with the grassy side downward, on the side of the ditch, where the bank is intended to be made, and some of the best mould should be laid upon it, to bed the quick. The sets of quick, prepared as before directed, are then to be laid upon that mould, a foot asunder, with their cut ends somewhat sloping upward. When this first row of quick is thus laid, it must be covered with mould; some of the remaining turf must then be laid upon that mould with the grass side downward, as before; and more mould must afterwards be laid upon this turf. When the bank has, by these means, been raised about a foot high, a second row of sets should be laid in the spaces between the lower quick, and with their ends turned the opposite way, in order to thicken the bottom of the hedge. These are then to be covered in the same manner as the former: the bank is to be topped with the bottom of the ditch; and a dry or dead hedge must be made on the other side, to defend the young plantation from cattle.

"To make these dead hedges, stakes should be driven into the loose earth, so low as to reach the firm ground. They should be about two feet and a half asunder. Oak stakes are reckoned the best, and black thorn and fallow next. When they are fixed, small bushes should be laid at the bottom, but not too thick; for that would make the bushes rot. The upper part of the hedge should be laid with long bushes to bind the stakes in, by interweaving them: and, to render this hedge yet stronger, it may be eddered, as it is called, that is, the tops of the stakes may be bound in on each side, with slender long poles or sticks. When this eddering is finished, the stakes should be driven anew; because the doing of that, together with the weaving of the hedge, will probably have loosened them.

"The quick must be kept constantly weeded, and secured from being cropped by cattle, and in February it should be cut to within an inch of the ground; for this will make it shoot strong, and greatly help its growth.

"When a hedge of this kind is about eight or nine years old, it will be proper to plash it; the best time for which is in October or February.

"After it has stood twenty or thirty years, and there is in it old stubs, as well as new shoots, those stubs should be cut sloping off within two or three inches of the ground, except the best and longest of the middle size, which should be left to lay down, and some of the strongest, which should be cut off at the height of five or six feet, according to the intended height of the hedges. These last may be left to serve instead of stakes, and fresh stakes should be put wherever they are wanted. The hedge should be thinned, so as to leave on the stubs only such shoots as are designed to be of use, that there may be room left to put a spade in between them, in order to give the earth as good a stirring as possible. The ditch also should be cleaned, and its slopes carefully repaired; and where the earth has been washed from the roots of the quick, or is hollow, it should be faced anew with so much of the first spit of earth as there is occasion for: the second spit of this earth should be laid on the top of the bank; for if it be laid on the side or face of the bank, it will slip again into the ditch when wet comes, and perhaps drag down a great deal of the bank.

"Two extremes are to be avoided in the plashing of quicks: the first is, the laying the plashes down too low, and too thick; because that makes the sap run wholly into the shoots, and leaves the plashes without nourishment, which, with the thickness of the hedge, kills them. The second is, not to lay them too high; because this draws all the sap into the plashes, stunts the shoots at the bottom, and renders the hedge so thin, that it will neither hinder cattle from going through, nor from cropping of it.

"When the shoot designed to be plashed is bent, give it a small cut with a bill, half through, slanting a little downward; then weave it about the stakes, and trim off the small superfluous branches that straggle too far out on either side of the hedge.

"If the stubs are very old, cut them quite down: secure the chafms with a good dead hedge on each side, till the young shoots are got up tall enough to plash; and plant new sets in the vacant spaces.

"If the bank for a fence be without a ditch, and it is intended to make a hedge of quicks, the sets, prepared as before, should be planted in two rows, almost perpendicular, at the distance of a foot from each other, in the quincunx order; so that in effect there will be only six inches asunder." *Miller's Gard. Dict.*

Mr. Marshall, in his Minutes of Agriculture, in Norfolk, makes the following observation. "October 28th, 1782. This morning I observed some workmen fencing a rick-yard with furze-faggots alone: a species of fence I have not met with before.

"In a trench, about eighteen inches wide, and six inches deep, they set the faggots, as close as possible, upon their ends; spreading the bottoms, and covering the skirts with the loose mould dug out of the trench; also with that of a narrow trench, (a spade's width) dug for the purpose, on each side; treading the mould firm to the roots of the faggots; which being sufficiently loaded, the trench-lets were shovelled, and the banks smoothed.

"One of the labourers says, he has set a furze-fence in this manner across Gresham-field (an exposed situation): which has stood one or two winters.

"Furze-faggots, thus placed, are a fence against every kind of stock; even hogs and hares; and, in a country over-stocked with the latter, might frequently be used, as a temporary fence, with great advantage."

When the plants of the thorn are themselves stunted, or much decayed, as they generally are pretty soon, through the unmerciful wounds given them by unskilful hedgers; instead of plashing them, the farmer's best way will be to dig them up, and plant young sets in their stead. The only inconvenience attending this renewal, is the expence of a dead hedge, which is not wanted in plashing: but I question much, whether the healthiness of the plants, when cut smooth, and in such a manner as not to retain water, may not sufficiently compensate that charge. For the same reason, it seems to be most rational to cut the plashes upward; because the wound will then be covered from the wet, at least in some degree, by the slip which remains prominent over it.

Besides the plants already mentioned for hedges, the sweet-briar, or eglantine (dog-rose), is thus recommended by a correspondent of the Society of Improvers in the Knowledge of Agriculture in Scotland, who had tried in vain, in that country, all the methods of fencing usually practised in Hampshire and Essex.

"Observing that no creature eat up or destroyed the sweet-briar or eglantine (dog-rose) I gathered the hips of this plant, and laid them in a tub till March: the seeds then rubbed out easily, and I sowed them in ground prepared for garden-peas. By this means I got my crop of peas without prejudice to my briars, which came up the next year; and the year after, when they were about a foot high, I planted them in the following manner:

"After marking out my ditch, I laid my plants about eighteen inches asunder, upon the side-grass, and covered their roots with the first turfs that were taken off the surface of the intended ditch. The earth-side of these turfs was placed next to those roots, and upon the turfs was laid other earth, taken out of the ditch, which I then finished. In four or five years, these plants made a fence which no sheep, cattle, or horses could pass. If old briars are dug up, and divided, they make excellent plants. Where the fences are thin, they may be easily thickened, by laying down branches; for these will make shoots of six or seven feet in a year. They bear clipping very well.

"In sandy places, I seldom care to throw all the earth out of the ditch at once, but wait a year, till what I had thrown up is settled and swarded a little; then I raise my bank to the intended height. In the mean time nothing hurts my briars; and in two or three years after they have been planted, nothing can pass the fence. Sheep sometimes attempt it; but they soon are so entangled, that they would lie there till they die, if they were not taken out."

In the hedges which divide the farmer's fields only, fruit-trees may be planted; and these will yield profit, as well as ornament; or the fruit may be grafted upon a stock in the hedge, properly suited thereto.

These stocks should be pruned up every year, till they are brought out of the reach of cattle, and then they may be grafted with the red-streak, gennet-moile, or any other fruit. If they have proceeded from apple-kernels, they may remain ungrafted, and will yield very good cyder-fruit: but then it will be longer before they bear. Also, if the leaf, shoot, and bud of a natural stock, promise more than common, a trial may be made, whether that stock will not perhaps produce a fine new fruit; and if it be not liked afterwards, it may then be grafted.

Mr. Miller reckons, the plants raised from the kernels of the small wild crab is much better for hedges, than those which are raised from the kernels of any other sort of apple; because the former never shoot so strong as the latter, and therefore may be better kept within the proper bounds of a hedge; and as they generally have more thorns upon them, they are better guarded against cattle.

Mr. Young, in his Annals of Agriculture, vol. VI. observes, that "Mr. Bakewell is very curious in his fences, and plants his quicks in a different manner from what is common in various parts of the kingdom. He plants one row at a foot from set to set, and, making his ditch, lays the earth which comes out of it to form a bank on the side opposite to the quick. In the common method, the bank is made on the quick side above it. Reasons are not wanting to induce a preference of this method. The plants grow

only

only in the surface earth, uncovered from the atmosphere, which must necessarily be a great advantage; whereas, in the usual way of planting that earth, which is always the best, is loaded by a thick covering, obliquely, of the earth out of the ditch. If the roots shoot in the best soil, they will be out of the reach of the influences of the air, the consequence of which is, they cannot have so large a space of that earth, as if set on the flat. The way to have a tree, or a quick, thrive in the best manner possible, is to set it on the surface, without any ditch or trench; that cuts off half its pasture. But if a ditch is necessary, the next best way must of course be still to keep it on the flat surface; and the worst way, to cover up that surface, by loading it with the dead earth out of a trench. To say that there are good hedges in the common method is not a conclusive argument, unless both were tried in the same soil and exposure.

"In some cases, however, there is in this country, and Mr. Bakewell's farm is not free from it, a great waste of land, in making new fences. The ditch and bank are made as I have described, and then there are added a double post and rail, one on the outside of that bank, and the other on the outside of the quick, which altogether take up an enormous space of land."

Mr. Young, in his *Annals of Agriculture*, inserts the following new method of fencing, by W. Erskine esq.

"The importance of good fences is universally acknowledged by every lover of husbandry, although there are various opinions about the kinds of them, every one being naturally prejudiced in favour of those he has been most accustomed to see, or by the opinion of others whose judgment he relies on. An intelligent correspondent, in the second volume of the Bath papers on Agriculture, is so warm an advocate for quickset hedges, as to make him totally condemn the dead walls which are to be seen on the road between Bath and Cirencester, and in many other parts in England. I hope he will not take it amiss, if I cannot absolutely assent to his assertion, "that quickset hedges are more useful and profitable;" that they are more ornamental cannot be denied, and they are generally allowed to afford more shelter, but the length of time, the constant attention, and continual expence of defending them until they bear even a resemblance of a fence, induces many people in those places where the materials are easily procured, to prefer the dry stone walls; for though the first cost is considerable, yet as the farmer reaps the immediate benefit of the fence (which is undoubtedly the most secure one), they are thought on the whole to be the least expensive; besides, the cattle in exposed situations, and especially in these northern parts, are so impatient of confinement at the commencement of the long, cold, wet nights, that no hedges I have ever yet seen in any part of this island, are sufficient to keep them in. These inconveniences probably suggested to the late sir George Suttie (eminent in East Lothian, for his love and skill in agriculture) an idea of a fence, that at once joined the warmth and ornament of the hedge with the almost perpetual fence of the wall.

"If I mistake not, you have in some of your useful works, recommended hedges to be planted against the common dry stone walls: sir George Suttie has rather improved on this thought; he planted his hedges after the common method here, in the face of the ditch; but instead of putting a paling or post and rail on the top of the bank, he placed a wall of two feet and an half high; his local situation induced him to build with lime, and in places where that commodity is tolerably reasonable, it is the best method, as the satisfaction they afford by requiring no repairs, and the duration of them more than repays the expence; but where the price of lime is high, they may be built without any cement, and answer the purpose very well, if the work is properly executed.

"I have now experienced the benefit of these fences for some years, so that I can, with great confidence, venture to recommend them; indeed their superiority over all others is so manifest to every one who has seen them, that they are daily becoming more and more common in this country. As it would afford me great pleasure, if I could by any means extend the benefit of them to those gentlemen, whose situation are peculiarly adapted for them, I have endeavoured to render the making of them easy by the inclosed sketch and description; which if you think sufficiently plain and intelligible, I beg of you to favour this with a place in your valuable work, as that may perhaps induce some

gentleman or other in Gloucestershire, Oxfordshire, Yorkshire, &c. &c. to make trial of them; and if they are successful in getting them properly executed, I am fully persuaded that every one who sees them will acknowledge them to be the most agreeable and complete fence ever contrived.

"When a new fence is proposed to be made, the surface of the ground of the breadth of the ditch, and likewise for two feet more, should be pared off, in order to prevent as much as possible the weeds and grass from hurting the growth of the young thorns. See Plate VIII*, for a view of the fence.

"The ditch should be 5 feet broad, 2½ deep, and 1 foot broad at the bottom; leave 1 foot for an edging or scarcement, then dig the earth one spit of a spade for about one foot, and put about three inches of good earth below the thorn, which should be laid nearly horizontal, but the point rather inclining upwards, in order to let the rain drip to the roots, then add a foot of good earth above it; leave three or four inches of a scarcement before another thorn is planted; it must not be directly over the lower one, but about nine inches or a foot to one side of it; then throw a foot of good earth on the thorn, and trample it well down, and level the top of the bank for about three feet and a half in order for the base of the wall to rest on. The base of the wall should be about nine or ten inches (but must not exceed one foot) from the thorn. The wall to be about two feet thick at the bottom, and one foot at the top; the cope to be a single stone laid flat, then covered with two sods of turf, the grass of the undermost to be next the wall, and the other sod must have the grass side uppermost; the sods should be of some thickness in order to retain moisture, so that they may adhere together, and not be easily displaced by the wind; the height of the wall to be two feet and a half, exclusive of the sods, which together should be from four to six inches, by which means the wall would be near to three feet altogether.

"I would willingly add the cost of these fences; but as the rate of wages, and the quantity of work performed for them, differ so widely in one place from another, that I can only offer some data to enable people in different places to form some conjectures about them.

"I have them done, every thing included (the walls built with lime) from 10½d. to 13d. per ell (which ell is equal to 37 inches 2 parts) according to the ease and difficulty of working of the quarry, and the distance of it from the place where the fence is erected.—The lime costs about 6d. per boll (the boll is equal to 4 bushels, 0872,66 parts). I use from 15 to 16 bolls of lime to the rood of 36 square ells, Scotch measure; there are upwards of 43 Scotch ells, or 44 English yards, in length in a rood of a wall two feet and a half high.

"Sometimes where there are plenty of what is here called land stones, such as flints, &c. on the ground that is to be inclosed, I use them; it then requires from 30 to 35 bolls of lime to the rood.

"The thorns are to be brought from any nursery-man who commonly raises them from the seed, and sells them from 5s. to 10s. per thousand, according to their age, reckoning six score to the hundred.

"I generally have the ditches, as well as quarrying the stones, loading them, and building the wall done by the great, and commonly pay for making the ditch, laying the thorns, and preparing the top of the bank for the wall, from 7d. to 8d. for six ells running measure.

"The wages of day labourers here are from 8d. to 10d. per day, commonly 9d. The stones are quarried from 8s. to 12s. per rood, according to the softness or hardness of the quarry.

"The quarrier's wages are from 12d. to 16d. per day—I give the masons from 11s. to 12s. per rood, for building.

"The wages of such kind of masons, are from 14d. to 16d. per day.—About 50 carts (the weight that the cart carries from 7 to 9 cwt.) will build a rood. Carriage of ditto, about half a mile distance, about 8s. 4d. per rood, (2d. per cart). The hire of these carts are from 1s. 6d. to 2s. per day; the man generally drives two carts, sometimes a man and boy drive 5 carts.

"In the second volume of your six months Tour, you have given a letter from sir Digby Legard, wherein he acquaints you, that the dry stone walls of 4½ feet high, in the Wolds of Yorkshire, costs about 6s. for seven yards in length; and

and by your account, in the same volume, of Mr. Danby's, he gets his walls of six feet high for 5s. 6d.

"Sir George Suttie's fences are peculiarly adapted for these places, as the addition of the ditch and hedge cannot cost 3d. per running yard, and the height of the wall being so much lowered, encloses almost double the quantity of ground.

"Warmth is certainly as beneficial to hedges as trees, and the walls gives the shelter so absolutely necessary for rearing of young hedges, in very exposed situations, and they likewise preserve a proper moisture about the roots.

"If the hedges have been planted six or seven years before the wall is built, cut them over within two or three inches of the ground with a sharp tool, either in October or November, or early in the spring, and erect the wall as early in the season as possible, which in this country scarcely begins before the latter end of March. It is almost impossible for any one, who has not seen any of these kind of fences, to conceive the rapidity of the growth of the hedges in favourable situations. I had one cut over in the spring, and by the end of the year it was almost as high as the wall, and in three years time I am pretty positive no sheep would attempt it, not even the wildest Highland ones, who make nothing of a wall of 4½ feet high.

"When I first began to make these fences, I committed some error, having never seen any of them, which experience has taught me to correct. I drew the top of the wall to a point, and put too much earth on the bank, which made the wall stand too far from the hedge, and that allowed the cattle to get between the hedge and the wall, which, besides retarding the growth of the hedge, enabled them to get over the wall.

"In order to save the expence of the defending the hedge on the side of the ditch, the field should be thrown into that course of crops, as not to require to have any cattle in it for four years, by which time, in tolerable good ground, it will require none, as the hedge will nearly cover the wall, if kept clean for the two or three first years."

Fences made in marshy grounds require plants which delight in moist soils. Of this kind are, particularly, the black-alder, the willow, and the poplar: the birch-tree, and the ash will likewise grow very well in such places; but the first of these, viz. the alder, is reckoned the best and most profitable.

It likes a soil so moist as few other trees will thrive in, and is propagated either by layers, or planting of truncheons about three feet in length. The best time for planting these last is in February, or the beginning of March, when they should be sharpened at their larger end, and the ground should be well loosened before they are thrust into it, lest the bark should be torn off, which may occasion their miscarriage. They should be set at least two feet deep, to prevent their being blown out of the ground by violent winds, after they have made strong shoots, and they should be kept clear from all such weeds as grow tall, at least till they have got good heads; after this, they will keep down the weeds, and require no farther care.

If alders are raised by laying down the branches, this should be performed in October, and by the same time twelvemonth they will have roots sufficient to be transplanted, which must be done by digging a hole, and loosening the earth in the place where each plant is to stand. The young sets must be planted at least a foot and a half deep, and their top should be cut off to within about nine inches of the ground; for this will make them shoot out many branches.

The alder tree may be trained into very thick close hedges, to the height of twenty feet and upwards. It will thrive exceedingly on the sides of brooks, for it grows best when part of its roots are in the water, and may, if planted there, as is usual for willows, to be cut for poles every fifth or sixth year. Its wood makes excellent pipes and staves; for it will last a long time under ground, or in water; and it is likewise much esteemed by turners, plough-wrights, &c. and for making several utensils necessary in agriculture. Its bark yields a good black dye.

All the sorts of willows, of which Mr. Miller enumerates fourteen, grow best in moist boggy land, and may be easily propagated by planting cuttings or sets, either in the spring or autumn: for these readily take root, and are of quick growth.

In countries where there is great plenty of rough flat stones, the fences which bound an estate, or farm, are frequently made with them. It is a pretty common practice in Devonshire and Cornwall, where they build as it were two walls with these stones laid one upon another, first two, and then one between; and as the walls rise, they fill the intermediate space with earth, beat the stones in flat to the sides, which makes them lie very firm, and so proceed till the whole is brought to the intended height. They then plant upon these walls quick hedges, and even timber trees, which thrive exceedingly; and they esteem these fences the best security that can be to their ground and cattle. However, if these stones are laid rough and dry, they cannot but be disagreeable to the eye, and must certainly require frequent repairs, because they will often be forced out of their places, or beaten down by cattle.

To prevent this, let such walls be built in the bottom of a ditch, made wide enough for the purpose, and sloped down on each side. The deformity will then be hid; and as the cattle cannot stand facing the wall, so as to attempt to leap over it, the stones of which it is composed will be the less liable to be beaten down. The earth taken out of the ditch may be spread on the adjacent ground, and its sides may be planted with such trees, or under-wood, as best suit the soil. If a space of several feet proportioned to the demand which there may be for timber, is left on the inside of the fence, it will be attended with every advantage arising from a supply of that necessary commodity; without prejudice to the arable or more valuable pasture.

Another very strong and durable fence may be formed thus, in grassy places. Dig pieces of turf, four or five inches thick, the breadth of your spade, and about a foot long. Lay these turfs even, by a line on one side, with the grass outward, at the distance of ten or twelve inches within the mark, at which the ditch, afterwards to be dug in the solid ground, is to begin. Then lay in the same manner, but with their grass-sides turned out the contrary way, another row of turfs, at such distance as to make a breadth of foundation proportioned to the intended height of the bank. The reason for placing these turfs thus much within what is to be the edge of the solid ground dug away on each side, is to prevent the bank from falling in, if the ground underneath it should be any way defective. A ditch, of what breadth or depth you please, may then be dug; or the ground may be lowered on each side with a slope; in which last case there will be no loss of pasture by the fence, because it may be sowed with hay-seeds, and will bear grass on both sides. Part of the earth taken out of the ditches or slopes, will fill the chasm between the rows of the turf, and the rest may be scattered over the adjacent ground. Three, four, or more layers of turf may be thus placed upon one another, and the interval between them filled up as before, till the bank is brought to the desired height; only observing to give each side of it a small slope, for greater strength. The top of this bank should be about two feet and a half wide, and the whole of it should be filled up with earth to a level with the turfs, excepting a little hollow in the middle, to retain some rain. Quicksets should then be planted along this top, and they will soon form an admirable hedge. By this means, a bank four feet high, and a slope only two feet deep, will make, besides the hedge, a fence six feet high, through which no cattle will be able to force their way: for the roots of the grass will bind the turfs so together, that in one year's time it will become entirely solid; not a joining will appear, nor a turf can be got out; and it will be yet much stronger, when the roots of the quick shall have shot out among it. The only precautions necessary to be observed here, are, first, not to make this bank when the ground is too dry; because, if a great deal of wet should suddenly follow, it will swell the earth so much, as, perhaps, to endanger the falling of some of the outside, which, however, is easily remedied if it should happen; and, secondly, if the slope be such as sheep can climb up, to secure the young quick at the time of planting them, by a small dead hedge, either on or near the top on both sides. If any of the quicks should die, which they will hardly be more apt to do here than elsewhere, unless, perhaps, in extreme dry seasons, they may be renewed, as in other places, by planting new ones, or by layers from those which remain.

A fence like this will even do for a park; especially if posts and rails, about two feet high, are placed a little

sloping

sloping over the side of the bank, on or near its top: for no deer will be able to jump over this, nor can they creep through it.

This is one of the best fences to afford shelter for cattle; and if the quick on the bank is kept well clipped, it will form a kind of green wall, pleasing to the eye.

When the bounding fence is only to guard against accidents from without, it may be made in the ha-ha manner; only taking care that the earth be so well rammed down at the back of the wall, as that the stones may be properly supported, and bear equally.

The ingenious author of the *Essays on Husbandry* recommends the horn-beam plant, as one of the best yet known for making fences, according to the method used in Germany, where such fences are common.

"When the German husbandman, says he, erects a fence of this nature, he throws up a parapet of earth, with a ditch on each side, and plants his horn-beam sets in such a manner, as that every two plants may be brought to intersect each other, in the form of St. Andrew's cross. In that part where the two plants cross each other, he gently scrapes off the bark, and binds them with straw thwart-wise. Here the two plants consolidate in a kind of indissoluble knot, and push from thence horizontal slanting shoots, which form a sort of living palisado, or *chevaux de frise*; so that such a projection may be called a rural fortification. The hedges being pruned annually, and with discretion, will, in a few years, render the fence impenetrable in every part." *Essays on Husbandry, Essay I. page 14.*

High fences are nuisances on arable land, for when heavy rains fall, the corn of narrow close fields, and every where under high trees, is liable to be lodged; but in large open fields, or where the hedges are low, very little damage will be done. The fences of an arable field ought not to be above four feet high; as a good ditch with a trimmed quick-hedge, Mr. Marshall says, is to be preferred before any other. He also says, dead hedges are a heavy tax on an inclosed farm; and live fences, except quicks, are barbarously treated in this country. Even quicks are generally hacked down to the ground, and a dead hedge raised behind the stumps, till the young shoots get strong enough for a fence. There are few old hedges without a sufficiency of live stuff in them, if it were properly treated, to make a fence. But instead of plashing and trimming this into the form of a hedge, it is all levelled with the ground; and, that the young shoots may not rise up in judgment on the folly, they are ingeniously smothered by a rough dead hedge placed immediately on the stubs. Should a hardy few escape total suffocation, they have no other way of enjoying the sun and air, than by shooting out horizontally across the ditch, or into the field; filling both the one and the other with weeds and other trumpery. He says also, if the hedge wants making, and there be live stuff enough for a fence, he recommends it to be plashed in the Yorkshire manner; if the live stuff be too thin, fill in with dead boughs. Such as do not require to be re-made, are to be treated as follows: with a sharp pea-hook or a common reaping-hook, (not a sickle) begin on the ditch-side, and strike off every thing, whether oak, hazel, black-thorn, or quick, stem or spray, dead or alive, which overhang the ditch; clearing at the same time the bank and ditch from grass and weeds. If the bank-side is free from trees, bushes, or other incumbrances, he recommends it to be treated in the same manner; leaving the hedge, whether crooked or straight, about a foot, and or a foot and half thick, clearing away the grass, weeds, and briars, as on the other side. The immediate neatness which this gives, is pleasing, and its utility obvious: there will be no waste ground, no harbour for weed; and where live shrubs abound, the fresh shoots the following spring will make it difficult for even a bird to get through them. If the bank-side is encumbered, he recommends to grub and plough close to the hedge, or plough close to the incumbrances, and trim back every thing which overhangs the last furrow. This alone gives a garden-like appearance, and will be worth all the trouble: but even this is not without its use: the nursery of weeds in a great measure will be destroyed, and a convenient path formed round the field. The farmer who will thus accommodate the sportsman in hunting, will always be favoured; for it is frequently with great reluctance that he will ride over wheat, because he could not keep the outside furrow, with-

out the hazard of being torn off his horse by briars and thorns, or having some violent blows from the boughs of the trees. Indeed the most pleasing reflection is, that all this utility, conveniency and lightness, may be obtained at a trifling expence. Mr. Marshall proceeds and gives the following account: viz. "I set a lad to trim the ditch-side of a rough black-thorn hedge, which had not been touched for twice seven years. The ditch was totally blinded with thorns, briars, grass, and weeds. The length was about 60 rods. He began about eight in the morning and finished about five in the afternoon. His wages did not amount to more than 15d. or a farthing a rod. The following day he trimmed back the overhangings of the outside furrow of a field of wheat of four acres, in four or five hours; by which any person could walk or ride round with pleasure, and view the coming crop without injuring it, which without this trifling labour and expence, could not be done with ease or conveniency."

Mr. Marshall, in his *Rural Economy of the Midland counties*; speaking of fences, says "At present, however, garden quick may be said to be the universal hedge-wood; although there was, within the memory of many men, no such thing in use."

"The rejection of nursery plants, however, did not proceed from ignorance in the method of raising them, but from principle, founded on a false notion, that plants, pampered in the rich soil of a garden, were of course improper to be planted in a ditch bank of common earth. No, no: the planters of those days knew better. "Gather them in woods, where they have been exposed to hardships, and have learnt to live upon coarse fare, and in that case, when they come to be transplanted into hedges, they must thrive."

"A gentleman near Tamworth was the first who ventured to plant garden quick on a large scale; and his success ruined the business, as it had long been, of quick-gathering. The quantity now raised, at Tamworth and its neighbourhood, for the Birmingham and other markets, is extraordinary. It is mostly transplanted. Its price, even at Tamworth, seven shillings a thousand: at Birmingham, eight to ten shillings: yet at those prices one gardener sells, even when no public inclosures are going forward, three or four hundred thousand annually."

"The most judicious planter I met with in the districts, and from whom, with the gardener here alluded to, I had these particulars, chuses his plants at four years old, transplanted at two; and cares not how rich a soil they are raised in."

"The time of planting, here, is not unfrequently autumn. I had an opportunity of making a comparative observation, on a neighbour's practice, between plants set in autumn, and others planted, in continuation of the same hedge, in spring. The autumnal planting, in this case, had a decided preference. But the situation was somewhat dry, and the spring and summer proved so likewise:—under these circumstances autumnal planting will generally succeed best."

"The method of planting has been said to be that of putting the plants into a broad flat mound: generally planting two rows, ten or twelve inches apart, and a similar distance from the brink of the trench, by the side of which they are planted."

"The reason given for this mode of planting is, that a deep ditch makes a high heavy bank, and this overloads the roots."

"There is, no doubt, some truth in this reasoning. Plants never thrive so well as on level ground, provided they are not incommoded by standing water: but it is a fact, evident in various parts of the kingdom, and particularly in my own practice, in three different and distant parts of it, that hedges may be raised with success in the front of a high bank; and that its disadvantages are by no means equal to the advantage gained by a deep ditch and high bank, as a defence to the rising hedge."

"Two rows of posts and rails are here the common guard: incurring an expence equal to twice that of a deep ditch and banklet on one side, and a high bank and hedge on the other. If the hedge be planted behind a shelf of sufficient width, and part of the mould of the ditch be applied in forming a banklet on its outer brink, the load incurred by the remainder is little, if any impediment, to the progress of the young hedge."

"The method of planting a hedge in this manner is mentioned above."

"The nursing of young hedges, a business which, in most

most parts of the kingdom, is in a manner totally neglected, is in many cases well attended to here. They are pretty generally weeded, and, in some instances, hoed: in others, however, they are here, as in other places, seen struggling among weeds; principally of the following species.

"I enumerate them here, as I paid more attention to hedge-weeds in this, than in any other, district: and though they vary in some degree, in different places, they are, upon the whole, very much the same in all.

"The treatment of grown hedges. Plashing may be called the universal practice of this district. Nevertheless, I have observed a few instances of cutting hedges, that do not come within the description of plashing.

"In this practice, one row of stems, if double quicked, is cut to the stub, the other, hedge height; not level off, or all of the same height, but in such a manner as to lean back, away from the stubs of the fallen row; cutting those which stand foremost the lowest, and such as lean or branch away from them, the highest; leaving the back spray on, to form a blind, and assist to make a fence.

"Under this management, two rows of quick are evidently preferable to a single row; for although I have seen single quick treated somewhat in this manner, especially in Derbyshire, the effect is very different. In this case the stools and the stems are fed from the same roots; the same set of fibres; and the stems with the spray left upon them, rob the lower shoots, from which the new fence is to rise, of a great part of their sap; while in the other, the stools not only stand distinct from the stems, but have a distinct set of roots to support them, entirely independent of the stems left standing as a temporary fence.

"The methods of plashing are various: the old and still most prevailing method is to leave part of the stems standing, as live stakes; between which the plashers are interwoven, in the usual manner.

"Judicious managers, however, object, and with good reason, to live stakes; which, throwing out spreading heads, in the pollard manner, overhang and destroy the plashers, and prevent the shoots of the stools from rising: consequently tending to convert the hedge into a row of thorn pollard; in which state old hedges, that have been thus treated, are too evidently seen. On the contrary, when the entire hedge is cut down, or crippled as plashers to the stub, the plashers have no impediment, and the young shoots are the less incommoded, in as much as the plashers shoot less luxuriantly than the stakes. Still, however the shoots from the stools, the only offspring of the old hedge from which a new one can be expected, are greatly injured by the plashers overspreading them.

"Hence an improvement has been struck out, in this district, which probably raises the art of plashing to its highest degree of perfection. This is effected by driving the dead stakes, not in a line with the stubs, but some foot or more behind them, and by winding the plashers among them, and eddering them, according to the custom of this country, with brambles, leave the shoots from the stubs the same air and head-room, or nearly the same, as if the whole were cut down, and a dead hedge raised behind them.

"The advantage of this method of plashing, compared with the practice of felling the whole to the stub, is, that a live hedge, which improves by age, is raised, instead of a dead one, which grows worse every year. The disadvantage, that of part of the sap (of single hedges) being drawn away from the young shoots; which, in this case, are left less free and open than when the whole of the stems are cleared away at the stub.

"However, where there are a sufficiency of young pliable stems for plashers, and the ditch does not require much repair, the plashing here described may have, upon the whole, the preference; especially if the plashers, when the young hedge has got up, be removed from their interference with upright shoots.

"But, where the hedge has been neglected, the stems are grown few and large, particularly where vacancies require to be filled up by layers or otherwise, and the ditch requires to be new made, felling to the stub is indisputably preferable.

"It is observable, however, that in the district under survey, the ditch is rarely remade, and but seldom scoured: even where the soil is retentive; and a ditch, of course, necessary to good management.

"The reasoning, in this case, is the same as in that of planting by a narrow ditch: namely, the fear of overloading the roots. In that case there may be some shadow of truth; but in this, in which the roots are feeding several feet from the bank, there is probably not the least foundation. The practice, no doubt, originates in indolence or false economy.

"This censure, however, is not intended to be passed indiscriminately. There are many individuals, who are aware of the utility of open ditches, in freeing their lands from surface water."

FENNEL, the name of a well known plant cultivated in kitchen gardens. It is propagated by the seeds, which ripen in autumn, and should be sown soon after. They will come up in the spring, and require no other care than to keep them clean from weeds. This plant will grow in any soil or situation.

FENNY, moorish, marshy, boggy.

FENNY-LAND. See the article BOG MARSH, and MOOR.

FERMENT, the substance used to raise a fermentation, as yeast, wine-lees, leven, &c.

FERMENTATION, an intestine motion excited in vegetable substances, whereby the cohesion of their parts are destroyed, and may easily be separated from one another.

In every fermenting liquor, an intestine motion is generated in all its parts. It is called intestine, because it is excited by the internal principles contained in the vegetable juices; for vegetable juices or infusions made in water, however bright at first, and apparently homogeneous, on being kept in a moderately warm place, in vessels not closely stopped, become turbid, conceive an intestine motion, emit numerous air-bubbles, and discharge a pungent vapour of extreme subtilty.

All bodies which may be so changed by this intestine motion, as to produce wine, are said to be fermentable: and as this was never found to happen in any other than vegetable substances, vegetables alone are said to be fermentable.

The fermentable class of vegetables are extremely various, and might be distributed into as many classes, as they require different methods of fermenting. We shall, however, mention them no further than they relate to the pleasure and profit of the husbandman.

The first class of fermentable substances, includes all the pulpy summer fruits, which, when ripe, abound with a tartish sweet juice: such as grapes, apples, pears, elder-berries, gooseberries, raspberries, currants, cherries, plums, and all other summer fruits, provided they be kept free from a tendency to putrefaction.

The second class contains the fresh expressed and native juice of plants, provided they be of a tartish and sweetish taste; such as the juice of the sugar-cane, of liquorice, and other similar plants. To this class may be added all the juices which distil from certain trees when wounded, especially in the spring; as the birch, the plane or maple, the vine, the walnut-tree, &c. The maple has this remarkable property, both in the small kind and in the great, which is called the sycamore, that, being tapped, it will bleed freely in the winter, and its juice will flow very plentifully even after a hard frost. All these juices generally run into a spontaneous fermentation.

The third class comprises those vegetable juices which are formed and insipidated by nature into a certain saponaceous substance, consisting of saline and oily particles; such as honey, manna, and all other juices which are not gummy or unctuous.

The fourth class comprehends all those seeds which, when ripe and dry, may be ground into a fine meal, without their forming an unctuous paste; such are barley, wheat, oats, rye, &c.

Certain physical circumstances are requisite to render these different substances fit for fermentation; namely, first, a perfect degree of maturity suitable to each kind. All seeds and fruits which are so perfect, as, when sown in fertile ground at a proper season, and in a proper climate, to produce a plant of their own species, are fit for this operation. Another requisite to fermentation is a moderate proportion of oil: for though fat subjects are more apt to grow rancid, than to ferment, yet if they are entirely deprived of their oils, they are hereby also rendered unfit for fermentation. Thus, bruised almonds, which are rich in

oil, will scarcely ferment; but they may be so far freed from their oil by art, as to be made fitter for this purpose. Solubility in water is a third and principal requisite in fermentable subjects.

The methods of preparing each fermentable substance for fermentation will be given under the articles WINE, CYDER, and BEER.

The juices of summer fruits are, of their own nature, greatly disposed to ferment, so as immediately to begin this operation, without the addition of any other ferment. Other liquors may, however, stand in need of the help of other ferments, to begin this intestine motion, which, under proper conduct, proceeds afterwards of itself. The chief of these ferments is the recent flowers, commonly called yeast, thrown up to the top of beer in the act of fermentation: for if this rarefied frothy matter be mixed with other fermentable liquors, it greatly promotes their fermentation. The same matter become heavier, and sunk to the bottom, provided it be not too stale, still retains the same vigour, though in a less degree, than its former state. The remains of former fermenting liquors sticking to the sides of casks, have the same effect: for casks thoroughly penetrated by the subtilty of wines which they formerly contained, are extremely apt to raise a violent and quick fermentation in the fresh liquors put into them. Acid paste of flour fermented, or baker's leaven, may all be employed for the same purpose: for though meal may be preserved fresh and sweet during years, if it be kept in a dry state, and perfectly free from insects; yet if it be wrought with water into a soft close paste, and lightly covered in a warm place, it will soon begin to heave, be all over full of cavities, change its smell, colour, and tenacity, prove acid both to taste and smell; and thus become that proper ferment from which the whole of this operation first took its name. When thus prepared, if part of it be mixed with other paste, fresh and not yet fermented, it will cause this to ferment much sooner, and more strongly, than it would otherwise do. Hence, we need not be solicitous about a first ferment, because nature affords it spontaneously every where. The great promoters of all the stages of this process are warmth, a moderate admission of air, and the addition of actually fermenting matter.

If we take large glass bodies, place them upright where they may be kept in an equal heat, and then fill each of them three quarters full with a crude fermentable liquor well prepared for the operation, the orifice being slightly covered with a cloth, and a heat kept up to above sixty degrees; it will be pleasing to observe the several degrees of fermentation.

The mass, at first resting, and possessing a certain space in the vessel, gradually begins to swell, rarefy, and conceive an intestine motion through its whole body, acting upwards, downwards, and side-ways, in strange circumvolutions without ceasing, though with a different force. In the mean time bubbles are every moment formed in every part of the mass, and constantly endeavour to rise up to the surface, where they burst with a hissing noise, or often break in the mid-way. Hence the whole mass froths, discharging with an audible ebullition a certain tartish spirit, which proves acrimonious to the nose, surprisingly elastic, and capable of bursting almost any vessel by its great expansive force. If a large vessel full of fermenting must, in the height of its action, should discharge this condensed spirit through a small orifice, and a strong healthy man should draw in at his nostrils the vapour so issuing, he would instantly fall down dead; or if he received but little thereof, he would become apoplectic, and remain an idiot his whole life. When this vapour is confined and accumulated in close rooms, it will extinguish fire, and suffocate animals. Its producing the first of these effects is a sign that it is collected in sufficient quantity to cause the other. While candles continue to burn, we need not be afraid that this wild gas, as Helmont calls it, will be dangerous to life. It is on account of this spirit, that people are obliged to air wine-vaults, where wines are fermenting in the vintage season, by setting open the windows, lighting fires, and letting in the wind.

In the progress of fermentation, the grosser parts of the mass begin to rise to the top, and separate there from the other liquor below, so as to collect into a spongy crust, which exactly covers the liquor underneath, and keeps in the more active parts thereof, in such manner as to prevent their being exhaled and dissipated before they have performed their effect. Now, it is curious to observe how

great the agitation constantly is every where, even in the smallest part of the fluid matter, below this crust. A greater attrition can scarcely be conceived, than that which is here made with the utmost rapidity among all the particles. The crust being successively broke, and raised up with a considerable noise, upon the returns of the explosions, the exhalations escape, while the crust, presently falling together, closes again, and prevents the active principles from exhaling otherwise. Thus, the formation and continuance of the crust is greatly assisting in the due performance of fermentation.

As soon as all the gross parts of the mixture are thus collected at the top, some less rarefied particles of the lower part of the crust, being no longer sustained by the light bubbles which caused them to ascend, begin to sink through the fluid, and are agitated upwards and downwards by bubbles in and about themselves, by means of which they are again raised to the top, from whence, upon the breaking of the bubbles there, they again fall downward; and when they have done this several times, they at length remain quiet at the bottom. After this, new little masses do the same; and after some continuance thereof, it frequently happens that all the upper crust, then grown heavier, or less rarefied, on account of the air discharged, sinks of a sudden downward, but soon after rolls upward, almost entire, with such a force as would seem incredible, if it were not seen. When the upper crust is thus gradually consumed and fallen to the bottom, the fermentation ceases, though the same degree of heat be continued; and the liquor, then floating over the faeces which remain at the bottom, becomes transparent.

So long as the crust remains at top, it is called the flowers of the fermenting liquor, and is the most proper and immediate ferment. What falls to the bottom is called lees.

The time requisite for the perfect completing of fermentation can hardly be determined, because it is different in different liquors, and depends much on the season of the year, and heat of the weather. The juice of the palm-tree finishes its fermentation in a few hours in Africa; and this operation is likewise very soon ended in Asia; but in the northern countries, it proceeds slower. In the heat of summer it proceeds quick, but in winter more languidly. It is, however, easy to know when the fermentation is finished, viz. when the whole series of the phenomena above described, has successively appeared, and is at length spontaneously gone off. Then the vessel should be immediately stopped down, and the liquor should be kept for some time on its lees, a great part of which will be assumed and assimilated by the liquor, which will thereby become stronger and richer in spirit than it was before. If the vessel is not stopped down, the spirit produced in the fermented liquor will soon exhale, and leave behind only a vapid useless fluid; but if the liquor is kept quiet in a close vessel, it will gradually become more pure and spirituous. The sweeter and richer the juice is, the longer does the fermentation continue, and the stronger and more spirituous is the wine or other liquor.

The distinguishing marks of a vinous liquor are as follow: it has the faculty of inebriating, or altering the actions of the spirits and animal functions, by refreshing, animating, and exhilarating the drinker: after this, it raises the latent passions (*in vino veritas*), and finally, it destroys the external and internal senses and voluntary motions, and thus brings on a palsy, sleep, or at last death.

Fermentation also changes the relaxing, saponaceous, cooling, and generally purging virtues of vegetable juices, into such as are strengthening, coagulating, and healing. Thus, the fresh infusion of malt, before fermentation; solution of sugar or honey in water; the fresh expressed juices of ripe summer-fruits, &c. when plentifully drank, prove flatulent, purgative, weakening, and cooling; but when properly fermented into beer, mead, or wine, they have quite contrary qualities, which they had not before. It is a very singular property of fermentation, that it produces from fermented liquor a spirit which is convertible into a liquid flame, and yet may be perfectly mixed with water.

The things which promote fermentation, or tend to the better performance thereof, are free admission and emission of air, a warmth between fifty and seventy degrees, and the addition of a proper ferment.

It is found that when the sweet juices are boiled down to a thick consistence, they not only do not ferment in that state,

state, but are not easily brought to ferment, when diluted with as much water as they had lost in the evaporation. Juices and decoctions in general, which have suffered much fire, however sweet, are little disposed to ferment.

One of the chief checks given to fermentation, is the fumes of burning sulphur, received in a large quantity at several times, and shut up along with the air remaining on the top of the fermenting liquor. If the whole cask be penetrated and filled with the fumes of burning sulphur before the fermenting liquor is put in, and if the empty part on the top of the liquor be afterwards well filled with the same, and the vessel cautiously bunged down, the fermentation will certainly be stopped: and if, after some time, it should begin again, from the prevalency of its own cause, it may again be suppressed by the same fumes. The same end is also obtained by mixing with the fermenting matter a large quantity of any powerful acid, such as acid spirits of vitriol, or nitre; though these at the same time prove hurtful to the fermenting liquor. Alkaline salts likewise, if added in a large quantity to fermenting liquors, immediately excite an increase of effervescence, which presently ceasing, all farther fermentation is stopped. But here too fermenting liquor is spoiled, so that it can scarcely be brought again to ferment, though it may to putrefy. In the same manner, those things which destroy acidity by drinking it up, hinder fermentation. Thus, chalk, testaceous and calcareous substances, iron, lead, tin, have this effect. Stopping up, the containing vessels so close, that nothing can escape or enter, will stop the fermentation, provided the vessel be so strong as not to be burst by the force of the confined liquor. This is manifest in new malt liquors, which, when included in strong bottles, well corked, effervesce violently upon receiving the air. The extracting of the elastic air stops fermentation: too great heat rather dissipates and throws off the active principles of fermentation, than excites and promotes them; and lastly, too great a degree of cold likewise stops fermentation.

FERN, the name of one of the worst of weeds, and one of the most difficult to destroy where it has a deep soil to root in. Mr. Mortimer says, he has seen its root eight or ten feet deep in some grounds; and adds, that the best way of killing it is by cutting it often while it is in grass; that the most proper seasons for this purpose are the Spring, Midsummer, and Michaelmas: that is, when the circulation of the sap is strongest. Most of the roots being then cut asunder, and thereby deprived of the channels through which nature intended to convey the sap, will bleed to death, or, if it stagnates in them, they will soon rot. The fern itself, if cut when full of sap, and left to rot upon the ground, will greatly improve the soil, and mellow it so as to prevent its binding: or, if it be burnt when so cut, it will yield a much greater quantity of salt, than any other vegetable. If it be ploughed up, plentiful dunging of the land, and sprinkling it well with ashes, have been found to kill this weed: but the most certain cure for it is urine. In several parts of the North, where they keep their fern under, and destroy a great deal of it by mowing it frequently when green, they also find that rolling of it is of great service; and when they burn it, the poor people make the ashes of it up into balls, with a little water, dry them in the sun, and use them in washing their linen, for which they think them nearly as good as soap. Often treading down these plants, and feeding Scotch sheep on them, is said to be almost an infallible way of killing the fern.

When intended to convert to dung for manure, it requires a long time to mature, which is very much against it, as it will delay the maturity of a dunghill a full year longer than straw. Perhaps straw, at 15s. per load, is cheaper, and a more eligible litter, than fern at 5s. The received opinion that fern breeds smut, may be accounted for, by being mixed with straw; the latter of which will be fully digested, and fit for the field, when the fern is in the height of fermentation, swarming with animalcules of various species, in various states. These are of course conveyed to the soil; perhaps comes smut. From the straw-mixen will come a healthy, whilst from the fern, a diseased one. Indeed the fern retards considerably the maturation of the manure: but at the same time, Mr. Marshall says, he does not wish to decry fern wholly, as it may be very eligible in many situations; nor does he mean to convey an idea, that the manure produced from it is of an inferior quality to that produced from straw, if left long enough to mature: for he is of opinion, that ma-

nure from fern, thoroughly concocted, is as meliorating, and as free from infection, as that made of straw; and, where it can be kept separate, fern may be very eligible cart-horse litter.

Trees planted among fern will thrive very much, though it be on a hot gravel: the fern shading their roots, and keeping them moist and cool.

FERTILE, fruitful, abundant, plenteous.

FERTILITY, fecundity, abundance, fruitfulness.

FESCUE, the name of a genus of grass, of which there are several species; as the fote-fescue, the sheep's fescue, &c. See the article FOTE-FESCUE, SHEEP'S FESCUE, &c.

FESTING-PENNY, earnest given to servants when hired.

FETLOCK, the tuft of hair that grows behind the pattern-joint of many horses; those of low size have scarce any such tuft.

FETTERS, chains for the feet.

FEVER, a disease that frequently attacks several sorts of cattle, particularly horses.

The symptoms which denote the horse to be afflicted with a fever, are great restlessness, the creature ranging from one end of the rack to the other; his flanks beat; his eyes are red and inflamed; his tongue parched and dry; his breath hot, and of a strong smell; he loses his appetite, and nibbles his hay, but without chewing it, and is frequently smelling to the ground; the whole body is hotter than ordinary (though not parched, as in some inflammatory disorders); he dungs often, little at a time, usually hard, and in small bits; he sometimes stales with difficulty, and his urine is high coloured; he seems to thirst, but drinks little at a time and often; his pulse beats full and hard, to fifty strokes and upwards in a minute.

The first intention of cure is bleeding, to the quantity of two or three quarts, if the horse is strong and in good condition; then give him a pint of the following drink four times a day; or an ounce of nitre mixed up into a ball with honey, may be given thrice a day, instead of the drink, and washed down with three or four horns of any small liquor.

Take of baum, sage, and chamomile flowers, each a handful; liquorice-root sliced, half an ounce; sal prunel, or nitre, three ounces; infuse the whole in two quarts of boiling water, and when cold strain it off; then squeeze into it the juice of two or three lemons, sweeten it with honey.

As the chief ingredient to be depended upon in the drink is the nitre, it may, perhaps, be as well given in water alone; but as a horse's stomach is soon palled, and he requires palatable medicines, the other ingredients may in that respect have their use. Soleysel for this purpose advises two ounces of salt of tartar, and one of sal armoniac to be dissolved in two quarts of water, and mixed with a pail of common water, adding a handful of bran or barley-flower to qualify the unpleasant taste: this may be given every day, and is an useful medicine.

The following also may be given for this purpose:

Take Russia pearl ashes one ounce, distilled vinegar one pint, spring-water two pints, honey four ounces; give a pint three or four times a day.

This neutral mixture, and the nitre-drink above, may be taken alternately; they are both efficacious remedies, and in some cases may properly enough be joined with the camphor drink.

His diet should be scalded bran, given in small quantities; which, if he refuses, let him have dry bran sprinkled with water: put a handful of picked hay into the rack, which a horse will often eat, when he will touch nothing else: his water need not be much warmed, but should be given often, and in small quantities: his cloathing should be moderate, too much heat and weight on a horse being improper in a fever; which scarce ever goes off in critical sweats (as those in the human body terminate), but by strong perspiration.

If, in a day or two he begins to eat his bran, and pick a little hay, this method with good nursing will answer; but if he refuses to feed, more blood should be taken away, and the drinks continued: to which may be added two or three drams

drams of saffron, avoiding at this time all hotter medicines: the following clyster should be given, which may be repeated every day, especially if his dung is knotty and dry.

Take two handfuls of marshmallows, and one of chamomile flowers; fennel-seed an ounce; boil in three quarts of water to two, strain off, and add four ounces of treacle, and a pint of linseed oil, or any common oil.

Two quarts of water-gruel, fat-broth, or pot-liquor, with the treacle and oil, will answer this purpose; to which may be added a handful of salt. These sort of clysters are properer than those with purging ingredients.

The following opening drink is very effectual in these fevers, and may be given, every other day, when the clysters should be omitted; but the nitre-balls or drink may be continued, except on the days these are taken.

Take of cream of tartar and Glauber's-salts, each four ounces; dissolve in barley-water, or any other liquor: an ounce or two of lenitive electuary may be added, or a dram or two of powder of jallap, to quicken the operation in some horses.

Four ounces of Glauber's-salts or cream of tartar, with the same quantity of lenitive electuary, may be given for the same purpose, if the former should not open the body sufficiently.

In four or five days the horse generally begins to pick his hay, and has a seeming relish to food: though his flanks will heave pretty much for a fortnight; yet the temper of his body, and return of appetite, shew that nothing more is requisite to complete his recovery than walking him abroad in the air, and allowing plenty of clean litter to rest him in the stable.

This method of treating a fever is simple, according to the laws of nature; and is confirmed by long experience to be far preferable to the hot method.

The intention here is to lessen the quantity of blood, promote the secretions of urine and perspiration, and cool and dilute the fluids in general.

How far vinous cordials, strong beer drinks loaded with fiery powders, and such methods, are likely to answer these purposes, is submitted to the judicious observer; as also whether adopting the cool one in its stead is not as real an improvement in farriery as physic.

There is another sort of fever that horses are subject to, of a more complicated and irregular nature than the former, which, if not properly treated, often proves fatal.

The signs are a slow fever with languishing, and great depressions: the horse is sometimes inwardly hot, and outwardly cold; at other times hot all over, but not to any extreme; his eyes look moist and languid; he has a continual moisture in his mouth, which is the reason he seldom cares to drink, and when he does, it is but a little at a time. He feeds but little, and leaves off as soon as he has eat a mouthful or two; he moves his jaws in a feeble loose manner, with an unpleasant grating of his teeth; his body is commonly open; his dung soft and moist, but seldom greasy; his staling is often irregular, sometimes little, at other times profuse, seldom high-coloured, but rather pale, with little or no sediment.

When a horse's appetite declines daily, till he refuses all meat, it is a bad sign. When the fever doth not diminish, or keep at a stand, but increases, the case is then dangerous. But when it sensibly abates, and his mouth grows drier, the grating of his teeth ceases, his appetite mends, and he takes to lay down (which perhaps he has not done for a fortnight), these are promising signs. A horse in these fevers always runs at the nose, but not the kindly white discharge, as in the breaking of a cold, but of a reddish or greenish dusky colour, and of a consistence like glue, and sticks like turpentine to the hair on the inside of his nostrils. If this turns to a gleet of clear thin water, the horse's hide keeps open, and he mends in his appetite; these are certain signs of recovery.

The various and irregular symptoms that attend this slow fever, require great skill to direct the cure, and more knowledge of the symptoms of horse's diseases than the generality of gentlemen are acquainted with. The experienced farrier should therefore be consulted and attended to in regard to the symptoms; but very seldom as to the application of the remedy, which is generally above their

comprehension; though it may be readily selected, by duly attending to the observations here inculcated.

First then, a moderate quantity of blood, not exceeding three pints, may be taken away, and repeated in proportion to his strength, fullness, inward soreness, cough, or any tendency to inflammation. After this, the fever drink may be given, with the addition of an ounce of snake-root, and three drams of saffron and camphor, dissolved first in a little spirit of wine; the quantity of the nitre may be lessened, and these increased, as the symptoms indicate.

The diet should be regular; no oats given, but scalded, or raw bran sprinkled; the best flavoured hay should be given by handfuls, and often by hand, as the horse sometimes cannot lift up his head to the rack.

As drinking is so absolutely necessary to dilute the blood, if the horse refuses to drink freely of warm water or gruel, he must be indulged with having the chill only taken off, by standing in the stable; nor will any inconvenience ensue, but oftener an advantage; for the nauseous warmth of water, forced on horses for a time, pall their stomachs, and takes away their appetites, which the cold water generally restores.

Should the fever after this treatment increase, the horse feed little, stale often, his urine being thin and pale, and his dung sometimes loose, and at other times hard, should the moisture in his mouth continue, his skin being sometimes dry, and at others moist, with his coat looking staring, and surfeited; upon these irregular symptoms, which denote great danger, give the following balls, or drink; for in these cases there is no time to be lost.

Take of contrayerva-root, myrrh, and snake-root powdered, each two drams, saffron one dram, mithridate or Venice treacle half an ounce, make into a ball with honey, which should be given twice or thrice a day, with two or three horns of an infusion of snake-root, sweetened with honey; to a pint and a half of which may be added, half a pint of treacle-water, or vinegar; which latter is a medicine of excellent use, in all kinds of inflammatory and putrid disorders, either external or internal.

Should these balls not prove successful, add to each a dram of camphor, and where it can be afforded, to a horse of value, the same quantity of castor. Or the following drink may be substituted in their stead for some days:

Take of contrayerva and snake-root, of each two ounces, liquorice-root sliced one ounce, saffron two drams; infuse in two quarts of boiling water close covered for two hours, strain off, and add half a pint of distilled vinegar, four ounces of spirit of wine, wherein half an ounce of camphor is dissolved, and two ounces of mithridate or Venice treacle; give a pint of this drink every four, six, or eight hours.

A more simple drink, and perhaps full as efficacious, may be thus prepared:

Take camphor one dram, dissolved in rectified spirit of wine one ounce, then gradually pour on a pint of distilled vinegar warmed, and give for two doses. The quantity of camphor may be increased.

Should the horse be costive, recourse must be had to clysters, or the opening drink: should he purge, take care not to suppress it, if moderate; but if, by continuance, the horse grows feeble, add diascordium to his drinks, instead of the mithridate; if it increases, give more potent remedies.

Let it be remembered, that camphor is a very powerful and effectual medicine, in these kinds of putrid fevers; being both active and attenuating, and particularly calculated to promote secretions of urine and perspiration. It has been long celebrated in malignant fevers, as it gives motion to stagnant humours, in the most distant parts, and promotes their expulsion by the common outlets; nitre may be advantageously joined with it in many cases. These are the medicines that are chiefly to be depended on in putrid and epidemic fevers, where the circulation is slow and languid, the blood and juices tending to congregate, putrefy, and run into grumes.

A horse should drink plentifully to promote the operation of these medicines; but instead of them, to a horse of small value, give an ounce of diapente, half an ounce of

mithridate, and one dram of camphor, with a strong infusion of rue, scordium, and snake-root, in the manner as above directed.

Regard should also be had to his staling; which, if in too great quantities, so as manifestly to depress his spirits, should be controuled by proper restringents, or by preparing his drinks with lime-water. If, on the contrary, it happens that he is too remiss this way, and stales so little as to occasion a fullness, and swelling of his body and legs, recourse may be had to the following drink.

Take of sal. prunella, or nitre, one ounce; juniper-berries, and Venice turpentine, of each half an ounce; make into a ball with oil of amber.

Give him two or three of these balls, at proper intervals, with a decoction of marshmallows, sweetened with honey.

But if, notwithstanding the method we have laid down, a greenish or reddish gleet is discharged from his nostrils, with a frequent sneezing; if he continues to lose his flesh, and becomes hide-bound; if he altogether forsakes his meat, and daily grows weaker; if he swells about the joints and his eyes look fixed and dead; if the kernels under his jaws swell, and feel loose; if his tail is raised and quivers; if his breath smells strong, and a purging ensues, with a discharge of foetid, dark-coloured matter, his case may then be looked on as desperate, and all future attempts to save him will be fruitless.

The signs of a horse's recovery are known by his hide's keeping open, and his skin feeling kindly; his ears and feet will be of a moderate warmth, his eyes brisk and lively; his nose grows clean and dry; his appetite mends; he lays down well, and both stales and dungs regularly.

Be careful not to overfeed him on his recovery: let his diet be light, feeds small, and increased by degrees as he gets strength; for by overfeeding, horses have frequent relapses, or great surfeits, which are always difficult of cure.

This is the most successful method of treating these irregular, malignant fevers; where it is evident, by the various efforts nature makes to relieve herself, she wants assistance, and a spur to quicken her motions. For by the use of these warm medicines, a crisis, or termination of the disease is quickened and promoted, as appears by the alteration made both in the urine and skin; the former of which, by its thickness, shews signs of concoction, as it is called, or of a separation of the feverish matter from the blood; and the latter by its smoothness and glossiness proves that a regular and free perspiration is obtained: these two secretions are of such importance to the welfare of every animal, that the necessity of rectifying them, when disordered, is obvious from the consequences.

If this fever should be brought to intermit, or prove of the intermitting kind, immediately after the fit is over, give an ounce of jesuit's-bark, and repeat it every six hours, till the horse has taken five or six ounces; should eruptions or swellings appear, they ought to be encouraged, for they are good symptoms at the decline of a fever, denote a termination of the distemper, and that no further medicines are wanted.

The true reasons perhaps why so many horses miscarry in fevers, are, that their masters, or doctors, will not wait with patience, and let nature have fair play: that they generally neglect bleeding sufficiently at first: and are constantly forcing down sugar-sops, or other food in a horn, as if a horse must be starved in a few days, if he did not eat: then they ply him twice or thrice a day with hot medicines and spirituous drinks, which (excepting a very few cases) must be extremely pernicious to a horse, whose diet is naturally simple, and whose stomach and blood, unaccustomed to such heating medicines, must be greatly injured, and without doubt are often inflamed by such treatment.

From the experience we lately had of the epidemic cold and fever among our horses, and from the observations of others in the years 1732 and 1734, it evidently appeared that the simplest method of treatment succeeded best. Thus it is proper to bleed largely at first, to the quantity of three quarts, if the horse is full and strong: and if it appears that his lungs are not relieved by it, but continue stuffed and loaded, the bleeding should be repeated; and a rowel may be put in his chest or belly.

Dilute the blood with plenty of water, or white drink; let his diet be warm bran mashes, and his hay sprinkled. Should the fever rise, which will be known by the symptoms above described, give him an ounce of nitre thrice a day in his water, or made up in a ball with honey. Let his body be kept cool and open, with the opening drink, given twice or thrice a week; or an ounce of salt of tartar may be given every day, dissolved in his water, for that purpose, omitting then the nitre. After a week's treatment in this manner, the cordial ball may be given once or twice a day, with an infusion of liquorice-root sweetened with honey; to which may be added, when the phlegm is tough, or cough dry and husky, a quarter of a pint of linseed, or fallad-oil and the same quantity of oxymel squills.

As the kernels about the throat are greatly swelled in these cases, I need not mention the necessity of keeping the head and throat warmer than ordinary, to promote a freer perspiration, and forward the running at the nose, which in a horse answers the end of spitting, or expectoration in us: but the nose should never be syringed, as is sometimes done, to promote this discharge, which it often checks, and occasions bad swellings in the neighbouring parts and glands; for let it be remembered these are critical runnings of nature's own appointment, which by art may soon be frustrated. The following cooling purge it is very proper to give at the decline of the distemper, and may be repeated three or four times.

Take two ounces of fenna; anniseed and fennel bruised, each half an ounce; salt of tartar three drams; let them infuse two hours in a pint of boiling water; strain off, and dissolve in it three ounces of Glauber salt, and two of cream of tartar: give for a dose in the morning.

This purge generally works before night very gently; and in fevers, and all inflammatory disorders, is infinitely preferable to any other physic.

Before we close this account of fevers, it may be no improper hint to the curious, to take notice that a horse's pulse should more particularly be attended to than is customary, as a proper estimate may thereby be made both of the degree and violence of the fever present, by observing the rapidity of the blood's motion, and the force that the heart and arteries labour with, to propel it round. The highest calculation that has been made of the quickness of the pulse in a healthy horse, is, that it beats about forty strokes in a minute; so in proportion of the increase above this number, the fever is rising, and if farther increased to above fifty, the fever is very high.

How often the pulse beats in a minute may easily be discovered by measuring the time with a stop-watch, or minute sand-glass, while your hand is laid on the horse's near side, or your fingers on any artery; those which run upon each side of the neck are generally to be seen beating, as well as felt a little above the chest. *Bartlett's Farriery*, p. 31.

FEWEL, combustible matter; as fire, wood, coal, &c.

FIELD, a piece of ground inclosed, whether for tillage, or pasture.

FIELD HUSBANDRY. See **HUSBANDRY**.

FIELD scabius, a perennial weed common among the corn. It is all over rough and hairy. The stalk is upright, and often a foot or foot and a half high, spotted, and branching. The lower leaves are oval, and indented about the edges. Those which grow on the stalk are divided, and of that sort which botanists called pinnatifid. The flowers are blue, and of the compound kind, consisting of a considerable number of small flowers, each divided into four parts, and having one seed under them. The taste of the plant is a disagreeable bitter.

FIELD WELL. See **DRINKING-POOLS**.

FIG, the name given by farmers to a sort of wart on the frush, and sometimes all over the body of a horse. The figs that appear on the frush or sole, discharge a malignant stinking humour, which is very difficult to cure.

FIG-WORT, *pile-wort*, or *lesser centaury*, a perennial weed common in pasture-grounds. The roots consist of oblong knobs. The leaves are heart-shaped, cornered, and placed on foot-stalks. The flowers in general resemble those of the crowfoot, but differ somewhat from them.

them in having the cup divided into three parts only, the petals being about eight in number, and narrower. This low plant runs very much by the roots, and choaks all others which are near it.

FILLER, or *thiller* horse, that fastened immediately to the cart, and which supports the shafts.

FILLY, a female or mare colt.

FIMBLE-*hemp*, early ripe hemp.

FINE-BENT, the name of a very excellent species of grass found in great plenty on the best sheep pastures. We have given a figure of this grass on Plate XV. fig. 4. See the article GRASS.

FIRE-BLAST, an accident to which hops are very liable. See the article HOPS.

FIRE-BOTE, a quantity of fuel.

FIRING, an operation often performed on different parts of a horse. It is done in the following manner: when the firing-iron is red hot, the farrier applies the thinnest part to the horse's skin, in one or more places, according to the nature of the disease.

Firing, or cauterizing, is often necessary after strains and other accidents, which may occasion a long continued weakness, or where there is a fullness, and the part is grown hard and callous, especially about the joints, sinews, and nervous parts, those parts being composed of an infinite number of fibres and nervous threads, which lie so close together, that nothing but what is of the most powerful nature is sufficient to relieve them when obstructed. This is performed in the most effectual manner, by burning the outside, and giving vent to the inclosed matter to discharge itself; and sometimes proves beneficial, when all other helps have been found ineffectual.

In firing about the sinews and nervous parts, great care is to be taken not to go too deep at first, but by gentle repeated razes or lines, till they come to a pale red colour; for if the fire once touches the sinew, it will make the horse go lame as long as he lives: the same ought to be drawn pretty close together on each side the joints or sinews, following the course of the hair, without making of cross lines, which are of no use in these parts, and are only apt to disfigure the horse afterward.

When the more fleshy parts, or an obstinate humour, that cannot be brought to suppuration, requires firing, the skin ought to be pierced deeper, in order to draw away a sufficient quantity of matter from the part; the same ought to be performed upwards, to prevent any ulcerous disposition attending it: and in such cases little soft doffils of tow, dipped in warm basilicon, and spirit of wine, may be thrust gently up into the orifices.

The firing instrument, or knife, ought to be somewhat rounded on the edge, and gradually thicker to the back, sufficient to keep the heat of the fire for some time; the same should be rubbed clean, that no dirt or ashes may stick to it, and not used until the flaming redness is in part gone off. All the scared parts ought immediately to be bathed with spirits of wine, and where nothing else is requisite to complete the cure, the place is only to be anointed with oil and bees-wax melted together. *Gibson's Farriery*, vol. I. p. 251.

FIRING-IRON, a piece of iron about a foot long, one end of which is made flat, and forged like a knife, the back of it being half an inch thick, and the edge about the eighth of an inch.

FIR, a timber tree very common on mountainous and barren places, especially in the colder climates. It differs from the pine in having single leaves, which are, for the most part, produced on every side of the branches; whereas the pine has two or more leaves produced out of the sheath or cover.

Fir trees are raised from seeds taken out of their polypermous cones. The way to get out the seeds is, either by exposing the cones to a gentle fire, or by soaking them all night in water, which will cause their squamous cells to open, and readily emit their seeds. The former method is the best, provided they are not exposed to too great heat. But this ought not to be done until you are ready to sow them, which is best performed in the beginning of March.

These plants should be all raised in a nursery, where they may be protected from the birds, otherwise they will be in danger of being destroyed, when they first come up: for as they bring up the husk of the seed on the top of the plant, the birds in picking off the husk will break off the

plant, whereby a whole bed may be lost in a few hours; if they are not carefully guarded from them.

The best time of sowing these seeds is about the latter end of March, or the beginning of April, on a bed of light earth, covering the seeds about half an inch deep with the same sort of earth. In this bed the plants should remain until the following spring; when there should be a number of beds prepared in the nursery to receive these seedling plants; and the beginning of April they should be transplanted into the beds, at the distance of six inches row from row, and at three inches asunder in the rows: If the season should prove dry, it will be proper to water the plants every week once or twice, according to the warmth of the weather; and the beds should be covered with mats, to screen the plants from the sun, and drying winds, until they have taken good root; after which time they require no farther care, but to keep them clear from weeds. In these beds the plants may remain two years; at the end of which they should be transplanted into an open spot of ground, for their roots will in that time meet quite over the beds.

The distance which these plants should be planted in this nursery, should be four feet row from row, and two feet asunder in the rows.

When the plants are planted, if the season should prove dry, they should be watered, to settle the earth to their roots; and if this is repeated three or four times, if the season should continue dry, it will greatly promote their taking new root, and secure them from the injuries of the drying winds. In this nursery the plants may remain two or three years, according to the growth they shall have made; and, during this time, the ground between the plants should be constantly kept clean from weeds, and dug between the rows every spring; in doing of which, care must be taken not to cut or injure the roots of the plants: this is all the culture they will require during their continuance in the nursery: and, when they are transplanted into the places where they are to remain, the necessary care to be taken is, in taking them up, not to injure or cut off their roots, and let them be as little time out of the ground as possible; and, when they are out, to guard their roots from the drying winds. The surest time for removing of these trees is about the beginning of April; though they may, and often are removed with success at Michaelmas, yet the spring is the more sure season, especially in moist land.

Most of the kinds of firs may be removed at the height of six or seven feet; but those of two feet high are much better, and will in a few years get the better of those taller trees. *Miller's Gard. Dict.*

FIRS for cattle. Mr. Young in his *Annals of Agriculture*, vol. XIV. says "I was so pinched, last spring, for provender to cattle, that I had not a stone of straw, or a stone of hay, from the middle of March; nothing but whins and oats for horses, and fir tops (that is, tender shoots of firs) for cattle; I had 430 horned cattle, and about 120 horses, small and great, of which I lost but few (four or five, I cannot tell which) cattle; but there were numbers of cattle that died in this country for want. Some tenants lost the one-half of their cattle, and some almost the whole."

FISH-PONDS, reservoirs of waters, applied to the breeding of fish.

Fish-ponds are no small improvement of watery and boggy lands, many of which are fit for no other use. In making of a pond, its head should be at the lowest part of the ground, that the trench of the flood-gate, or sluice, having a good fall, may not be too long in emptying. The best method of making the head secure, is to drive in two or three rows of stakes about six feet long, at about four feet distance from each other, the whole length of the pond head, whereof the first row should be rammed at least about four feet deep. If the bottom is false, the foundation may be laid with quicklime, which slacking, will make it as hard as a stone. Some lay a layer of lime, and another of earth dug out of the pond, among the piles and stakes; and when these are well secured, drive in others, as they see occasion, ramming in the earth as before, till the pond-head be of the height designed.

The dam should be made sloping on each side, leaving a waste to carry off the over-abundance of water in times of floods or rains; and as to the depth of the pond, the deepest part need not exceed six feet, rising gradually in shoals

shoals towards the sides, for the fish to sun themselves, and lay their spawn. Gravelly and sandy bottoms, especially the latter, are best for breeding; and a rich soil with a white fat water, as the washing of hills, commons, streets, sinks, &c. is best for fattening all sorts of fish. For storing a pond, carp is to be preferred for its goodness, quick growth, and great increase, as breeding five or six times a year. A pond of an acre, if it be a feeding and not breeding one, will every year feed two hundred carps of three years old, three hundred of two years old, and four hundred of a year old. Carps delight in ponds that have marl or clay bottoms, with plenty of weeds and grass, whereon they feed in hot months.

Your pond should be drained every three or four years, and your fish sorted. If it is a breeding one, the smaller ones are to be taken out to store other ponds with, leaving a good stock of females, at least eight or nine years old, as they never breed before that age. In feeding ponds it is best to keep them pretty near of a size. *Mortimer's Husbandry, vol. I. page 290.*

FISTULA, a deep, narrow, and callous ulcer, generally arising from abscesses. See **ULCER**.

FISTULAR, **FISTULOUS**, an epithet applied by farriers to wounds and ulcers, which degenerate into fistulas.

FISTULAR, or *fistulous*, is also an epithet applied by botanists to leaves and flowers which are tubular, or that resemble a hollow pipe.

FLAGS, the turf, or surface of the ground, which they pare off for burning. See **BURN-BAKING**.

FLAIL, a well known implement of husbandry, used in threshing all sorts of corn. See the article **THRESHING**.

FLANKS, the sides of an horse. In a strict sense, the flanks of a horse are the extremities of his belly, where the ribs are wanting, and below the loins. They should be full, and at the top of them on each side, should be a feather; and the nearer those feathers are to each other, so much the better: but if they be as it were within view, then the mark is excellent.

The distance between the last rib and haunch-bone, which is properly the flank, should be short, which is termed well-coupled; such horses are most hardy, and will endure labour longest.

If a horse have a flank full enough, you are to consider whether it be too large; that is, if over-against that part of the thigh called the stifle, the flank fall too low; for in that case it is a great advance to purseness, especially if the horse be not very young.

A horse is said to have no flank if the last of the short ribs be at a considerable distance from the haunch bone; although such horses may for the time have very good bodies, yet when they are hard laboured, they will loose them.

A horse is also said to have no flank when his ribs are too much straightened in their compass, which is easily perceived, by comparing their height with that of the haunch-bones, for they ought to be as high, and equally raised up as they are, or but very little less, when the horse is in good case.

A horse is likewise said to have little flanks, to be sorrily bodied, to be grunt-bellied and thin gutted, when his flank turns up like a greyhound, and his ribs are flat, narrow and short.

A well flanked horse, is one that has wide and well-made ribs, and a good body. In this case the whole flank is used in the room of gut.

FLAX, the name of a plant cultivated both for the sake of its stalk and seed; the former being used in making linen, and the latter for oil.

The stem of this plant, which is round and hollow, grows to the height of about two feet, and then divides into several branches: these are terminated by blue flowers, consisting of five petals, and are succeeded by capsules divided within into ten cells, in each of which is enclosed a bright, slippery, elongated seed. Its leaves are long, narrow, sharp pointed, and placed alternately along the stem and branches.

The soil for flax should be a stiff loam, rendered fine by tilth, and situated in a valley bordering upon water; or such a soil as is thrown up by rivers. If there be water at a small depth below the surface of the ground, it is thought still better, as is the case in Zealand, which is remarkable for the fineness of its flax, and where the

soil is deep and stiff, with water almost every where, at the depth of a foot and a half, or two feet underneath it. It is said to be owing to the want of this advantage, that the other provinces of Holland do not succeed equally well in the culture of this useful plant; not but that fine flax is also raised on high lands, if they have been well tilled and manured, and if the seasons are not very dry.

It is justly remarked, in the letters which the Dublin Society have published on the culture of flax, that moist stiff soils yield much larger quantities of flax, and far better seed than can be obtained from light lands: nay, that the seed secured from the former way, with proper care, be rendered full as good as any that is imported from Riga or Zealand: but, as M. du Hamel rightly observes, strong land can hardly yield such fine flax as that which grows on lighter ground.

In the southern countries, the husbandmen who raise flax, sow part of their seed in September and October; so that the plants which spring from thence, remain of course in the ground all the winter; and this is a judicious practice in those places, because plants which have not covered the earth well before the summer heats come on, are apt to be parched by the heat and drought which usually prevail in that season. They sow linseed again in the spring; but the latter do not yield so large a crop: the flax, however, which it produces is more esteemed, because it is finer than that sown in autumn. M. Du Hamel seems, indeed to think, that the autumnal sowing yields the best seed; but however, that be, in places where the winter is apt to be severe, and where the flax, which is but a tender plant, would in course be in danger of being destroyed during that season, almost all the flax is sown about the end of March, or in the beginning of April. This spring flax is what we shall principally consider in this article.

It may be laid down as a general rule, that the land which is intended for flax should be brought to exceeding fine tilth by repeated ploughings, and that it should be enriched by a manure suited to the quality of the soil. Thus, when a pasture is broken up in order to its being sowed with flax, it must be well ploughed during eighteen months, or two years, before it will be fit for producing a crop of flax. To defray the expence of this culture, some other crops may be got off the land in the mean time, especially of such plants as do not occupy it long, and particularly of those which are remarkably benefited by frequent stirring of the earth whilst they grow; such as beans, pease, turnips, &c. because these repeated stirrings render the mould fine and loose, and help to kill the weeds, which would otherwise do great damage to the flax. The Memoirs published by the Society of Brittany inform us, that the Livonians, when they clear woodland, burn the wood upon it, then plough it, and in this state prefer it to any other kind of soil for flax.

If the land which is intended for flax be stiff, great care should be taken not to till it when it is wet, for fear of kneading it.

If the ground on which flax is to be raised has been long in tillage, it should be plowed deep before winter, and laid up in a very high ridges, in order that the winter's frosts may the more effectually moulder or loosen it.

In the month of February, if the land be not too wet, some very rotten dung should be laid in the furrows, and immediately covered over. In March, for southern countries, or in the beginning of April, where the climate is colder, another ploughing should be given to lay the land smooth, the clods should be broken by hand, or with the spiky-roller, and the seed should then be sown and harrowed in with a light or bush-harrow, so as not to bury it above an inch deep. If the soil be moist and cold, a little pigeon's dung may be sown with the seed, for it agrees admirably well with the flax: but this must not be done if the ground is very light and too dry. It will also be right to lay wet land out in beds thirty or forty feet wide, separated by deep trenches, to drain off the water, and convey it into the surrounding ditches.

Most of our linseed is brought from the North, namely from Riga and Zealand: but we may ourselves raise it very good, by conforming to the directions here given.

Linseed is reckoned good when it is large, oily, heavy, and of a bright brown colour. To know whether it be

oily, a few grains of it are thrown into a red-hot fire-shovel, and they in that case crackle almost instantly and blaze briskly. If it is sufficiently heavy, it will sink to the bottom of the water; and to judge whether it be new, a number of seeds exactly counted should be sown on the end of a hot-bed, and notice taken whether they all grow.

The best way of sowing flax, in order to obtain very good seed, is to drill it in equidistant rows about a foot distant, and then it may be hand-hoed, which will keep down the weeds, and improve the crop. But it is still better to drill the rows about twenty inches asunder.

The seed being smooth and heavy, is very proper for drilling, and in this way a very small quantity of seed sows an acre. The common allowance of seed sown broad cast is about two bushels and a half to an acre, oftener more than less; but drilled in rows at twenty inches distance, half a peck is sufficient for an acre.

Thick sown flax runs up in height, and produces fine soft flax; if sown thin, it does not rise so high, but spreads more, and puts forth many side branches, which produce abundance of seed, and such seed is much better filled, plump, and heavy, than the seed produced from thick sown flax. Nothing should be planted or sown between the rows, but the ground should be hoed with a hand-hoe, or small plough, taking care that none of the mould is thrown against the rows; to prevent which the intervals may be hoed with a triangular harrow, having a proper number of iron tines in it, and guided by two handles fixed behind. By these handles the tines are made to go deeper or shallower at pleasure; and if the intervals are cultivated with this instrument, beginning before the earth is become stale, and while the weeds are small, the land may be kept very clean, and in fine tilth, at a much less expence than by hand-hoeing: for one horse is sufficient for this work; a great deal may be done in a day, and by a frequent repetition of this hoeing, especially when the earth is dry, the weeds may be so effectually kept down, as never to rise much above an inch high. But the rows must be weeded by hand.

The flax thus cultivated is shorter than common, but stronger. It is not so subject as other flax, to be beat down and lodged in stormy weather, the stalks of it being fortified by the free admission of the sun and air among them; and there is sufficient room to hand-weed the rows, without lying upon, or treading down the flax, as in the common way of weeding.

It is usually reckoned, that in flax sown broad cast, the flax and seed are nearly of equal value. And it will no doubt be said, that by sowing it so thin, the crop of flax will be much lessened, which must be acknowledged; but the great object here is the quality of the seed, which will be incomparably superior to the seed commonly sowed thick; and if duly cultivated, in the method here laid down, will, in respect of the size and weight of the seed, excel either the Plantation or Riga seed. — In this way also, lighter land will produce better seed than in the common flax husbandry; because the earth that is kept in fine tilth; to any considerable depth, retains more moisture in dry weather, than soils of the same kind that is badly tilled, or suffered to grow stale and hard.

A change of seed is found necessary in cultivating some kinds of plants, particularly of wheat and some other sorts of corn, otherwise they are apt to degenerate. The necessity of changing seems to arise from the soil or climate: for which reason farmers choose to sow upon light land the seed raised upon clays, and other stiff soils, and the contrary, which they find of service; and the same advantage is found in some measure by a change of soils for flax seed. But this being a plant of nice culture, it seems most advisable, not to depend wholly upon a change of soil, even though the drilling and hoeing, as above, should still improve the seed in size and weight, beyond what is common in broad-cast sowing; but rather to sow, every second and third year, the best foreign seed, by which means, and the hoeing culture also, the flax farmer may be sure of having good seed every year.

When the goodness of the seed is known, more or less of it is to be sown, according as the husbandman intends either to raise a quantity of linseed for sowing, or to have very fine and soft flax. In this last case, the seed should

be sown pretty thick, in order that the plants may rise the closer together, and by that means grow slender and tall, which adds much to the fineness of the fibres of the flax. If the linseed is sown with an intention to let the flax remain for seed, a much less quantity of it should be used, that so the plants may come up thin, and thereby have room to grow to their full vigour and extent. As strong soils should be chosen for this purpose, it may perhaps be most advisable to follow the example of the judicious M. de Chateauvieux, in sowing it in drills, and horse-hoeing the intermediate spaces. He observed in his experiments, that the plants of flax thus raised yielded great plenty of excellent seed.

Some sow, with their linseed, either annual or perennial grass-seeds, when they intend to lay the land down for pasture after the flax is taken off. The plants grow but weakly under the flax, which, however, they do not hurt; but as soon as the flax has been pulled, they increase apace, to the great benefit of their owner.

Flax is sometimes damaged by insects when it is about three or four inches high. It is said that they may be destroyed by a slight strewing of foot, ashes, &c. At all events, it is certain that this dressing will give vigour to the flax, though it should not kill the insects.

If any weeds appear among the flax, as is almost always the case, they must be thoroughly rooted out; and that the flax may be as little damaged as possible in the doing of this the weeders should work bare-footed: they may indeed sit down upon the flax, for sitting upon it is found not to hurt it; but it would be greatly injured, if not killed, by being trod upon with the heels of shoes.

The finest flax is most liable to be laid, particularly in countries subject to storms. To guard against this accident, some people run across their flax field slender poles fixed to stakes: but a better method, and which was practised by the ingenious gentleman who directed the cambric manufactory at Winchelsea, was, to run small ropes across the field, both lengthwise and breadthwise; for these, being fastened where they intersect one another, and supported by stakes at due distances, form a kind of netting, which is proof against almost every accident that can happen from tempestuous weather.

Opinions are divided in regard to the degree of ripeness at which it is best to pull flax. Some think it should be pulled whilst it is green, in order that its fibres may be the softer and finer. Others, with the same view, pull it up before its seeds are quite formed; and others again think, that it should not be pulled till some of the capsules, which contain the seeds, have begun to open, being of opinion, that the fibres of green flax are too tender, and that they fall into tow. On the other hand, it is certain, that the fibres of flax which has stood till it is very ripe, are always stiff and harsh, that they are not easily separated from the reed, and that they do not bleach well. Here, therefore, as in most other cases, both extremes should be avoided; and it consequently seems most reasonable to think, that the properest time for pulling flax, is when its stalks begin to turn yellow, when its leaves begin to fall, and when its seeds begin to be brown.

As soon as the flax is thought to have attained a due maturity, it is pulled generally by handfuls: but as it is seldom all of an equal degree of ripeness, or of an equal degree of strength, it would certainly be advisable to pull first the ripest and strongest plants, and then the weaker and less ripe; for by this means they would at once be separated, which is of essential importance in the watering, because the weak and green flax requires much less steeping than the stronger and more ripe. All weeds, and the earth which adheres to the roots of the plants, should be carefully taken away, and then the handfuls of flax should be laid regularly on the ground.

The author of the judicious letters concerning flax, in the Dublin Society's Weekly Observations, seems to direct a too great degree of ripeness of the flax when it is pulled, and assigns as a reason, that it does not otherwise stand the force of the mill for scutching it. But as it has been found by experience, that the force of that mill is too great, and as a better method of performing this operation, in which the force can be suited to the strength of the flax, may soon be known, this great degree of ripeness will become the less necessary.

As the flax is pulled, it is laid together by handfuls, with the seed end turned to the south. These handfuls

should neither lie quite in a line with each other, not directly across, but a little slanting upwards so that the air may easily pass through them. Some, instead of this method, tie the handfuls of flax loosely at the top, then spread out their roots, and thus set several of them together upright upon their roots. In either of these ways, the flax is generally left twelve or fourteen days in the field to dry it. This drying is certainly not necessary for the rippling, because the ripple will separate the capsules from the flax as effectually before it has been dried as it will afterwards; and if it be done with a view to ripen the seed, it should be considered, that the flax will be more hurt by the longer time of steeping, which will become necessary in consequence of this drying, than the seed can be benefited; because the more the membrane which connects the fibres to the reed is dried, the greater must be the degree of putrefaction necessary to loosen and destroy the cohesion of this connecting membrane: the finer parts of the flax itself must necessarily be destroyed by this degree of putrefaction; and if the putrefaction does not arise to such a degree as to destroy the cohesion of this membrane, the fibres of the flax will adhere so strongly to the reed, that the force necessary in scutching will prove equally detrimental to the flax. The practice in some parts of Brittany, as we are informed by the Memoirs of the Society of that province, seems therefore much more rational; and this is, to ripple the flax after it has lain in the air two or three days; but even one day will be sufficient if the weather is dry.

If any flax is raised on purpose for seed, or if, through the dryness of the season, or the badness of the seed that was sown, the flax is come up very thin, so as manifestly to shew, that the seed which it may produce will be more valuable than the rest of the crop; in either of these cases, the flax should be let stand till its seed is perfectly ripe; thus sacrificing the flax itself to the then greater advantage of having good seed.

In order to ripple the flax, which is the next operation, a large cloth should be spread on a convenient spot of ground, with the ripple placed in the middle of it. The manner of performing this work is so well known, that there can be no need to describe it here. Its purpose is to obtain the linseed, which is always of considerable value, even though the flax has been pulled before its perfect maturity.

After the flax has been rippled, the seeds thereby obtained should be spread in the sun, to dry. Those which separate from the pods, of their own accord, are the fullest and ripest, and should therefore be set apart for sowing, in case the precaution of raising some flax purposely for seed has not been attended to. The pods, or capsules, are then broken, either by treading or by threshing, in order to get out the remaining seeds, the whole of which, as well as the former, should be carefully sifted, winnowed, and cleaned. When the seed is laid up, it must be frequently stirred, or ventilated, to prevent its heating. Even this second seed affords a considerable profit, by the oil which it yields, and also by being used, when broken, for fattening of cattle. The cakes of linseed, after the oil has been pressed out of them, are likewise found to be useful for this last purpose, though they are thought to render the fat of cattle yellow; for which reason it is advised not to give it them till within a few weeks before the beasts are to be killed. Their utility as a manure has been already mentioned.

As soon as the flax has been ripened, it should be carried with all convenient speed to the watering place. If care has not been taken before to separate the different kinds of flax, that separation must now be made: because, otherwise, some of the flax will be rotted in the water, before the rest will be sufficiently steeped.

The choice of the water for steeping it in, is thus very properly pointed out in the Directions for raising Flax, published by order of the Commissioners and trustees for fisheries, manufactures, and improvements, in Scotland.

"All flax ought to be watered in canals, which should be dug in clay ground if possible, because that soil best retains the water: but if a firm retentive soil cannot be got, the bottom or sides of the canal, or rather both the bottom and sides, may be lined with clay; or, instead of lining the sides with clay, which might fall down, a ditch may be dug without the canal, and filled with clay, which will prevent both extraneous water from entering, and the water within from running off.

"A canal of forty feet long, six broad, and four deep, will generally water the produce of at least an acre of flax.

"It should be filled with fresh soft water from a river or brook, if possible, two or three weeks before the flax is put in, and exposed all that time to the heat of the sun. The greater way the river or brook has run, the softer, and therefore the better, will the water be. Springs, or short runs from hills, are too cold, unless the water is allowed to stand long in the canal. Water from coal or iron is very bad for flax. A little of the powder of galls thrown into a glass of water, will immediately discover if it comes from minerals of that kind, by turning it into a dark colour, more or less tinged, in proportion to the quantity of vitriol contained in it.

"The canal ought not to be under any shade, because this, besides keeping the sun from softening the water, might render some parts of the canal cooler than other parts, and thereby make it water the flax unequally.

"The flax raiser should observe, that, when the water has been brought to a proper degree of heat by the sun, small plants will rise quickly in it; numbers of small insects and reptiles will generate there, and bubbles of air will rise up to its surface. If no such signs appear, he may conclude, that the water is not warm enough, or that it is otherwise unfit for flax."

Running water is not proper for steeping flax, because it prevents that degree of putrefactive fermentation which is necessary to separate the fibres from the reed; and besides this, in such streams, the flax is apt to be carried away by sudden floods, or to be filled with the mud and slime which those floods bring with them: but to have a small rill of water pass through the steeping place is very advisable, because it will supply the loss of that which is evaporated. Stagnant water, which is naturally of a bad colour, should likewise be avoided, because this communicates to the flax a colour which is not afterwards easily got rid of.

The flax, after it has been rippled and sorted, as before mentioned, should be tied very slack, with a band made of a few stalks, in bundles not larger than a man can easily grasp with both his hands, in order that the water may the more easily and more equally penetrate through them; and in this condition they should be put into the canal, somewhat sloping, or even half-standing upon one end, which, say the Edinburgh directions, should be the seed end, and consequently the root end uppermost; because, add they, (though I do not find it at all noticed by any other writers on the subject) when the seed ends are uppermost, there frequently breeds a great deal of vermin, destructive of the flax, and this, they assure us, is effectually prevented by putting the seed end downmost. However this may be, the flax, when put into the water, should be covered with straw, or fern, upon which a wicker hurdle and some stones may be laid, to keep it down, but without pressing too hard against the bottom. It is a common opinion, that if the flax is not thus covered, the sun will discolour it, even though it be quite covered with water.

More or less time is requisite for the steeping of the flax, according to the nature of the water, the heat of the air, and the greater or less degree of woodiness of the flax. It is steeped sooner with a south than a north wind: and that which has been pulled green is also much sooner steeped than that which has been pulled very ripe: consequently it is not possible to fix any precise length of time during which it should remain in the water. The way to know whether it has been steeped enough, is to draw a few stalks from out of the middle of the heap, and then try it: if the reed snaps short, without bending, and the bark parts easily from the reed, towards its point, the flax has been sufficiently steeped, and it must, in this case, be speedily taken out of the water, for otherwise it will soon become too tender, and begin to rot.

In some countries, the flax is steeped but four days, at the end of which it is taken out of the water, and the little bundle, or handfuls, into which it was before made up, are laid regularly side by side, till they have formed a pretty thick bed, upon which are then put planks loaded with stones. The flax is left in this condition four or five days, or more, according to the heat of the air; and its lying thus in a heap answers the intent of farther steeping in water: but as a great degree of putrefaction may arise in this operation, so much judgment and care are necessary, that I cannot think it an advisable method.

The Memoirs of the Society, which the states of Brittany have instituted, upon a truly judicious plan, for the improvement

ment of agriculture, arts, and commerce, inform us, in consequence of an account which the duke of Choiseul, minister of state in France for foreign affairs, received from the French ambassador at the court of Russia; to whom he had written on this subject; at the request of the society, that the Livonians use two sorts of places for steeping their hemp and flax; that the most simple of these are only holes dug near the side of rivers, and that the flax, or hemp, watered in them (which is very like the method practised in France) generally sells for from twenty-five or thirty per cent. less than that which has been steeped in the following manner.

When they would have flax or hemp of superior quality, they chose a spot where there is a fall of clear water, and there make, one under another, five, and sometimes six; basons or reservoirs, each of which is at least one foot, and at most two feet deep. The water can either be let run from one bason to another, or be stopped at pleasure. The basons are separated by slight banks of clay; and in each bank is a little opening, which may be closed whenever it is thought proper. To prevent the stream from overflowing the first bason, and afterwards successively the others, it is itself turned a little aside by a small bank of clay, and this bank is broken down whenever the water is to be renewed in the basons.

The Livonians put their hemp and flax first into the uppermost bason only. At the end of two, three, or four days, they remove it into the second bason, from thence into the third, and so on, till they have brought the several bundles of these plants down into the lowest. At each of these shiftings, the first bason is filled with fresh flax, and the water is renewed in all the basons. By this means, the steeping is not completed till the flax or hemp has passed through all the basons, and has remained a proper time in the lowermost, which is the last. Neither the English nor the Dutch import any hemp from Riga, but what has been steeped in this last mentioned manner; whereas a great part of that which the French receive from thence, is such as has been steeped in stagnant waters, in holes dug on the side of rivers.

When the flax is taken either out of the water in which it has been steeped, or from the heap above-mentioned, the bundles of it are spread out, like a fan, at the root end, and laid on a dry new-mown meadow, that it may dry, bleach, and become supple. It is there turned from time to time, and as soon as it is quite dry it is carried off: for otherwise the moisture of the dews and grass will have nearly the same effects upon it, as if it had remained longer in the water. This is evinced by the practice of those, who in some places, instead of putting their flax into water, only spread it on a damp meadow where the grass is somewhat long, leave it there all night, and in the morning, before the sun has dried it, gather it up in large heaps, and remove it into the shade, in order to spread it out again on the grass the next evening; and this is repeated till the flax is found to be sufficiently watered. In other places, it is watered by hand during the day, and so let it remain constantly on the grass. It is then let dry, and is afterwards housed. But, as M. Du Hamel rightly observes, this method is so tedious and troublesome, that, even if it should, as some say it does, give a little additional whiteness to the flax, yet the advantage in that respect is so small, as by no means to compensate for the inconveniences of the practice, which he therefore thinks is not advisable in any case, unless it be when the flax, after being taken out of the water, is found not to have been sufficiently steeped.

The disadvantage of laying the flax upon long grass, after it has been steeped, in order to dry it, is very justly pointed out in the Directions for raising Flax, published by order of the commissioners and trustees for fisheries, manufactures, and improvements in Scotland, when they advise the husbandman by no means to follow this method, because the grass, growing through the flax, frequently spots, or rots it. These judicious gentlemen therefore recommend short heath as the most preferable place for spreading flax upon, after it has been taken out of the water; and this the rather, because, when the flax is wet, it fastens to the heath, and is thereby prevented from being blown away by the wind, whilst at the same time the heath keeps it a little above the earth, and so exposes it the more equally to the weather: but grounds exposed to violent winds should also be avoided.

"The flax, continued they, when taken out of water, must be spread very thin upon the ground; and as it is then very tender, it must be gently handled. The thinner it is

spread the better, as it is then most equally exposed to the weather: but it ought never to be spread during a heavy shower, because that would wash and waste too much the bark, which is then excessively tender; though it soon after becomes firm enough to bear the rains, which, with the open air and sunshine, clean, soften, and purify it to the degree desired, and fit it admirably for parting from the reed: in short, after the flax has acquired a little firmness by being a few hours spread in dry weather, the more rain and sunshine it gets, the whiter and better it will be.

"The skilful husbandman, who follows this method, spreads his first row of flax at the end of the field from whence the most violent wind commonly comes, placing the root-ends foremost: he makes the root-ends of every other row overlap the seed-ends of the former row three or four inches, and binds down the last row with a rope; by which means the wind does not easily get below the flax, to blow it away: and as the seed-ends are seldom so fully watered as the root-ends, this over-laying has an effect like giving the seed-ends more watering.

"The flax is judged to have been sufficiently grassed, when it is of a clearer colour than before, when its bark is blistered up, when that bark parts easily from the reed; and when the reed is become very brittle: but no written description can possibly here convey a knowledge of this point, at all equal to that which is acquired by experience.

"The whole of the flax should be sufficiently grassed before any of it is lifted; for if a part be lifted sooner than the rest, that which remains will be in great danger from the winds.

"A dry day should be chosen for taking up the flax; and if there is no appearance of high wind, it should be loosed from the heath or grass, and let loose for some hours, to make it thoroughly dry.

"As a great quantity of flax can scarcely be equally watered and grassed, and as its different qualities will best appear at lifting it off the grass, each different kind should then be collected together, and kept by itself; that is to say, all of the same colour, length, and quality.

"The smaller the bundles are into which the flax is made up, the better they will be for drying, housing, &c. and in making up these bundles, as in every other operation upon flax, it is of great consequence that all the stems be laid together as they grew, that is to say, root-ends to root-ends, and seed-ends to seed ends."

The Livonians, say the before-quoted Memoirs of the Society of Britany, cut off the roots of their hemp, but not of their flax, when it is taken out of the steeping basons above described. They then tie the flax or hemp up in bundles about as thick as the lower part of a man's thigh. These bundles are placed upright, and supported by a stake, around which a few of the tops of their stalks are twisted, the better to secure their standing. They are left in this situation one day, to drain; then they are spread upon the grass for one or two days, and after this they are laid in heaps, and covered over with haulm, stubble, straw, or some other such like covering, to make them sweat. When the hemp or flax has sweated enough, it is laid in heaps in the shade, and there dried: but these heaps must not be so thick, but that the air may penetrate a little into them. It is on this last operation that the good or bad quality of the hemp or flax thus managed chiefly depends. Both of them may be kept two or three years, and even longer, upon their reeds, after they have been prepared in the manner above directed; and when it is intended to break them, after this keeping, they are put into an oven properly heated.

In the common way, after the flax has been grassed, it must be dried by heat, to make its reed break readily, and separate the more easily from the bark. To guard against the danger of fire, this business is frequently performed in a place distant from any other building. The caverns, or hollows under hills, or rocks, before described for drying hemp, are also very proper for this purpose.

There are two general ways of drying flax. Some place against a wall, upon uprights and cross pieces, a hurdle of which the bars are small, and about two inches asunder, and upon this the flax is spread four, five, or six inches thick: a small fire, made of broken reeds of flax, is cautiously kindled under it, and care is taken to turn the hemp from time to time, that it may dry equally in every part: the flax-dresser takes off only that part of it which is at the side of the hurdle next the wall, then pushes the rest forward into its place, and fills with fresh flax the vacancy thereby made at the fore-part of the hurdle. This operation

tion should not be entrusted to any but a very attentive person, because, if the flame should be suffered to rise too high it would set fire to the flax. It is true, indeed, that this seldom happens; and when it does, the loss is not great, because but a small quantity of flax is laid together on the hurdle. Some say that the smoke of the fire thus made of the broken reeds, hurts the colour of the flax, and that this lessens its price when it is sold; but that the quality of the linen made of it is not at all the worse, this discolouring being easily removed by bleaching.

The other method of drying flax is by putting it into a hot oven. The Livonians make their ovens, for this purpose, either of clay, brick, or hewn stone. Those which are built with clay, are sometimes large enough to contain eight hundred bundles at a time: but it is more common to make them for only two, three, or four hundred. They are shaped like the ovens for an army, that is to say, they are very high arched. They require no greater degree of heat, which is given with dead wood, furze, broom, &c. than is just sufficient to render the reed of the flax brittle; and the same of hemp, for the Livonians use them for both these plants, the bundles of which they set upright in them, and as soon as they take them out of the oven, they carry them to a kind of mill to be broken.

The Dutch build their ovens for drying flax within a large capacious chimney at the end of the building where the breakers and scutchers work. The usual dimensions of this building, which is well lighted, are, in the clear, thirty feet by fourteen; but it is sometimes larger where great business is carried on, though seldom, if ever, less. The dimensions of the oven here generally are fifteen feet in depth, ten in breadth, and five feet in height: its roof is arched, its entrance, which is just large enough to admit a man with tolerable ease, is made to shut close with a wooden door. This oven is not heated with wood, excepting at the very first; for after the workmen have begun to dress the flax, the broken reeds, and other refuse parts which are beaten off it, and swept up, suffice to continue the heat; so that each parcel affords firing for the next, till the whole is dried. The Dutch kindle the fire in the oven some hours before the day's work is over. The sweepings of the flax light easily, and the oven heats and cools again sufficiently before the breaking, and scutching is finished. They fill it when they leave off work; and the next day when they return to it they find the flax dry and ready for breaking. The flax breaks best and most easily when it is a little warm and crisp: and consequently the working it then is cheapest and most advantageous; and accordingly the Dutch never draw two bundles together from the oven, but take them one by one as they want them. It will, perhaps, be needless to observe, that when the oven is heated, it must be well cleaned before the flax is put in; for the least spark will set the flax on fire, and this would be a considerable loss, as the ovens hold a large quantity.

The famous M. Tschiffeli, of Berne, in Switzerland, has obliged the public with a Memoir on the Culture of Flax, the substance of which we shall lay before our readers.

In his direction for the choice of seed, he says, it should be of a bright shining brown colour, not flat, but thick and plump; should crackle much when cast on live coals, and should sink to the bottom almost as soon as thrown into water.

With respect to soils, this writer observes, that any may do for flax, provided it is not too wet, or too stoney, and has not too much sand or gravel mixed with it: some however, are to be preferred, particularly black earth, neither too strong nor too light; and, in general, strong land is to be preferred to light.

To prepare grass-grounds and pastures for sowing flax, M. Tschiffeli lays down the following rules:

The land should, by the end of July at latest, be turned up in small furrows, about two inches deep. Early in the month of September, a heavy harrow should, in dry weather, be drawn over the field, in order to pulverise the soil; and the month following, if the land is not in great heart, it should have a good dressing of dung, which being first regularly spread, should, in dry weather, be ploughed in to the depth of six inches at least, with narrow furrows, leaving the field rough all the winter.

In the following spring, this gentleman observes, that as soon as the ground is dry, the land should have a good harrowing; and about the middle of April, which is in Switzerland the season for sowing, it should, in dry weather, have its third ploughing, somewhat deeper than the second; and if the weather should not immediately afterwards be favour-

able for sowing, the land should the same day be harrowed down smooth.

When flax is to be sown on a fallow, the three usual ploughings are to be given, observing only, that every ploughing is deeper than the last; and the dung should be buried by the last, leaving it rough during the winter, and managing it as above in the spring.

When flax is sown the second year after a fallow, the land being dunged the preceding year, and in good heart, no manure will be necessary; but immediately after harvest it must be ploughed about two inches deep, to prevent the weeds from growing and impoverishing the soil. As soon as any weeds afterwards make their appearance, it must be well harrowed with heavy harrows, and about Michaelmas should be ploughed in narrow furrows, about six inches deep, lying rough during the winter season. The following spring the ridges should be harrowed down, and afterwards laid smooth with smaller harrows, being in April ploughed for the last time.

Flax, M. Tschiffeli remarks thrives best upon land that has the preceding year borne a crop which shaded the ground, and prevented the weeds from growing; therefore good flax is seldom got after rye.

This writer very justly observes, that the quantity of seed to be sown should be proportioned to the nature and condition of the land, never less than two, nor more than three bushels to the acre. Light land should be sown earliest, but always after the dread of white-frosts is over, and never in rainy weather, or when the ground is wet; a mild day is best for this purpose, when the wind is not in the north-east, and dew may be expected in the evening.

It is best, our sensible husbandman says, to begin to plough for sowing after noon, the harrow following close at the heel of the plough. A little before sun-set, the seed is to be spread, best at three casts, and the work left in this state till the next morning, when, without fail, the seed must be covered with light harrows, or strong rakes. If the soil is rather light, and the spring likely to be dry, it will be best to roll the land; and if it was not manured before the winter, some very rotten dung may be spread after the seed is harrowed in, and before the field is rolled.

It is better to use no dung at all than that which is not well rotted: foot and ashes, hogs or cows urine, are good manures for flax, or in fact almost any thing that will not carry weeds on to the land.

When flax is grown to the height of about four inches, it may safely be weeded; but the precautions taken in Switzerland on this occasion are worth notice. There the work is carefully executed, but with as much expedition as possible, the weeders going bare-footed into the field, and working as much as they can, either sitting or lying down, heaping the weeds, and carrying them away every time they leave off working. The weeders should also, if possible, always face the wind, by beginning at the corner of the field to which the wind blows, as in this method the flax will rise the sooner: and the work should never be done in rainy weather, or when the ground is wet.

If the flax is to be propped, the best time to do it is at the time of weeding. To prop flax is to fix supporters, about the size of a man's finger, branched a little at the top, and about three or four feet long, at the distance of every three feet.

Flax should be pulled in dry weather, in general, when the foot of the stalk begins to turn yellow, though the seed should not be quite ripe. If the crop is not all of equal ripeness, the ripest should be separated; as if all were to be grased together, the unripe part would be rotten before the other was sufficiently grased: it is also best to pull, though at one time, the longest separate from the shortest. When it is all pulled, it must be spread on grass-ground, or on a stubble, the crop end of the stalk being laid to the south, that the seed may ripen the better.

M. Tschiffeli is of opinion, that when the quantity is large, it is best to separate the seed by threshing as soon as it is got in, in the following manner. The beds must be made pretty thick, the crop-ends of the stalk touching the wall of the barn; and over the feet of the stalks a heavy plank is to be laid, to prevent the flax from being scattered about in threshing. The wall, by confining the workmen, will prevent them from striking too hard, and thereby damaging the flax.

If the quantity of flax is small, it may be rippled in the ordinary way, observing only that the handfuls be not too large. When the seed is separated, it must be laid on a cloth, exposed

posed to the sun for several days; and afterwards it should be kept in a very airy place; but must be stirred every two or three days for three weeks. It may be kept in this condition two or three years, without the least damage; but when once this seed is deprived of its capsule, it will scarcely ever keep above a year.

When the flax has been rippled, it must again be laid, but thinner than the first time, on a grass-field that has been about a fortnight before mown, being spread, if possible, in dry years on damp ground, and in rainy years on dry land, but never on wet meadows. It must at this period be carefully turned every other day, if the weather is wet, or the dews heavy.

The time the flax is in grassing, depends on the coarseness or fineness of the staple, the heat and the cold, dryness and wetness of the weather; but if, in bruising betwixt your fingers, the top of the stalk when it is dry, the harle or bark separates easily from the woody part or boon, and this last is not tough, but brittle, the flax should be taken from the ground, in order to be carried under cover as soon as it is dry.

The best method of drying flax for braking, this accurate writer says, is to dig a hollow place in the earth, two feet deep, three wide, and from twelve to fifteen feet long, lining it with stone, over which, at the height of about four feet, is fixed a griddle, or grating, consisting of small poles, securely made fast to four or six piles, or stakes, driven into the ground.

The most proper fuel, we are told, for drying the flax, is either charcoal, or well-dried turf, as well because they give an equal degree of heat, as on account of their not producing much of either flame or smoke.

When the workmen begin to brake the flax, they must go on briskly; for it should be done whilst it is hot from the grating, and should be effected by an equal motion, beginning at the crop-end.

In this manner does the sensible and patriotic Mons. Tschiffeli say that flax should in this country be cultivated and managed; and, if we are not greatly mistaken, the method might, with very little variation, be to advantage adopted in the British islands.

As different countries have different methods in cultivating the various productions of the earth in general, so those relating to flax, in particular, are greatly diversified. We have, therefore, given under this article every thing we thought worthy the reader's attention. The following is the method practised in the Mahera, a district of the county of Roscommon in Ireland; and was wrote by Mr. John Irwin, a gentleman who has long cultivated flax there with success.

Of the Cultivation and Management of Flax in the Mahera.

The poorer sort of people in the district I live in, are so indigent, that they are almost in a state of slavery. Indeed, within these last forty years, they have much recovered from their bare and naked condition, owing in a great measure to the considerable extension of the linen manufacture.

Their chief riches consist in their annual crops of flax, corn and potatoes, in order to pay their rents, which they help off with day-labour; a most galling article to them; for, as to cattle, few of them have any, or but a milch-cow or two at most, which are appropriated for nourishing generally a numerous issue. The calves, which industry ought to be let remain with them to increase their funds, or to clothe their families, a rapacious landlord seldom wants a pretence of appropriating to himself. These people then, from necessity, it is evident, must be perfectly versed in the cultivation of flax and potatoes; and they would succeed very well as to corn, had they surmounted a few old prejudices respecting the form or make of their implements, and the methods of using them. It is, however, from ocular knowledge of their proceedings, in my work and their own, that what I now communicate to you is founded.

The soil about Oran, being strong, deep, and moist, with a clayey loam mostly at bottom, yields excellent flax. It is here scarcely ever produced immediately from the ley. The general practice is as follows: a parcel of ley land in good heart, that is, which has not been ploughed for many years, is proclaimed to be set to grass potatoes (otherwise spaddane, a very mistaken practice, especially

if a deep soil, if not to be sanded, or if a light, if not marled, or otherwise manured) for this land the poor are charged from three pounds to five pounds per acre, sanding not always included: a most unconscionable price!

They generally bargain for two successive crops; and it is for their benefit, as also for that of the land, to have it sanded, because it strengthens it the better to stand a continuation of tillage, and to come the sooner to turf, and yield a good coat of grass, when let back into the ley; but the sky-farmers (those who hold at rack-rents) are mostly so greedy for gain, that it is with reluctance they agree to sanding, as it abates fourteen shillings per acre of their price. When land that requires it is not sanded previous to this kind of tillage, it is doing it great prejudice; but farmers are not always solicitous about this matter, especially on short leases.

Land properly set in this way ought to be sanded at least a year before setting, that it might have proper time to penetrate into the earth, and impregnate it with its salts; but they are such bad farmers about me, that they set, sand, and plant their potatoes almost at the same time. Even in this bad away the land should be set and sanded (or otherwise manured) at least in November, and the potatoes planted the March following at farthest: but I have seen land not sanded till March or April, and not sowed till towards the end of May, (a palpable blunder;) yet this land has yielded a tolerable crop, owing to its great natural fertility; for the sand becomes of little use, if the land is turned up soon after it is fresh laid on. This does much hurt in the country; for such land, after it is let out for a long series of tillage, (suppose fifteen years) is a long time recovering itself, and that which is spaddanized out of the ley, and not gravelled at all, unless of a most superior rich kind, is doubly injured.

The potatoes should be dug towards the end of October, or beginning of November at farthest, (frosty weather excepted) to make room for a crop of bere, or a crop of flax, the spring following; if for flax, the land should get a deep ploughing before Christmas, to benefit of the winter manure, such as frost, snow, air, &c. and a cross ploughing in the beginning of February; and towards the end of March, it ought to get another ploughing in the track of the first; then the ridges to be harrowed down as fine and as flat as possible, and the seed sown in, and lightly covered with another gentle harrowing; for the seed is not apt, from any cause that I have observed, to be disturbed in the ground.

In this situation it should be left till June, then weeded. Some weed it when four or five inches high; but treading it so young hurts it; and this weeding is of no use, for it must be weeded again before pulling, especially in deep chiltern countries, where weeds get a head much more than in light gravelly soils. In these the flax is always shorter and finer, and the seed in less quantity; but the Irish seed, thought it is often imposed for foreign, is never so good: for example, the first year's return of foreign seed will produce a middling good sort of flax, whereas the second return will not. To sow the seed even should be most carefully attended to: a commonly skilful hand will with ease cast it properly, the method being so well known. Sixteen pecks of seeds at twelve quarts to each peck, is a proper quantity for an acre of good light soil. In my deep grounds I have known fourteen pecks to be sufficient.

The seed now much used in Ireland is the Plantation, but the better sort of the Baltic or Riga seed I would prefer. The Dutch agrees worst of all with our climate. The choice of it is easily known. The women are surprisingly skilful in every thing that regards this plant: one of them will shut her eyes, put her hand into several hogheads of flax-seed, and fix upon that which is best; but they have marks from pressing it to oil between their fingers, so as to observe the edges, and from taste, smell, and view, without requiring to make the other common experiments; whence they are seldom deceived; not but the merchants play them a thousand tricks in this article, which is become very lucrative of late years, from the vast demands there are for it.

The heavy, pale reddish, or rather clear brown looking seed, being thick and short, and oily in the feel, is the best. Sometimes, among some parcels of the seed, there are certain mixtures, by which predications the women immediately estimate the quality of it. The old Irish seed, of which quantities are still sown, is the worst of all; the

returns are extremely bad, and the flax but indifferent for use.

Two crops successively are common in deep rich lands; but as flax is a great drawer, they are not the better for it, as it greatly retards their coming to grass.

We always sow flax after potatoes or corn, (bere) and, if proper care be taken in the preparation of the land, find it to answer well. How far better it may be immediately out of fresh land manured, I will not take upon me to say: some writers recommend this method; but it would never answer with our poor people. I have seldom known flax to be raised immediately from manured grounds: mine being rich, deep, and moist, and properly wrought to return a first crop of some other article, yields afterwards admirable flax. Where different soils can be had in the same district, it is needless to observe, that the richest and strongest, with a clayey loam at bottom, is best: the nature of this plant requires such, being a great drawer of the nutritive parts of the earth; but, on the other hand, there is a medium to be followed in this, as in most other things: land may be made too rich for flax, which will undoubtedly lodge it, that is, occasion its prematurely lying flat to the ground: this prevents its ripening, consequently occasions great waste of it, total loss of seed, and what is recovered of it manufactures but indifferently, and stands the tests of use worse: however, there is much of this sort spun into yarn by the poor, and imposed for good on the eagle-sighted yarn-buyer, notwithstanding his great vigilance.

If middling good land, whether in the ley or not, be fallowed early in the summer, and gets the proper tilth till the March following, when it is to be sown, there is no doubt but it will yield an excellent and abundant crop of flax. Land cannot be ploughed too often, or made too fine, for this purpose. Flax ought to be sown and pulled in dry weather.

It is not ripe in my neighbourhood, generally speaking, till the beginning or middle of August, and sometimes later, when late sown: the better sort of husbandmen think it is not necessary to sow it earlier than Good-Friday: about that time most people begin.

The poor people have several marks by which they know when it is fit for pulling: the degree of brownness of the colour is the chief, and is a sufficient guide to any person. The men and women, promiscuously ranged in a row a breast, pull it expeditiously enough, especially if they are a little refreshed with some of the good things of this life, and lay it on the swarth. If there be danger of rain, they bind it the same evening into sheaves, and stack it, putting commonly eight sheaves in every stack. Here it is suffered to remain for some days, till it is sufficiently dry to remove.

The poor, from necessity, proceed to manufacture it immediately, by rippling of the rows, and watering it, &c. But my method is as follows. After I let my flax sufficiently season in the field, so as to prevent the danger of heating, which destroys it, I draw it into my haggard, stack it, and thatch it well. Thus I let it remain till the next sowing time, (March) when I ripple it and water it, and, if I have leisure, proceed to dress it; if not, make it back into a stack, and let it lie so, without any hazard of danger, as long as convenient: or, (another way) soon after pulling, it may be rippled, watered, and stacked, so as to be ready for dressing the spring following. But I chuse the former method, because I thereby preserve the seed, and sell it, if I take a little care, equal to the foreign, which will go a good way in reimbursing me my expence: it is true the quantity of flax will be somewhat diminished for remaining so long unwatered; but then it makes ample amends in meliorating it; for I have observed, that the flax thus managed dresses and manufactures much better, and when in linen, it wears best. But the impatience of our Irish ladies, who are the conductors of this branch, from the time the flax is over ground, till made into linen, is such, that they do not relish delays of this sort, though infinitely the best method of proceeding.

For watering flax, clear stagnated pools or canals, or ponds, are best, provided there are no fish, as it kills them: springs and running-waters must be avoided. To sink it under water is proper, and let it lie about three weeks, more or less, according to the quality of the flax, and the condition of it at putting in.

About me, the poor people still preposterously will water it

in bog-holes, because they think the water cannot be too soft, and that the banks being unincumbered with long grass, facilitate the drying of it.

When it is brought home (as they have no ovens) they fix a large hurdle horizontally by a ditch side about four or five feet from the ground: on this they lay a parcel of flax, and underneath make a large turf fire, and keep constantly turning it.

They judge it fit for the brake, by rubbing a parcel between their hands, and finding the prickles to detach themselves easily from the flax.

The braking is a very laborious part: it is pity that about where I live there are no engines contrived for this purpose, as it would save great expence in labour. This part of the process ought, properly speaking, to fall solely to the share of the men; but the women as commonly do it, which I think very unseemly, and still more so to see a man scutching and hackling flax, which is equally as common with us: but the women always scutch mine, and I find do it best, as I order them refreshment, it being merry-making time, (though but short) like vintage, or sheep-shearing time.

The construction of the brakers I need not explain; they are simple engines, and known to every body. The broad scutch is best, as it hurts the flax less: it ought to be made of well seasoned oak, to be light, that the women, who are dexterous at it, may manage it more easily.

A great deal depends on the skill of the hackler, who ought to be very expert and knowing in dividing it properly, and in arranging the sorts according to their different fineness. I have had some hacklers manage this matter so well, that out of the very tow they produced I had good linen for common use. I had other hacklers, who, instead of preparing my flax to spin to eight or ten dozen of yarn to the pound, of which it was capable, prepared it so badly, as to produce me only from four to six dozen yarn.

To the spinners we keep in our houses we generally give from thirty-five to forty shillings a year: these spin from four to eight dozen yarn; but if they spin finer, they are entitled to get a gratuity in addition, or higher wages. There are girls in plenty in the north of Ireland (where the manufacture most flourishes) who spin surprisingly fine, and many of them with both hands at once, at wheels adapted for the purpose; but scarcely any of these ever come into the parts where I live.

As to the rest, from the time the yarn is sent to the weaver, till it is brought home from the bleach fit for use, it forms a particular process in itself, and shall be communicated to the public, when more ample leisure will permit. However, before I dismiss this subject, it may not be improper to make a few detached observations to illustrate still more what I have already said.

There are various ways to know good seeds, which is one of our most essential objects. First, to discover its thickness, by taking some grains, and squeezing them between the fingers, until the white edges of the inside pulp or grain are forced to appear. To estimate its goodness by its weight may be easily done, by throwing a handful into water, and if good it will sink quickly. To prove if it be oily, throw a handful on the fire, and if, as soon as it touches the coals it burns up and crackles, its goodness may be depended on. But no seed of Irish growth, as I said before, will thrive well a second year in any of the soils in my neighbourhood; nor will the same soil answer for more than two successive seasons, without the intermediate occupation of other crops procured from manures.

As the culture of flax lays down land very smoothly and well, if you chuse to have your land let out, you may sow grass-seeds with a light roller, or bullock, in some little time after your flax is in the ground: they will not hurt it; and by this means you will have a full coat of grass the same season, which otherwise perhaps would not be the case for two or three seasons, flax being a great impoverisher.

When the flax is a clear yellow, or a clear brown, something resembling a lemon colour, and begins to drop its leaves, it should be pulled; but never when it is green, though often done, which is a very destructive method, for in this case it loses considerably in quantity and quality both with respect to flax and seed. Those who imagine pulling it green will make it yield the finer linen are mistaken:

taken : they need only consult the method of the Flemings, who suffer it to remain the longer in ground, the finer they want it to prove for their laces, cambricks, &c. Care, however, should be taken not to let it remain too long in ground, as this makes it work badly, yield bad yarn, and not bleach so well.

I have kept my flax in stack in my haggard some two or three seasons, and never found it was damaged by vermin, though I know there are preventatives laid down by some writers for this purpose.

If the season be moist, there is no stacking it with safety, till it remains unheaped a considerable time in the barn, as the least heating is certain destruction to it.

No land can be too good for flax, if the seed be duly proportioned to it. If the crop fails on a rich and strong soil, it has too much seed ; for it should not be so thick, but that every stem may have the benefit of the sun and air to fortify it. *Museum Rusticum*, vol. I. p. 5.

Mr. Young, in his *Annals of Agriculture*, vol. xiv. p. 349, says that "Flanders is justly celebrated for the culture of flax ; it is there cultivated in great quantity, and is considered one of the most considerable agricultural revenues of the country. They have a particular way of sowing flax, which, in the French language is called *lin ramé*, and which as it seems to me interesting, I will give you some account of : the land for the *lin ramé* is ploughed, and manured before winter ; and in the beginning of March, or sooner, according to the season, it is deeply ploughed again : some days before sowing it, they spread upon the land some pigeon's muck, and afterwards the seed, which they cover with an harrowing, and a rolling. When flax comes up, and is four or five inches high, they first weed it with the most scrupulous attention, and then they build a kind of cover hanging over the little plants in the following manner: they stick on both sides of the ground, bordering the ridge, some strong wood forks, about six inches high, upon which they put long poles along the width of the ridge, in a direction parallel to the ground. These poles are crossed by small sticks, branches of trees, &c. so as to form a kind of grate full of holes, through which the plants of flax pass, as they grow higher : by these means, their stems have a good defence against winds and rains, and their roots against an excessive humidity and heat, and so their vegetation is very much benefited. The produce of the *lin ramé* is very great ; when it succeeds well, the crop exceeds in value the land where it grows : I have heard of such crops of flax, so cultivated, as to be almost beyond credibility."

A Short Account of the Advantages of the new Machinery for braking, scutching, and beating Flax and Hemp, invented by Robert Macpherson, Assistant-Secretary to the Commissioners and Trustees for Improvements in Scotland.

The breaking of flax by the Dutch hand-brake (which is the best old method of breaking) the scutching with stock and hand, and beating with hand-mallets, being laborious, tedious, expensive, and requiring many hands, it was thought a valuable improvement, when, some years ago, a water-mill was invented, by which these operations are performed with more ease and expedition. But in some parts of the country, a sufficiency of water and water-fall is not to be met with ; in other parts where these are to be had, lint-mills are not erected, on account of their heavy expence ; and wherever erected, they are found liable to the following inconveniences. First, the expence of fitting up the mill, making dams, the aqueduct, &c. and keeping these in repair, is great ; and much damage happens by fire, and by water floods. Secondly, in Scotland, it has hitherto been found, that on account of the scarcity of hands, and difficulty of dressing in the old hand-methods, flax never was raised in considerable quantities, until the country people found the convenience of a mill in their neighbourhood ; and therefore the first sitting-up of a mill in a part of the country where there was none before, could not for years expect business adequate to his out-lay of money. This circumstance obliged the linen-board in Scotland to defray part of the expence of fitting up many of these mills. Thirdly, this mill is extremely dangerous to the workmen ; many have lost arms by it, some their lives, and the nature of the work there is otherwise remarkably unhealthy. Fourthly, this mill is so con-

structed, that the stroke of its scutchers is ineffectual, unless they are moved with a degree of violence, that nothing less than the utmost dexterity and closest care can prevent from destroying a very considerable part of the flax ; and as that skill and unremitted attention cannot be expected among a number of common day-labourers, the great waste of flax always attending these mills is easily accounted for, especially as unskilful hands are often employed ; for being called to this work only in winter, the lint-miller must content himself with labourers that, at the beginning of the season, are not otherwise engaged. Fifthly, The carriage of the rough flax to mills at a distance, the delay there, sometimes for months, till others be served, during which time the flax must lie without doors : damage, embezzlement, &c. these are much complained of ; and, with the waste before-mentioned, have in general ruined the character of these mills. Sixthly, The expence of flax-dressing is still kept high, because the proprietor of the mill must have a large rent, especially as his outlay upon it is extensive ; the miller must have a living ; and the workmen extraordinary wages for such dangerous and unhealthy work. In short, it has become very doubtful, whether, upon the whole, these mills have not been more hurtful than beneficial to the manufacture.

The new water-mill for dressing flax and hemp, invented by Robert Macpherson, removes part of these inconveniences. For, 1. It is much less wasteful of the flax : as much so, it is presumed, as water machinery can possibly be. It not only yields more flax from the scutch, but the flax, dressed by it yields still more from the heckle. 2. It is fitter for dressing long hemp. 3. It is no way dangerous nor unhealthy to the workmen. 4. It requires a less expensive mill-house, and less annual repair. 5. It requires much less water. 6. For one, two, or a few workmen, the parts of its machinery which dress the flax or hemp, may be joined to the movement of a corn-mill, or any other mill, by a small iron-axle, or by rope and pulley, through any wall or partition, at a side, above, or below.

Where much business in the beating way is to be done, the new machinery with water or a horse, gives entire satisfaction. But scutching proves an operation that requires more judicious management than can be expected at a public water-mill. A lint-miller, who dresses flax for others, finds his profit in the dispatch made by the great velocity which can be given to the scutchers by a power of water ; but the proprietor of the flax loses more by the waste occasioned by that velocity than the miller gains by the greater dispatch. In short, the dressing of flax by any expensive public water-mill remains still liable to many of the inconveniences mentioned in the first part of this paper.

The foot-machines (likewise invented by Robert Macpherson) it is presumed, obviate all these inconveniences, and go far towards bringing flax-dressing to perfection. For, 1. They waste the flax or hemp as little as the hand methods of dressing. 2. They are much more expeditious, and as much so as dare be attempted without destroying a considerable part of the flax or hemp, which above every thing else ought to be avoided. 3. The working with them is not so laborious as the hand methods. 4. They are not dangerous to the workmen. 5. They are not too bulky for general use : they are portable upon a cart, are of small expence, simple construction, can be made by any good carpenter and smith, and each machine is wrought by a single person.

With these foot-machines any person may have his flax or hemp dressed under his own eye, by his own servants, and at times when otherwise they would be idle, in the dark afternoons of winter, when the lanthorns used by hecklers will prevent accidents by fire, and in the day-time when bad weather hinders working in the fields. Thus the dressing of flax and hemp becoming easy, the raising of these crops, of all the most profitable to the farmer, and to the country, will become more general ; many will have their flax or hemp dressed by their own servants, without expence ; and when others are hired to that work, the expence must be much less than by the hand method, as the machines are greatly more expeditious. The water-mills are not taken into this comparison, because their waste of the flax or hemp overbalances the profit of their greater dispatch.

The importance of this new machinery to Britain, Ireland, and the colonies, must appear very great, when the following particulars are considered.

The

The value of the flax and hemp raised in England yearly cannot be reckoned less than — 250,000 L.
 It appears from the custom-house accounts, that there was imported into England, from Christmas 1762, to Christmas 1763, 100,997 bushels of linseed. In the fens about Lincoln-wash, thirty towns and villages have yearly about 6000 acres of flax and hemp. There are likewise some thousand acres of these crops yearly in the marsh-lands on the borders of York and Lincoln-shires. The town of Snaith, in Yorkshire, has the greatest flax-market of any place in Britain.
 The value of the flax and hemp raised in Scotland yearly is calculated about — 190,000 L.
 There is imported into Scotland about 60,000 bushels of linseed yearly.
 The value of the flax and hemp raised in Ireland yearly may be reckoned about — 500,000 L.
 The linen manufacture there is about double that in Scotland, and mostly made of their own flax.
 Sum of these — 940,000 L.

The expence of breaking and scutching that 940,000 pounds worth of flax and hemp may be reckoned 150,000 pounds; one half of which, or 75,000 pounds per annum, must come in time to be saved by the use of the new machines; for the new scutcher does more than double the work of the old hand-scutch in the same time. The new brake is not so advantageous in that respect; yet the inventor thinks he errs on the safe side, when he states the new brake and scutcher both together, as doing only double work.

The colonies in America were till lately encouraged to raise flax and hemp, by a parliamentary bounty in Britain.

The great advantages of raising our own seed, flax, and hemp, instead of providing them from foreign countries, need not be here represented. What is at present imported appears from the custom-house accounts as follows: and it cannot be doubted but the aforesaid new machinery will be the means of increasing our own growth, and consequently decreasing the foreign importation.

The linseed imported into England is annually about 100,000 bushels, reckoned in value L.
 about — 40,000 L.
 Into Scotland, about 60,000 bushels — 25,000 L.
 Into Ireland, about 80,000 — 34,900 L.
 Flax and hemp into England, about — 700,000 L.
 Into Scotland, about — 120,000 L.
 Into Ireland, about — — — — —

Sum of these, exclusive of the blank for Ireland, 919,000 L.

And that there can be no want of market for an extension of our linen and hempen manufactures (which the new flax-machinery must greatly promote) appears evident from the extensive importation of these manufactures from foreign countries; for, according to the custom-house accounts, there is annually imported into England, from the continent of Europe,

Linen-yarn, of value about — 200,000 L.
 Linen-cloth, of value — 1,500,000 L.
 And thread, lace, sail-cloth, cordage, facking, &c. the amount of which must also be considerable.

Explanation of Plate XIV. representing the Foot-machines for breaking and beating Flax and Hemp.

Of the FOOT-BRAKE.

A The three under-brake teeth, or swords, seventeen inches long, three inches deep, one and a quarter inch thick at back or bottom, a quarter of an inch at B edge, the edges two and three quarters inches asunder at the end next the guide B, and two inches asunder at the other end.
 C The two upper teeth, about an inch shorter than the under teeth.
 D The brake-mallet, about thirty-three pounds English weight.
 E, e. A compound foot-treadle. E is eight feet four inches F between the fulcrums, raised at F eight inches above

the ground (or rather five inches higher than the stance of the workman). e is two feet four inches between the G fulcrums, and is raised at G eighteen inches above the ground: that is, fifteen inches higher than the stance of the workman.

H The sword or upright timber-rod which turns the wheel by the treadle-crank.

I The treadle-crank, of seven and a half inches radius.

K The fly-wheel, four and a half feet diameter, above sixty pounds English weight. As here represented it is beat or cast-iron, but it is also made of timber.

L Brass cods or bushes.

M, m The lifting crank, m is fixed firm upon the axle of the fly, while the crank M, about eight inches radius, plays freely round the axle. In position first, m begins to take round the crank (which by the lever R pulls up the mallet:) when it comes to position second, the mallet is again at liberty, and by its weight pulls up the crank (faster than the fixed pieces move) into position third.

N. B. The treadle-crank is advanced about one eighth part of the circle before the lifting crank.

a A small pulley which turns easily round on the end of the crank, and to which a rope is fixed.

O A piece of timber which prevents the rope from falling in upon the axle, but which should not rub against the rope in its coming down.

P Here the rope passes between two friction-rollers, which are so placed that the rope comes down there four inches, or half the radius of the lifting crank, or the side of a plummet-line crossing the center of the wheel; that is, to the side on which the crank turns when it pulls down the rope.

Q A pillar, which serves only to support the guard for the rope O, and the friction-rollers at P.

R The lever.

S The lever-pillar.

T Part of the mallet-frame.

U Two pillars which guide the brake-mallet.

V An iron spring which receives the leap of the mallet, and throws it the quicker down.

W The pillars which support the fly.

X, U The pillars which bear the brake-teeth and mallet.

Y Spur and cross, supports of the pillars.

Z The bottom frame-piece.

a A broad stool upon which the workman stands, three inches above the ground.

The brake-teeth are made of good beech or plane-tree, the brake-mallet of plane-tree, ash, elm, birch, or oak; the sword, or upright timber-rod between the treadle and the treadle-crank, of beech, plane-tree, or birch; and the lever of beech, ash, or oak. The fly-wheel, if timber, should be made of oak, ash, beech, elm, or plane-tree. All the other parts of timber worth mentioning may be made of fir.

Of the FOOT-BEATERS.

The before-mentioned brake may at any time be converted to a beater of flax and hemp, by removing the brake-teeth, and putting in their place flat boards. In the upper of these boards may be driven thirty-two nails, the head about three quarters of an inch long, and the point of the head about a quarter of an inch diameter; the points of the nail-heads may be placed one inch clear asunder, and in the order marked B, at equal distances, as in this way any of the nails may most easily be drawn out in repairing the mallet. An iron hoop about the mallet will prevent its bursting with the driving in of the nails.

For the sole purpose of beating flax and hemp, the narrow end of the mallet is placed towards the workman; and where there is much work in that way, the mallet and fly may be made heavier, and then two or more workmen can work together upon the foot-treadles, which may also be made equally long.

Plate XVII. fig. 1. represents the scutching machine, where b B G is the foot-board; D, D, scutchers; Q, the center of the iron wheel C, C, Q; S, the upright piece, or scutching slack; A the piece on which the hand rests in order to scutch the flax. The machine is put in motion by the nunch at M, which is moved by the foot-board.

We have been the more particular in our account of the various methods used in cultivating and dressing flax, be-

because it is an article, which, with proper encouragement may become of the utmost importance to these kingdoms; and therefore, we were persuaded that we could not do a more acceptable piece of service to the husbandman, than by giving the various methods at full length, though we are conscious that in doing this the reader will meet with some repetitions, which could not be avoided without curtailing the whole, and consequently rendering it less valuable.

FLAX-SEED for stall-fattening is recommended by Mr. Marshall, in his Rural Economy of Gloucester, vol. I. where he says, "that, next to hay, oil-cake made of linseed is the main article of stall-fattening. But the price of this article is at length become so exorbitant, that it no longer, I am afraid, leaves an adequate profit to the consumer. Some years back, I recollect, it was the idea of men of experience, that it could not be used profitably as an article of fattening for cattle, at a higher price than three pounds a ton. Now (1788) it is, in some places, more than twice that price. The lowest price, at the more distant mills, is, I am well informed, five pounds; at Berkeley mills, six pounds; at Evesham, six guineas; at Stratford, six pounds ten shillings a ton.

"This extravagant price of the cakes has induced some spirited individuals to try the linseed, itself, boiled to a jelly, and mixed with flour, bran or chaff; and, from the information I have had, with favourable success.

"This novel practice requires a few minutes reflection. From the present scarcity and dearth of cakes, it may be inferred that the demand is greater than the quantity in the markets. If, therefore, the seed can be profitably used; though with only a small increase of profit, and with this even on a contracted scale; the use of it may operate very beneficially; by lessening the demand, and thereby lowering the present exorbitant price, of the cakes.

"It is highly probable, however, that it may be used with much greater advantage than cakes at their present price. I have by me a sample of American feed, (nearly equal to the best Dutch seed I have seen), which may now be imported for 38 to 40s. a quarter, of eight Winchester bushels. Supposing the bushel to weigh 50lb. the price of this prime seed is not twelve pounds a ton. Ordinary seed might be had cheaper.

"It is farther probable that the superior kind of nutriment, which the cakes afford, proceeds from the unexpressed oil they contain, rather than from the husks of the seed of which they appear to consist. This being admitted, and seeing the excessive power which is used in extracting the oil, we may without risque conclude that a ton of seed contains more than twice (perhaps five times) the nourishment which remains in a ton of cakes.

"The principal objection to linseed jelly is the trouble of preparing it. In an instance in which it was used with success, the method of preparing was this. The proportion of water to seed was about seven to one. Having been steeped, in part of the water, eight and forty hours, previous to the boiling, the remainder was added, cold; and the whole boiled, gently, about two hours; keeping it in motion during the operation, to prevent its burning to the boiler; thus reducing the whole to a jelly like, or rather a gluey or ropy consistence. Cooled in tubs: given, in this instance, with a mixture of barley-meal, bran, and cut chaff; each bullock being allowed about two quarts of the jelly a day; or somewhat more than one quart of seed in four days: that is, in this case, about one sixteenth of the medium allowance of cake.

"This however is thrown out as a general idea; not drawn as an inference: the comparative effect of these two materials of fattening forms an important subject for the decision of experiment.

"Viewing the present subject in a partial light, it might be said that an unlimited and excessive use of a foreign article of fattening for cattle, might lessen the demand, and thereby lower the value of our own productions, applicable to the same purpose; to the injury of the landed interest. If, however, we consider that, by the use of foreign linseed, an influx of the first vegetable manure we are acquainted with would be diffused over the soils of this country; and that wheat may be exported at a price more than equivalent to the present price of linseed; the landed interest would seem to have no cause of alarm; while in a more general point of view, the importation of linseed from America might be a national good. I understand from intelligence of the first authority, that some of the finest provinces of that country, are in a great manner destitute

of marketable returns, for the produce and manufactures of this kingdom; and further, that linseed, which can there be grown in unlimited quantities, is at present a drug in the American markets."

FLAYL. See FLAIL.

FLEABANE, or *Fleawort*, the name of a perennial weed common in pastures, the stalk of which is round, bending, solid, and heavy. The leaves are oblong, sharp-pointed, wrinkled, downy, and embrace the stalk, on which they grow very thick without any regularity. The flowers are yellow, radiated, and inclosed in a flower-cup, made of narrow scales like bristles.

FLEAK, a gate set up in a gap.

FLEAWORT. See FLEABANE.

FLET-MILK, milk that has been skimmed, or had the cream taken off.

FLOATING of Meadows. See the article MEADOW.

FLOTE-FESCUE *grafs*, an excellent *grafs* for cattle, growing in watery places.

The *flote-fescue* affords excellent feed for horses. Mr. Stillingfleet, quoting a piece published in the Amæn. Acad. vol. III. entitled *Plantæ Esculentæ*; takes notice, that the author of it says, article 90, "That the seeds of this *grafs* are gathered yearly in Poland, and from thence carried into Germany, and sometimes into Sweden, and sold under the name of manna-seeds. These are much used at the tables of the great, on account of their nourishing quality and agreeable taste."

Our ingenious countryman, in his addition to this passage, has the following words: "Mr. Dean, a very sensible farmer at Ruscomb, in Berkshire, assured me, that a field, always lying under water, of about four acres, that was occupied by his father when he was a boy, was covered by a kind of *grafs* that maintained five farm-horses in good heart, from April to the end of harvest, without giving them any other kind of food, and that it yielded more than they could eat. He, at my desire, brought me some of the *grafs*, which proved to be the *flote-fescue*, with a mixture of the marsh-bent. Whether this last contributes much towards furnishing so good a pasture, I cannot say. They both throw out roots at the joints of the stalks, and therefore are likely to grow to a great length. In the index of dubious plants, at the end of Ray's Synopsis, there is mention made of a *grafs*, under the name of *gramen caninum supinum longissimum*, growing not far from Salisbury, twenty-four feet long. This must, by its length, be a *grafs* with a creeping stalk; and that there is a *grafs* in Wiltshire, growing in watery meadows, so valuable, that an acre of it lets for from ten to twelve pounds, I have been informed by several persons. These circumstances incline me to think it must be the *flote-fescue*; but whatever *grafs* it be, it certainly must deserve to be enquired after.

"There is a clamminess on the ear of the *flote-fescue* when the seeds are ripe, that tastes like honey, as I have often found; and for this reason, perhaps, they are called manna-seeds.

"Linnaeus Flor. Suec. article 95, says, that the bran of this *grafs* will cure horses troubled with bots, if kept from drinking for some hours." So far the very ingenious Mr. Stillingfleet.

From what has been said above, we may conclude, that the *flote-fescue* is one of the best *grasses* that we can cultivate for the use of our horses, and that more especially, as it appears to thrive best in wet, low meadows, where many other *grasses* would not grow.

There are at Clacton-Lodge, in the county of Essex, not far from Thorp, some low meadows, which are every year flooded for months together during the winter season: these meadows are covered with a *grafs* of a remarkable fattening quality; for when old cows have been turned into them, though they were ever so poor and low in flesh, they have in a very short space of time grown as remarkably fat; and when killed, their meat would appear as fine, and taste as well as that of any steer or ox; therefore it is reasonably to be supposed, that the *grafs* growing in these meadows is no other than that of the *flote-fescue*.

FLY, in turnips. See TURNIPS.

FLY, in sheep, a species of maggots very troublesome to that animal. The reader will find an infallible method to destroy these troublesome insects under the article SCAB in Sheep.

FOAL-TEETH. See the article *Age of a Horse*.

FODDER, hay, straw, haulm, &c. given to cattle.

In the foddering-yards of back-sheds, or other out-houses, to have several divisions, over and above what is constantly used, has great conveniences in it; one of which is, that in them you may dispose of a two-yearling cow, or another cow, at the time of bulling; not only to keep them from a bull, but from the other beasts also, that would be leaping such a cow, whereby they may hurt each other, &c. especially cows forward with calf will be apt to warp by leaping a bulling-cow.

The open winters make hay the dearest, if a hard frost and snow come at the fore-hand of them; for if once cattle come to fodder, they must be held to it, or they will receive great damage. In watery weather all the hay that can be given to cattle will not make them thrive, but in dry frosty weather they will thrive with their meat very well.

Mr. Lisle says, that he let his cows go at large from their foddering-yard, during the winter, and so continued till April, when they fed on some grass; and those that had calved, he foddered with hay: the consequence of which was, that by the middle of April his cows would not stand to eat any straw at all, but were, during the months of March and April, so weaned from straw, by baits of grass and hay, that they fell off from the straw quite, and grew much leaner, and worse in flesh than they had been, and apparently worse than the farmer's cows, which were, after the winter months, wholly pent up to their straw, and to the pond.

All sorts of cattle that chew the cud, as sheep, cows, &c. care not to graze after each other, nor to eat one another's leavings in the foddering-yards, but cattle that do not chew the cud will eat after those that do, and *vice versa*.

Pliny tells us, where hay was scarce, it was usual to feed their cattle with chaff and barley-straw. Of chaff, says he, that is the best sort, which is the thinnest and smallest, and nearest to dust; the best therefore is from miller, the next from barley, and the worst from wheat, except it be for hard-labouring beasts.

On sound experience I am convinced, says Mr. Lisle, that in our hilly-country we ought not to have any dependence on sending our cattle out of the foddering-yard to grass before the middle of May, and therefore we ought to be provided with winter-fodder for cows accordingly.

At the beginning of winter, suppose the latter end of October, and a great part of November, while cattle still continue out in the field at grass, it is very necessary to fodder them early in the morning, while the hoar-frost hangs on the grass, which they will not eat kindly off till the sun has warmed it.

The straddling racks are best for foddering, if made strong enough, that is, so as not to be over-turned; for these racks may be lifted up as the dung mixen rises, which those fixed in the ground cannot be.

It is a practice in many places, to tie their cows up to a rack to fodder; but if a person would rightly consider the places where it is done, we should find it only used where the fodder is good, being either hay, or very good straw; but in the hill-country of Hampshire, where the cattle have straw fodder only, and that not so good as the straw in the valleys, the custom is to fodder their cows in racks, or cribs, in the open yard, which they think better than tying their cattle up to racks in houses; for though in cold and rainy weather the houses may keep their loins dry, yet in countries where the fodder is coarse, especially after wet and backward harvests, when the spirit of the straw is washed out by the rain, the giving cattle straw from racks, from whence they cannot pick and choose, as from cribs they may, is judged to tend to the impoverishing the cattle, whereas in cribs they can pick the sweet from the coarse.

There is a very remarkable difference in cattle eating their fodder, when fresh threshed, and when it has been threshed two or three days, especially if the straw be but indifferent fodder. *Lisle's Husbandry, vol. I. page 392.*

FOGGE, long grass remaining in pastures till winter.

FOISSEN, the natural juice or moisture of the grass or other herbs.

FOLD, the moveable inclosure wherein sheep are confined during the night.

It appears that the sheep-folds of the eastern nations were not such as ours, but houses erected for that purpose.

Mr. Garret, who had lived four years in Spain, says the ingenious Mr. Lisle, assures me, that in those parts where he was, they fold their sheep as we do ours, only their fold is made netwise with strong cords, and about six feet high, with the bottom flaked down to the ground, and two cur-dogs of a breed between a mastiff and a greyhound, lie within the fold to guard the sheep from the wolf.

"In favour rather of keeping a wether-flock than an ewe-flock on the hill-country, besides other conveniences, you may have the benefit of the fold for barley at the principal time when it does most good, viz. on the fallows between the latter end of February and the middle of April, when the ewes cannot be folded.

"The limitation of an ewe-flock for folding and keeping on throughout the winter, or be it a wether-flock, ought to depend on these rules; First, Not keep more at winter than you can winter, either by meads, or sowed grasses and hay. Secondly, Not to be satisfied that you can provide hay for them by sowed grasses, as broad clover, &c. in case such lands as are fitted to carry such grasses, lie at a distance for mowing, whereby you must maintain them with dung, where, by reason of carriage, it will be chargeable, unless your fold can maintain more ground than your out-lying lands to your farm, which, in the hill country, is not likely: and to carry but seven or eight pots of dung in a day, by reason of the distance, and mowing, is not reaping a profit, but bare exchanging: but if you have much land round about, and near your house, whereto you can carry thirty or forty load of dung a day, and which will bear broad clover hay, then you may increase your flock proportionably.

"As to fattening your ewes and lambs out of your flock, if you have lands disposed for fattening, you ought to consider, if you break your flock by drawing out ewes with their lambs for that purpose, what flock you will have left to fold on your wheat fallows, and how far your wheat land stand in need of a fold; for if you leave yourself not sufficient, it will be indiscretion to weaken your fold; besides, it will hurt your breed; for you will draw off many forward lambs, which might, perhaps, have carried on the breed otherwise, and when a hill country farmer is settled in a flock, it is not good to be buying yearly, to keep up his complement, on account of many dangers which may from thence ensue; it is better, therefore, in such case to buy ewes with their forward lambs to put into your fattening grounds; but in case you sow wheat-land good enough without the fold, or have another way of manuring it, by liming, &c. then it may be very well to fat off certain numbers of your flock.

"Though, says a very good farmer of my acquaintance, I have but a mean opinion of winter folding, or to fold on barley sown, and may in time fallow on grass-ground instead of barley-land, yet I would fold on barley-land fallowed or stirred, from the time my lambs were stiff enough after lambing to go on such fallows; for, says he, the benefit of an acre so folded, is three times as good as one winter-folded for barley.

"Farmer Glyde, of the Isle of Wight, with whom I was talking of husbandry affairs, told me, there was one thing he believed I knew not of, which he would tell me; he would, he said, advise me to fold my ewes and lambs on the barley-land in the spring, and divide my flocks in folding; for, said he, two hundred ewes and their lambs will do as much, if not more good, by folding on an acre of land, as four hundred wethers: I have, said he, folded a part of the same land at the same time two hundred ewes and their lambs, and in another fold of equal dimension five hundred wethers; and I have always found, that the folding of the ewes did me the best service, and brought me the best corn.

"My shepherd is of opinion, that ewes ought not to be folded on the barley fallows, or any other fallows in lambing-time, but wethers only; for the lambs, being wet, when lambed, would be dirtied with the fallows, and the ewes would presently forsake them; therefore the ewes ought in lambing time to be folded in the meadows, where it is clean, and the folds removed as often as the cold

cold wind should change from corner to corner. And afterwards, he said, they ought to fold wethers on the barley till a fortnight after May, but the ewes never after Candlemas.

"It is plain, that the early folding an ewe-flock, and lambs in April, on wheat-fallows, pinches the lambs, and so does folding them at that time on the barley-grounds, both which are too cold for them, especially on our hill country; care ought therefore to be taken, that those lands do not of necessity want folding on in those months, but that they may be otherwise provided for, and that during that time the ewe-fold may be on grass-grounds, or lay-grounds designed for fallows.

"We must be more cautious in April and May of folding an ewe-fold on the barley land, they being wettest, than of folding them on the wheat sown in August or September; because the lambs in April and May make the ewes rise often and move, whereby the ground becomes much more trodden at that time of the year by the ewe-fold, than it would be by a wether-fold, or an hog-fold, as may apparently be seen, if the folds be divided.

"Telling Mr. Gerrish the grazier, and farmer Isles, how dear Mr. Eyres our minister fold fat lambs to the number of fifteen, May eighteenth, viz. for ten shillings and six-pence each, and that they had been folded all along to the very day he sold them: they replied, that folding the lambs did very little hurt to them with respect to their fat, provided they were drove pretty late to fold, and let out early in the morning.

"Walking with Mr. Raymond into his arable common fields, October twenty-fifth (anno 1728) we met his shepherd pitching the fold on the new sowed wheat. I asked him, whether he did not find that pitching the fold on the wheat at this time of the year, and a fortnight later, turned to a much better account than folding for the barley crop for the year following. Mr. Raymond and his shepherd readily replied, undoubtedly it turned to the best account to fold after this time on wheat. I said, for my part, I had observed the fold carried on the land, designed for barley so early in the winter had little effect, its strength being spent and washed away by spring, so that it will make but little shew in the crop of barley next summer, and that therefore I chose to preserve four, five, or six acres of wheat-fallow that lies warm, and will bear sowing late, to carry my fold over to the latter end of October, rather than finish my wheat fold by the end of September, and then carry it on my barley; for though the latter part of October might, in our cold country, be too late to sow wheat, yet it was better than to be so soon folding barley, which would be no better for it. To which they replied, I was much in the right. And as I have before observed how insignificant the folds is in the winter, especially in hard frosts, I imparted it to Mr. Raymond, who concurred with me, and said, he had folded on arable land in snow, and found not the least benefit: whereupon he resolved in such cases to fold on meadow and pasture, in mighty expectations of grass: but it made no return; wherefore in snows he now lets sheep ramble.

"Whereas I have said, that in cold clay-ground, and in a cold hill country, a winter-fold does little good; yet I have by experience found the contrary in such parts of the hill country, where the land is dry and light, and that it does great service to the barley-crop. This difference may be reconciled thus, i. e. where the land, though called hill country land, does not lie very high, for the height much tends to the chilling of the ground. Again, the explanatory reason of this difference, though hardly accountable for, yet seems to me chiefly to lie in the chilling quality of the ground which at first receives the dung and urine, and that deadens the ferment; whereas in warmer ground its progression toward that end is supported by a sufficient benign warmth, since in both sorts of earth, the urine does undeniably sink into the earth, and mix with it.

"My ground being cold and feeding, I should in the spring of the year, when I come either to pitch my fold on the barley fallows, or on the sown barley, set it very wide, in order to avoid the usual inconveniences of penning at that time, viz. the rankness and lodging of the barley, and the conveniences, thinness, and coarseness.

"It was the tenth of October (anno 1720) when my fold was going to be set on the wheat-fallows of a field, which was heavy land, and the fallows, where the fold

was to go, were to be ploughed up the next day; I was afraid the land would be too wet to fold on after the wheat was sown, and spoke to the shepherd about it. He said, he believed I might be in the right, especially since the rams have been some days put to ramming the ewes, because the rams would keep moving and stirring the ewes all night in the fold, whereby the ground would be battered and trod, and so squatted, that the wheat might not get through.

"That the Greeks did pen up their sheep, that they might piss through hurdles, as in Herefordshire, you may see in Palladius's calendar, November, to avoid dirtying and damaging their fleeces.

"Farmer Miles, whom I have often mentioned with approbation, advised me, if I would turn arable into meadow, and lay it up to grass, to fling straw upon it that is less than half rotten, and then fold upon it the same night, and it will bring the ground on very fast.

"Pursuant to what has been before said, that folding in winter for barley is not profitable, because, by waiting for the fold's running over the land, we lose the principal season for fallowing; yet however it may be proper to fold till Christmas, and then go on the wheat-lay; because we can lose no fallowing season by that; we cannot well have finished our fallowing any year before Christmas.

"I find by Mr. Antill and Mr. Clerk, and others, that in Leicestershire they have no winter-folding for barley; they leave off by Michaelmas at farthest, and sometimes cannot fold again till May; the reason is, their lands are so wet they would be always in a poach, and the coldness of the lands would kill the sheep: to help which defect, they muck their barley-lands, and from thence begin their husbandry, and sow wheat the year after, often under furrow, on their barley-stubble, for they say, if they should dung their wheat-ground it would rot their wheat, and they sow peas and beans after the wheat, and then lay the ground to summer-fallow again, to be mucked in May for barley, or to fold for wheat; so that they carry out their dung before it is half rotten, or the seeds of the weeds killed: but in their inclosures they sow four crops of corn all on one earth, without dung, for the most part beginning with oats, and laying down to grass with wheat.

"I am told that in Dorsetshire the aim of the farmers is, to fold on their sheep-leaves in the middle of July, and so till Michaelmas, that in the winter there may be a good head of grass for the milch-ewes.

"It seems to be inconvenient to grasp at so large a wheat or barley-crop, as hardly to be able to compass it without folding late on the wheat after it is sowed, or on the barley land after it is sowed; for by being under the above necessity, in order to compass what one has engrossed, one may often be obliged to fold unseasonably on each sort of corn, nor will the fold in that case make good the damage done to the flock by the lateness of the season; and an ewe-fold is often damaged by folding on the cold land at the latter end of October; whereas it is better to come early with your fold off of the wheat-lands on to the barley ley-grounds, and from the sowed barley on to the wheat-fallows; for thereby you will fold the same quantity of ground of the respective grains without the respective inconveniences.

"Between washing and shearing-time sheep ought not to be folded, because of dirtying their wool, nor from the cutting of the lambs till a fortnight after, nor in sheep-leaves or arable in wet weather, for it will tread the grass into dung.

"A servant of mine, a man of very good understanding, tells me, he has been many years a shepherd, but could never observe that the fold ever did any good in frosty weather: particularly he remembers a very sharp frosty winter, in which a whole flock used daily to gather to a hay-reck, in a ground where they were foddered, yet he could not observe there was any better corn there than elsewhere. I asked him the reason of it; he said, the frost wasted and preyed on the dung; and I rather approve this observation of his, because of the great prejudice strong beer and spirits receive by being frozen, even so as to become mere *caput mortuum*.

"If frost has the same effect on dung, by impoverishing it, that it is said to have on the sheep-fold, and on strong beer: quere, whether it be proper or not, to leave horse or cow-dung spread on land without ploughing it in?

"Mr.

" Mr. Raymond is also of opinion, that the winter frosts do very much deaden the folding of the sheep, and rob it of its virtue.

" Farmer Elton said, the method he best approved of in folding, was always to fold that land first that was first designed to be ploughed, such as white or whitish land, they not being apt to bear weeds, nor will the fold be apt to cause weeds to come, and such land he would sow first, viz. at St. James's-tide. I said, I should think, though such land should be sowed ever so wet, yet, if the month of August should prove dry and scorching, it would burn, and suffer by such early sowing. He replied, if sowed wet, yet so as it came up, he never knew the drough to hurt it.

" It was a very dry season from the first of March to the sixth of May (anno 1721) during which time I set my fold on my barley. Several of the farmers in my neighbourhood said, it would be apt to do the barley more harm than good, for the sheep would scratch up the seed; whereas, if rain had come, so that the ground had not been in a dust, their scratching would have done no harm. But I rolled before I set my fold, and so I presume the ground was so fast as to receive the less damage, it being also stoney, and therefore the sheep could not scratch it so much as otherwise perhaps they might have done: the event was, the fold did no harm, but good.

" Mr. Gilbert of Maddington was telling me, the way of husbandry about him, near Salisbury, was, to fold on their wheat after it was sowed till St. Luke's-tide, which is in the middle of October; then to draw off their flock for a month to fold their sheep-leaves, and then on the barley-fallows. I asked some North-Wiltshire farmers, if about them they ever folded on the wheat-land after it was sowed; they said no, they never knew it to be done in any parts thereabouts, yet folding after the corn was sown did it more good than before; but the reason why they did not do it about Holt, &c. they believed was, because they were forced to lay up the wheat-lands in high ridges by reason of the deepness of the earth, and its wetness, and the sheep if folded on such land, would do nothing but lie between the furrows, which would do the land but little service: besides, they said, in the hill-country the land was rather of the lightest, and that the treading of the sheep, after it was sowed, pressed it closer than it was before, and so did it service.

" Mr. Raymond assured me, that sheep folded on sandy lands would thereby be sensibly more impoverished than those folded on clay lands, and this said he, the shepherds agree to, who live where there are such different sorts of land. The reason seems to be, because the sandy lands draw forth and drink up the moisture of the sheep to fill up which emptiness of the outward vessels, a fresh juice must succeed, and so on; or else that the sandy lands being hot, make the sheep perspire more than clay-lands do, whereas the cold clay rather repels perspiration.

" If sandy or light ground, as has been before hinted, draws the fat and moisture of the sheep-fold off, so as to impoverish a flock more than if they had been folded on cold clay-lands, it must be allowed, on the other hand, that light ground may be better enriched by a fold than heavy land, because the light ground imbibes more of the moisture and fat of the flock; and this gives some account why it is said, poor lands often pay better for their folding than strong lands: for the same reason winter-folding, when the ground is wet and cold, holds no proportion to summer-folding.

" Discoursing with farmer Biggs on husbandry, he said, he folded on the fallows all winter long, though never so wet; yet, said he again, sometimes the fold does harm; let be it never so wet, said he, early in the year, folding on the fallows does no harm; for, in the first, there is heat enough in the ground at the first hand of the year to keep off the chill, and then the ground is not so settled, but that the rain soon runs through it; but at the latter end of the year the ground is settled; then treading it with the fold in wet weather makes it hold water, by which it may be chilled, and kneads the very wet into it, whereby there will be the less corn.

" Before I came from Crux-Easton in February (anno 1698) in order to go into the Isle of Wight, I had a discourse with an old experienced shepherd about folding the flock on fallows: he said, as to wheat, it was excellently good, but they rarely folded on barley-land after it was sowed, for if it was a whitish land, and a hot summer came, it would be burnt up: besides, the sheep would be scraping at

that time of the year on barley-land, and would take the corn out of the ground; but the wheat, said he, lays too deep for them to do so. But when I came into the Isle of Wight, farmer Collins was of a different opinion, and said, he had alway folded with good success on hot, dry, sandy ground after it was sown with barley, and was earnest with me to try it; for said he, you will quickly see the benefit, and though the sheep should scrape, you will find the barley come thickest there. There is land, however, about Hufborne and Stoke in Hants, that will burn by folding on in the spring, and get more harm than good, if hot weather come, it being a hungry sharp gravel.

" As it seems to me, the double folding on the early wheat-fallows, to be sown on one earth, cannot occasion the roots of the grass ploughed-in to shoot up afresh, but rather prevents it, by treading the earth down into a hard plaister, so that they cannot rise; it is true, it may bring up afresh new grass, which having weak roots, will easily be torn up by the draggs.

" Columella, speaking of feeding sheep, says, there is no sort of land or food, but what (by the continual use of that only) sheep will be tired of, unless you give them some salt now and then to lick, from whence they may procure a new appetite to their meat and water. All the summer time, during the hot season, they must be let out to feed as early as may be, while the dew is on the grass; and when the sun is about four hours high, they must be led to water and under the shade, and again to feed towards sun-set. In the dog-days the flock should be so led as to feed with their heads towards the west in the forenoon, and towards the east in the afternoon; for it is of great consequence, says he, that the sheep's heads should be turned from the sun, which would be hurtful to them. And Varro gives the same directions, because, says he, the sheeps-heads are extremely soft. Perhaps this may be the chief reason of the rams and ewes in companies turning face to face, in hot sun-shiney days. During the winter, and early in the spring, they should be kept in their fold, till the sun has melted the hoar-frost from the grass, which would occasion rheums in their heads, and would also scour them: for this reason in cold wet seasons of the year they should be watered but once a day. They let their ewes, as Varro assures us, go out to feed with the rest of the flock, but kept back the lambs, which were suckled by the ewes at their return, and then again separated from them. They also tethered their lambs ten days old, lest they should dislocate or hurt their tender limbs by playing together." *Lisle's Husbandry, vol. II. page 178.*

Mr. Young, in his Annals of Agriculture, says, in respect to folding, " Mr. Bakewell's opinion is singular. He is decidedly an enemy to the practice, (except when flocks go on large, open commons in the day time, and are considered as dung-carriers to the arable land) and thinks that the advantages, supposed to be derived from it, are visionary; being, in fact, no more than robbing a large part of a farm to enrich a small one. That large flocks, even any number kept together above 100, are a barbarous practice; for, in such flocks, the strongest will beat the rest from their food; instead of which, the weakest sheep should have the best food; and, if folding is necessary on farms that have no commons annexed to them, why not have different small folds on different parts of the farm, and sort those of different kinds, or ages and strength, and thereby save the trouble of driving from one part of the farm to another? For, had not the animal, after it has filled its belly, better lie down to sleep than travel to create an appetite? And he is of opinion, from all the observations he has made in various parts of the kingdom, where folding is and is not practised, that experience strongly confirms the idea. Mr. Culley is of the same opinion. I must declare my own ideas to be far as the poles asunder. I consider folding to be a kind of summer farm-yard, that collects—what, collected, is manure; but, scattered, is little or none."

FOLE-FOOT, the same with colts-foot. See COLT'S-FOOT.

FOOD, a general name for whatever aliments are taken into the body to nourish it.

Food of plants, the particles they extract from the soil, air, &c. in order to their nourishment.

Philosophical enquiries into the principles of vegetation, and in the manner in which it is performed, are an object well worthy the attention of gentlemen whose situation allows them to pursue that truly useful and entertaining study. But as the industrious husbandman, for whose benefit this work is chiefly intended, as a compendium of the best practice

tice in agriculture, founded on the result of experience, cannot afford time for matters of speculation; nor would they, in point of prudence, consist with his necessary occupations, even if his education fitted him for such researches; it may be sufficient for him to form a general, but just, idea of the means by which plants are most successfully raised. A proper notion of this will help to guide him in the management of his lands, and shew him in what state the earth should be, to enable the plants which he cultivates most easily and readily to find their necessary food. This general knowledge of the basis of agriculture is even requisite in every one who would be satisfied of the reasonableness of his methods of proceeding.

Whether any one active principle does universally nourish all plants, or whether some particular salts or juices feed one plant, and others another, is a question, that has been warmly debated by philosophers.

The ancients generally entitled the earth to the production of the animals, vegetables, and other bodies, upon and about it; but several of the moderns, and among them some of very great name, both here and abroad, have declared in favour of water, as the efficient cause of vegetation. Lord Bacon was of opinion, that, "for the nourishment of vegetables, water is almost all in all: and that the earth doth but keep the plant upright, and save it from over heat and over cold." Others carry this hypothesis still farther, asserting water to be the only principle or ingredient of all natural things. They suppose that, by I know not what process of nature, water is transmuted into stones, into plants, and, in short, all other substances whatever. Van Helmont, and his followers, to whose opinion even the illustrious Mr. Boyle has shewn a strong propensity, are very positive in this, and alledge, as proofs, the considerable growth of mint, and several other plants, in water, and his well-known experiment on a willow-tree. Van Helmont planted this tree, which weighed five pounds, in two hundred pounds of earth dried in an oven, and watered it with rain, or distilled water, after carefully covering the case in which it stood with a perforated tin cover to prevent the admittance of any other earth. Five years after, weighing the tree, with all the leaves it had produced in that time, he found its weight to amount to one hundred and sixty-nine pounds three ounces; while the weight of the earth was only diminished about two ounces.

Mr. Evelyn thought, with the learned Dr. Sharrock, whom he quotes, that water is, of its own constitution alone, a soil to vegetables, not only as the most genuine vehicle of the riches which it imparts to plants, through the several strainers, and by means of which all change and melioration is effected; but because it is, of all other substances, best disposed for ingress, to insinuate into, and fertilize the earth; which is the reason why floated grounds are so remarkably fertile after the flood has subsided. "It is, says he, the nearest of kin to the vegetable race; for to assert, with any confidence, what part of the mere earth passes into their composition, or whether the earth serves only for stability, or as a womb and receptacle to their seeds, I shall not undertake to discuss; though I do not yet conceive the earth to be altogether so dull and inactive, as to afford no other aid to the generation of what she bears; the diversity of soils being infinitely various, and the difference of invisible infusions far beyond our arithmetic. But neither do I here by any means exclude the air, nor deny its perpetual commerce and benign influences, charged as it comes with those pregnant and subtle particles, which prevailing and insinuating into the earth's more steady and less volatile salts, that intestine fermentation is begun and promoted, which gives life, growth, and motion, to all that she produces. Dr. Mayow has proved, that the most exhausted and worn-out mould, is repaired by a bare exposure to the air alone, without which it produces nothing. Nor can plants, totally excluded from the air, live, or so much as erect themselves to any thriving purpose, as being deprived of that breath and vital balm, which no less contributes to their growth and nourishment than does the earth itself, with all our assistance. Besides, we find that the air is near of kin and affinity to water, and indeed seems as it were but a thinner water; for how else are vines, and other trees of prodigious growth, maintained among barren rocks, and thirsty pumices where rains but seldom fall, if not from the benign influences of the air?"

To this aerial food and moisture it is that most of the sedum kind owe their growth. Succulent groundsel, and the fragrant wall-flower, draw their nourishment from the same source. An ash now growing out of a wall of the abbey-

church at St. Alban's, affords a remarkable instance how much even trees are nourished by the air.

As all kinds of water, as well as air, contain many other substances besides the pure elements of water and air, it is difficult to ascertain whether these extraneous substances, or some of them, are not the food of plants. Dr. Woodward's experiments, as related in the Philosophical Transactions, seem to confirm the opinion that they are; for he observes, that a great part of what he calls terrestrial matter, mixed with the water in his experiments, ascended up into the plant, as well as the water; and the plants were more or less nourished in proportion as the water in which they stood contained a greater or smaller quantity of that matter. With regard to Van Helmont's tree, and the growth of plants in water, he very justly observes, that nothing like what the advocates for water would infer from thence, can possibly be concluded from any such experiments, unless the water used in them be absolutely pure, homogeneous, and not charged with any sort of terrestrial mixture, to which the plant may owe its growth and increase: for that all water, even the clearest and most transparent, does abound with such matter, will appear to any one who shall put some of the very purest into a clean glass phial, and stop it with the greatest care. Though perfectly transparent at first, it will grow cloudy, if suffered to stand some time without being stirred, and at length deposit an opaque sediment. Filtering and distilling will intercept some of the earthy particles with which it is naturally charged, but neither of these operations, nor any other that we know of, though ever so often repeated, will free it entirely from all extraneous matter, some of which will always remain in it, very fine and light, fit to attend every motion of the water, whose extreme tenuity, and exactly spherical globules, enable it to preclude smaller ducts than even imagination can conceive. We hardly know any fluid in all nature, except fire, whose constituent parts are so extremely subtle as those of water. They will pass through pores and interstices, impervious to air, or any other fluid. This enables them to enter the finest tubes and vessels of plants, and to introduce the nutritive matter lodged in the earth, conveying it to all parts of them; whilst each, by means of organs it is endowed with for the purpose, intercepts and assumes into itself such particles as are suitable to its own nature: letting the rest pass on through the common ducts.

The judicious Mr. Worlidge, uninfluenced by the new and prevailing mode of thinking in his time, according to which all vegetables were supposed to be fed by water only, declares positively, that he cannot but explode this opinion as destitute of foundation; for that, although several plants set in water only, do emit fibrous roots, and flourish therein for a time; yet, at best, this nourishment is but weak, because water does not contain a sufficient quantity of the true nutritive particles as the willow, poplar, and other aquatic plants raised therein, demonstrate, and as is still farther evident from their better thriving if the water be often changed. "Experiments, says he, have been made of gourds and cucumbers, planted in baked earth, and watered with water only; and after they have grown to such a bulk as the experimenter thinks proper, they are weighed, and also the earth, which last is probably but little diminished, or perhaps not at all; from whence they conclude, that the substance of those vegetables proceeded from the water. Thus have men made experiments speak as they would have them, to favour the new opinions they would impose on the credulous.

Spring and rain-water contain pretty near an equal charge of vegetable matter; river-water more than either of them. Nor can any doubt be made, but that the water which falls in rain at some times, is more charged with particles fit for the vegetation of plants, than that which falls at others. A more powerful degree of heat must draw up a larger quantity of that matter, with the humid vapours which form rain, than a more feeble warmth possibly can. The water of one spring may also flow with a higher charge of this matter than that of another: this depending partly upon the briskness of ebullition of the water, and partly upon the quantity of that matter latent in the earth, through which the fluid passes, and the greater or less laxity of that earth. For the same reason, the water of one river may abound with it more than that of another; and the same river, when much agitated, may bear up more of it than when it moves with less rapidity.

Though water be not itself the food of plants, it is an absolutely necessary agent, by which the matter proper for their

nourishment, which remains inactive till it be diluted by, and incorporated with this fluid, is conveyed to them, and introduced and distributed into their several parts, both from the earth and the air. But still it is not capable of performing even this office, without the concurrent assistance of heat, which gives it the necessary action, exalts and digests the nutritive juices, dilates the pores of the plant, and raises the sap into the stem, branches and fruit, where the sun perfects the work, by ripening it.

The necessity of heat in vegetation is apparent from our fields and forests, our gardens and our orchards. We see, that in autumn, as the power of the sun decreases, so its effects on plants diminish, and their vegetation slackens by degrees. Its failure is first discernable in trees, which, being raised high above the earth, require the most heat to elevate the water, charged with their nourishment, to their tops and extremities; so that for want of fresh support and nutriment, they shed their leaves, unless secured by a firm and hardy constitution, like that of our ever-greens. Next, the shrubs part with theirs; and the herbs and lower tribes; the heat being, at length, not sufficient to supply even these, though so near the earth, the fund of their nourishment. As the heat returns with the ensuing spring, they all recruit again, and are furnished with fresh supplies of verdure: First, those which are lowest and nearest the earth, because they require the least degree of heat to raise into them the water with its nutritive charge; next, the shrubs and higher vegetables, in their turns; and, lastly, the trees. As the heat increases, it grows too powerful, and hurries the sap with too great rapidity through the finer and more tender plants. These, therefore, go off and decay; and others, which are more hardy and vigorous, and require a greater degree of warmth, succeed in their order.

Mr. Tull is the only person who makes earth the food of plants. The experience of all ages contradicts this opinion; for the necessity of inducing something into poor soils, to enable them to produce crops, is universally acknowledged; whereas, if earth alone was the food of plants, it would in all cases produce the same effect.

As to the grand question, whether plants of different kinds are nourished by one universal food, or whether each particular species imbibes only its peculiar aliment; the supporters of this last opinion, among whom are the great lord Verulam and Dr. Woodward, say, it is not possible to conceive that one uniform homogenous matter should constitute bodies so unlike in all respects as the various tribes of vegetables; nay, even as the different parts of the same plant. But a moment's reflection will shew, that the latter part of this objection confutes the former: for if the plant has the power of altering the original juices taken in by the roots into so many various forms as experience proves it has, each plant may be indued with the faculty of assimilating to itself the juices it meets with in the earth; as we find the same food not only nourish different animals, but produce in each its peculiar character.

We have ocular demonstration, that the willow and alder thrive best on a moist soil, and that the elm, pine, fir, and cypress, prefer a drier earth. Yet these, and many more of the widest difference, are sometimes seen to draw their whole sustenance, bulk, and ornaments, whether annual or perennial, from the juices they find in the same piece of ground, and from the ambient air and dews; though our strictest diligence cannot distinguish the particular aliments which approach their several roots. Changing the earth about the roots of these, or any other trees, whose bark, sap, fruit, and seed, are of very different kinds and qualities, will only make each tree prosper the better. "Hence, says Dr. Beal, we may justly suspect, that the very contextures of their bodies, from the first spirting of their seed, and as they are formed gradually from the invisible principles of spirit and vigour of their seeds, however small and imperceptible, are the natural alembics, where the common rain-water and air are digested into very much differing leaves, fruit, seed, resins, gums, &c. perhaps as the cow's-belly converts the common juices of all sorts of grass into milk, or as the bee collects honey and wax from all sorts of flowers."

The same soil that has once been proper for the production of some sorts of vegetables (continue those who think that each particular species of plants has its particular food) does not always continue to be so; but in time loses its property. If wheat, for example, be sown upon land proper for that grain, the first crop will succeed very well, and perhaps the second, or as long as the ground is in heart; but in

a few years it will produce no more, if sown with that corn. Some other it may, as barley, rye, or buck-wheat.

That this is owing to an improper culture of the land, more than to any defect in the soil itself, will evidently appear to those who shall candidly weigh the principles of the New Husbandry, when that subject comes to be treated of.

Mr. Du Hamel makes no doubt, but that the particles which plants appropriate to themselves, take different forms in each plant, and even in the several parts of the same plant; but, as he justly observes, it does not at all follow from thence, that they were not originally the same. What would induce one to think them the same, is, that plants of different kinds rob one another of the nourishment which is in the earth: for, if a lettuce, for example, drew from the earth a food different from that of endive, a lettuce planted among endive would not only thrive better than if planted among other lettuce, but as well as if no other plant was near it. But we know, by experience, that this lettuce would grow very poorly, and consequently that plants, though of different species, do hurt and rob one another. If each plant drew from the earth only the particular juices proper for itself, poppies, thistles, &c. which kill wheat, would not in that case do it any hurt, farther than by shading it with their stalks. But that the injury they do the corn is chiefly occasioned by their roots, which consume the necessary nutritive juices, is evident from this, that if dry branches were set in such numbers as to make even a greater shade than those weeds, they would not equally prejudice the growth of the wheat.

After some other arguments of equal force, Mr. Du Hamel concludes, that plants of different species feed on the same, or nearly the same substances; that there is no plant which does not rob those that are within its reach of some part of their food; and that the soil which once is good for any one kind of plant, will always be able to supply it with food, provided it be properly cultivated.

To prove that the same juice takes different qualities in the vessels of the same plant, he instances an experiment which he made, by grafting a young lemon, of the size of a pea, by the stalk, upon a branch of an orange-tree. It grew there, ripened, and retained its quality of lemon without partaking in any shape of that of the orange. The juices of the orange-tree must therefore have changed their nature at once, on their passing into the lemon.

It is an old opinion, generally received by the ancients under the name of occult qualities, or sympathy and antipathy, that some plants delight in being near each other, while others will not live together. Several of the moderns have likewise embraced this sentiment, and urged in support of it, the fig-tree and rue, garlick and the rose, which, say they, agree remarkably well together, because the juices suited to the one are avoided by the other. Lavender, laurel, thyme, marjoram, and other aromatic plants, cannot, on the contrary, according to them, flourish together, because they feed on similar juices, of which they rob one another. Mr. Evelyn seems to be nearer the truth, when, speaking of this subject, he assigns as a reason why some plants will not thrive near others, certain effluvia or streams emitted by the one, which may be noxious to the other. Plants will not thrive under the walnut-tree, the oak, and others of the same kind, because their numerous and wide-extended roots exhaust the earth around them, and the drippings from their leaves are impregnated with an acrid matter, which is an enemy to vegetation.

Though there are evident instances of an election of food in some plants of very different kinds, such as the aquatic race, and those which delight in a dry situation; yet, so far as relates to the farmer, they may be said to be nourished with one and the same substance; but at the same time it is necessary, that both the earth and that substance be fitted for receiving and nourishing them: for be the earth ever so good, rich, and proper for the production of vegetables, little will come of it, unless its parts have that just degree of strength, or cohesion, which shall give stability to the plant, and at the same time afford an easy admittance to the fibres of its roots, to spread and extend themselves in search of that food.

The question, what is the food for plants? is of very difficult solution, as appears by the different opinions of those who have attempted to solve it. One thing is observable, that those who have endeavoured to answer this question, suppose, that the vegetable food is some one kind of matter, water, air, salt, or earth, but they do not seem to mean, that plants feed upon either of these alone, exclusively

ly of the other principles, for those who contend for water, for example, being that food, acknowledge, that the other elements are also necessary, and concur with water to feed a plant : they acknowledge that air is necessary, so necessary that vegetation cannot go on without air ; and the same may be said of the rest. Their meaning therefore appears to be, that the principle which they adopt, and suppose to be the food of plants, is so principally.

In the same manner, Mr. Tull was of opinion, that earth was that food ; not however excluding the other elements, but that earth was chiefly or principally that food : for so he explains himself, page 14 of his Husbandry, where he says, " and earth is so surely the food of all plants, that *with the proper share of the other elements*, which each species of plants requires, I do not find but that any common earth will nourish any plant." Now which of these opinions is right, or whether any of them is so, is very hard to determine. Mr. Tull's definition of the vegetable food, is in p. 10, " By food is meant that matter, which being added and united to the first *flamina* of plants, or *plantule*, which were made in little at the creation, gives them, or rather is, their increase. By this definition, earth seems to have a better claim of being the food of plants, than either of the other elements ; as earth is of a more solid and permanent nature, than air, water, or salt."

But whatever this food is, it does not appear that the researches of the curious concerning it, have hitherto been of much benefit to husbandmen, or to the improvement of agriculture. The discovery they aim at is chiefly theoretical.

But though it remains unknown what is the food of plants, there is another point of great importance discovered, namely whence that food is derived. It is found that the earth is enriched from the air or atmosphere. That though it should be ever so much impoverished, and exhausted by a repetition of robbing crops, it may be restored to its former fertility, and enriched to a high degree by good tillage, and exposure to the air, by which it is again replenished with those fertilizing particles, whereof it was before exhausted. This is a plain easy theory, that is intelligible to every common capacity, and practicable to every farmer : it is also immaterial to him, whether his plants are fed by air, water, salts, or earth ; it is sufficient for him to know, that the vegetable nourishment, of whatever nature that is, will be obtained by good tillage and exposure ; whereof he may be soon convinced by his own experience ; and while he keeps this principle in view, he cannot greatly err in practice.

It has been known for ages, that the most perfect tillage was the best husbandry ; the ancient Romans recommend it highly, but they do not seem to have considered the reason that such tillage enriched the earth, or was preparative to it.

They also cultivated their vines by digging, ploughing, or hoeing : but the practice of hoeing all plants, while they are advancing in growth, and the surprising effects of it, is a late discovery. We find by the writings of several foreign gentlemen, how much they were surprised when they saw the effects of it upon a variety of plants so cultivated.

As this was so obvious in the culture of turnips, many farmers have extended it to other plants, as pease, beans, potatoes, and others, to the great improvement of their crops, and land also ; inasmuch that they have left off fallowing, by which they formerly lost one crop in three or four ; besides saving the expence of the fallow : for they now find, that by substituting hoed crops instead of fallowing, their lands yield good crops every year, an improvement of great importance to the farmers and to the public.

FOOT, the part that supports an animal.

A horse may have a very well made foot, and well proportioned, and yet if it chance to be thin and weak, the buyer will be disappointed of his expectation ; for such a foot is liable to be spoiled in shoeing, by travelling on hard stony grounds, by too much drought in hot seasons, or by too much moisture in winter. A thin foot is that where the crust or horn is thin, this may be easily seen when the shoe is taken off, because the verge all round the sole will appear thin ; and where it is so, a horse will winch with the least touch of the pincers ; but as this trial will seldom be allowed of in buying a horse, the best way to those who would be acquainted with such things, is to observe the bottom of the crust, which is generally ragged, and where the shoe-nails are clenched and rivetted : if these be high, it is a token the foot is thin, and that there has not been sufficient hold for the nails, without driving them a good way upwards in the crust. In a thin foot, the heel

and frog are also apt to be soft and tender to the touch, and by reason of the weakness natural to such kind of foot, it sometimes turns awry, and one point of the heel will stand higher than the other, though this may be also owing to the crookedness of the pastern joints, and will sometimes happen where the foot is tolerably strong ; but is most common to such as have weak feet ; and where it is so, the horse wears his shoes more on one side than the other, and often causes him to cut, and go lame in a journey.

As a thin weak foot is justly reckoned a very great defect in a horse, so a very strong foot is not always the most eligible, but is liable to several accidents. A strong foot has the fibres of the hoof very distinct, and for the most part run in a straight line from the coronet to the toe, like the grain of oak, lignum vitæ, or any other hard wood that easily splits ; and though some such feet will last very well, and keep free from accidents, where sufficient care is taken to keep them moist and pliable ; yet when they happen to be neglected upon a long journey, or much hard riding, especially on dry stony grounds, or when they stand long in a hot dry stable, they will go lame and tender, at the same time that no defect is to be seen on the foot ; for when the soft parts within are bruised by the hardness of the hoof, or by the thickness and hardness of the sole, which in all such feet is like a plate of iron ; and when this happens, a horse will be in pain, and the true cause sometimes not found out for a long time, which I have known in several instances ; nor is it easy to restore such feet to a due temperament.

When a horse that has a very strong foot takes up a channel nail, or happens to be cut into the quick with a sharp bone, a sharp flint, or piece of glass, and a flow of humours follows upon such a wound or puncture, the confinement these meet with from the strength of the foot create much anguish, and for want of vent below, frequently causes an eruption round the coronet, which proves for the most part troublesome, and makes the cure tedious and uncertain, especially when such cases happen to fall into bad hands.

I have known some instances where the hoof and the sole have been quite loosened from all their attachments to the foot, the filaments and fibres that unite the horny part to the flesh being all torn and pulled asunder by the thickness and strength of the horn ; and where this happens in any degree, it is apt to leave a tenderness behind it, unless an uncommon care be taken to prevent it.

But the greatest inconveniency in a very hard strong foot, is its being subject to rents, and fissures, which cleave the hoof quite through, sometimes from the coronet down to the bottom ; and this kind of foot is the more easily exposed to such accidents, that the horny fibres have a more visible straight direction than where the feet are more soft and pliable ; these clefts being for the most part in the quarter, seldom admit of any other remedy than extirpating the whole piece that lies next the heel, which defect is from thence called a false quarter, wherein the cure is seldom so perfect, especially in the fore feet, as to leave no infirmity or blemish behind it. When the fissure or cleft does not penetrate through the horn, but makes a line on the surface, it is called a sand-crack, being very common in some sandy countries, where the horse's hoofs turn dry and crack with the heat of the sand. These are but little regarded where the lines are superficial, and not deep in the horn, and are often cured by rasping the foot, and keeping it cool and moist. However, it is a defect that must lessen the value of a horse, in proportion to the degree of goodness or badness of his foot ; for when the foot happens to be otherwise bad, these blemishes often degenerate, and are of ill consequence.

The next defect I shall take notice of in the feet, is of those horses that have narrow heels. Some horses feet are tolerably good, even where the heels are narrow : but when the foot is hot and inclined to rotteness, and the quarters lose the round turn that they ought to have as they approach the heel, and look as if they were bent and pinched together, inasmuch that the heels of some such horses are not above two fingers in breadth, then the foot is bad ; and the way that many take to mend these kind of feet, by hollowing on each side the frog, and thinning the quarters to cause them to stretch to a wider shoe makes them worse ; for the stretching out the quarters contracts the hoof on the instep, and almost always turns such horses hoof-bound, and wire-heeled.

But horses often grow hoof-bound from other causes, and

and in some it proceeds from the shape of the coffin-bones when it happens to be flat or hollow, where it ought to be rising and round, when the coffin drops by thinning the sole too much, and not taking care to stay it up with stuffing and splinters, and from diseases in the feet that leave a weakness and deformity in them. But when a horse that has a very strong flinty foot happens to be hoof-bound, the case generally turns out bad. For the harder the hoof, the more it presses round the instep and heel. This pressure makes the parts all round the coronet to grow fleshy and project over the instep, so as to be constantly bruised by the upper part of the hoof, especially when a horse carries any great weight upon him, and by this means in the end engenders a quitter, which creeps so under the hoof that it can seldom be removed without the loss of a quarter, the same as when there is a fissure and cleft, or rather worse, because of the depression and binding all round the upper part of the foot with the distemper of the coronet, which often renders such cures both very tedious and imperfect. Therefore this ought to be well looked into, especially in choosing a saddle horse, that his feet be tolerably shaped, smooth, and cool, not narrow heeled, nor hoof-bound, neither weak-footed, nor too remarkably strong; for most horses of this latter kind are also coarse, and chiefly fit for labour.

Another thing that ought carefully to be looked into, is that both his fore-feet be of equal size; for wherever this defect is the least apparent, though it may proceed from a horse's using one leg more than the other, as it happens to working-men who use the right-hand and arm more than the left; yet when one foot is smaller than the other, it is a blemish, and carries some doubt that such a foot may in time fail and perish, even as those do that have been hurt by accidents, or after old lamenesses in the shoulders, legs, and muscular parts, where the foot at last perishes in proportion as the muscular and nervous parts shrink and diminish.

Another defect in horses feet, is when they are flat and without depth. If such a foot happens to be strong, and the hoof smooth, if the sole be also firm, and the frog no ways rotten or fleshy, such a horse will endure the roads tolerably well. But when a flat foot is shaped like an oyster, has many rings and wrinkles, if the sole be soft, and the frog fleshy and spongy, it is a very great defect. Some horses are so remarkably faulty in this respect, that the frog bunches out beyond the bottom crust of the hoof, that their shoes must be made hollow, and the plates so broad as almost to cover the whole bottoms of their feet, to keep them from the ground. But indeed such horses are only fit for draught, and not for the saddle.

Some horses have tolerable good feet, only that their heels are low. Horses that have long yielding pasterns are the most subject to this defect, and also those that have their pasterns very small, short, and standing almost quite upright; these have generally long heels and flat feet, and their fore-legs coming straight down from the shoulder to the foot, without any bending of the pasterns, and for this reason are frequently called goat-legged. Many of the horses bred in the fens are of this kind, have but an awkward use of their limbs, and make very bad travellers, and those low heeled horses which have very long yielding pasterns, are apt to have their heels wear quite to nothing upon a journey, and all the care imaginable in shoeing cannot prevent it.

A very high heel is another extreme, which greatly lessens the value of a horse; for even where such a foot happens to be strong and smooth, it is nevertheless the cause of unsteadiness in a horse's going, exposes him often to trip and stumble, to sprains in the coffin and pastern-joints, &c.

There is one kind of horse, especially among the coach and cart breed, very remarkable for a large deep foot; the horn extremely thick and scaly, the heels broad and mouldering, and are apt to grow so very fast, that the farriers when they go about to shoe such horses, thinking to ease them of their great load, and to bring their feet into a better size, pare and rasp them to such a degree, that they leave their feet much larger about the coronet and instep than at the bottom; so that they always look as if they went upon pattens, which is not only very ugly, but such horses are seldom good for much.

A very large foot of any kind is to be avoided in a horse, even supposing it to be in itself firm and good. But when I speak of a large foot, I mean only when it is

disproportioned to his other parts, for a large horse must of course have a larger foot than a small one. But when we see the foot large, and the limb small, in all such it must be observed by those who have experience, that the bones and sinews are also slender, which not only denotes weakness, but heaviness and inaptitude to any brisk and vigorous action; and therefore unfit for the coach, or saddle, but to draw in a cart or waggon, or to carry a burden.

Some object greatly against white feet, as being generally worse than those of any other colour. Indeed when a horse has too many of his feet white, they do not always prove the best, yet I have seen white-footed horses have their feet such as the ablest judges could not find fault with. When a foot is smooth and tough, of a middle size, without wrinkles, neither too hard and brittle, nor too soft, and when the heel is firm, open, and no ways spongy or rotten, and the frog horny and dry, and the sole somewhat hollow, like the inside of a dish or bowl, whatever be the colour, such a foot will for the most part turn out good, though the dark or black hoof, where it resembles that of deer, is generally the best; and for this reason those who are the most curious about a horse's feet, do not choose such as have much white upon their legs and pasterns, to avoid their having too many white feet. *Gibson's Farriery, vol. I. p. 19.*

FOOT-PATHS are a great injury to arable land. See PATHS.

FOSSE, a ditch or moat

FOSTAL, a way leading from the main road to a large house.

FOUL-FEEDING, a voracious appetite to which some horses are subject, and though not properly a disease, is often the cause of various maladies. It is generally the effect of some latent distemper, as vermin, which have a quite different effect on some horses to what they have on others; for as horses of a lax habit of body often lose their appetites by worms, and are frequently griped and sickly in their bowels; so horses of strong rigid constitutions, that can bear the irritation those animals make in their intestines, are often voracious in their appetites, and continually craving after food.

Foul-feeders, however, differ in some things from those that have voracious appetites: for as the latter crave only after their common food, and can hardly ever be satisfied; so the latter will leave their hay to eat their litter, and seem to like it the better when it is well sauced with their own dung and urine: and therefore, they may be properly said to have a vitiated or depraved appetite. Though this does not always proceed from a voracious appetite, yet the first is often productive of the latter, and may probably be occasioned by enlarging the capacity of the stomach and intestines to such a degree, that nothing will satisfy their cravings, but what has weight and solidity; for the same kind of horses will eat mould and wet clay, or any kind of foul nasty weeds out of the ditches, and in the stable will eat stinking musty hay, which the generality of horses will refuse.

There are others of depraved appetites, that are neither foul nor voracious feeders, such as we often observe eat dry loam or mud out of the walls, which perhaps denotes some vitiated juices in their stomach; and this also is frequently owing to vermin, or at least to a bad digestion, though perhaps not to any imbecility in their constitutions; for though those horses have a longing for those extraneous things, yet their appetites at the same time seldom fail: but as this is often owing to full feeding, with the want of sufficient exercise, so we often see them recover and quite lose that vitiated taste, when they come to ride a journey, or go upon any other constant exercise.

The best method in all these cases of a vitiated or depraved appetite, is to begin with purging, and to dissolve chalk in their water, and afterwards to give them good exercise. The same method may be complied with to those that feed voraciously. To these the following draught may also be given, to blunt their appetites:

Take a large handful of the roots of marshmallows, cummin-seeds, and fenugreek-seeds, of each an ounce; liquorice roots sliced, half an ounce; boil in three pints of water till the roots are soft and slimy, then pour off the decoction, and dissolve in it an ounce of gum-arabic, and add four ounces of linseed-oil.

Let

Let the horse have four handfuls of this every morning fasting, till his appetite abates. If the horse be lean, which many voracious feeders are, he will gather more flesh under this management, and as his flesh increases, his appetite will abate.

As to foul feeders, many of these begin with voraciousness, and when they come to be stinted, take to eating of their litter to fill their stomachs, and in time take a great liking to it; and it is observable, that many of the horses that go broken winded, have this evil faculty; and therefore I should advise any one who has a foul-feeding horse, to keep his stall as clean as possible, to let no wet, dirty litter, lie under him, nor to put his litter under the manger, but to bestow it on some other horse, otherwise they will paw it out, and feed upon it greedily; but clean straw that has not been soaked with horse-piss and filth, will never hurt any horse: for though there is no harm in the urine, yet when the straw has been soaked in it with the dung, it often turns into a wad, or like a sponge in their bowels, and causes great disorders. But when their wet litter is taken away every morning, it may be the means to make them leave off that ill habit. *Gibson's Farriery, vol. II. p. 96.*

To **FOUNDER** a horse, is to over-ride him, or to spoil him with hard working.

FOUNDERING in the feet, a distemper that affects a horse by means of hard riding or labour, or by heats and colds, which disorder the body, and excite malignant humours, that inflame the blood, melt the grease, and make it descend downwards to the feet, and there fettle; which cause a numbness in the hoof, so that the horse has no sense or feeling in it; and is hardly able to stand, and when he does he shakes and quakes as if he had an ague fit upon him; sometimes this malady proceeds from his being watered while he is very hot, and his grease melted within him, and then suddenly cooled by setting him upon cold planks without litter; or by taking his saddle off too soon, or else by letting him stand while hot in some shallow water up to the fetlocks; by means of which extraordinary coldness, it causes the melted grease to fall down into their feet, and their to cake and congeal.

A horse may also be foundered by wearing strait shoes, and by travelling upon hard ground.

The symptoms by which you may know when your horse is foundered upon his fore feet, and not his hind feet, is by his treading only upon his hind feet, and as little as he can upon the other; or his going crouching and crumpling upon his buttocks; and when sometimes he is foundered upon his hind feet, and not upon his fore feet, (which happens but seldom) it may be known by his seeming weak behind, and his resting himself as much upon his fore feet as he can; being afraid to set his hinder feet to the ground.

The general method of cure is: first, to pare all the horses's soles so thin that you may see the quick: then to bleed him well at every toe, stop the vein with tallow and rosin, and having tacked hollow shoes on his feet, stop them with bran, tar, and tallow, as boiling hot as may be; repeating this every other day for a week together, and afterwards to give him good exercise, &c.

CHEST-FOUNDERING, a distemper proceeding from crudities in the stomach, or other weaknesses obstructing the passage of the lungs.

This is discovered by the horse's often coveting to lie down, and standing straggling with his fore legs; the symptoms being much the same as in purfiness; the only difference is, that young horses are subject to chest foundering as well as old; whereas, those horses which are troubled with purfiness are generally six years old and above.

Grass, with refreshing and cooling diet, cures the former, but encreases the latter.

The cure: take five or six pennyworth of oil of petre, and mingle it with an equal quantity of ale or beer, and with your hand rub this mixture on the part affected, a red hot fire-shovel being held against it while you are rubbing it.

FOUNDERING in the body, is caused by a horse's eating too much provender suddenly, while he is too hot and panting, so that his food not being well digested, breeds ill humours, which by degrees spread themselves all over his members, and at length does so oppress his body that it renders him extremely weak, and makes him incapable of bowing his joints; and when he has laid down cannot rise again; nor can he either stale or dung without great pain.

It is also caused by drinking too often upon a journey while he is hot, not being ridden after it.

The symptoms are, the horse will be chilly and quake for cold after drinking; and some of his drink will come out at his nose, and in a few days his legs will swell, and after a while begin to peel; he will have a dry cough, his eyes will water, and his nose run with white phlegmatic stuff, he will forsake his meat, and hang down his head for extreme pain, in the manger.

For the cure: first, rake the horse's fundament and give him a clyster; then put half an ounce of cinnamon, and of liquorish and aniseeds each two spoonfuls in fine powder, and five or six spoonfuls of honey into a quart of ale or sack, set it on the fire till the honey is melted, and give it him lukewarm to drink, riding him afterwards gently for an hour, clothe him and litter him warm, and keep him fasting for two hours more: sprinkle his hay with water, sift his oats clean from the dust, and give it him by little and little: let him drink warm meshes of malt and water; and when he has recovered strength, bleed him in his neck vein, and perfume his head with frankincense once a day.

FOWL, a general name for all sorts of birds; but used in a particular sense to signify such as are bred in the farmer's yard for profit.

The countryman's farm or habitation cannot be said to be compleatly stored or stocked without fowl as well as beast, which yield a considerable advantage by their eggs, brood, bodies, and feathers. Any poor cottager that lives by the high-way-side may keep them, they being able to shift for themselves the greatest part of the year, by their feeding on insects, corn, or any thing almost that is eatable by any other sort of animal: and therefore they are kept to great advantage at barn-doors, and other places, where corn or straw is scattered.

As for cocks and hens, we shall not enter into a description of the several sorts of them, only observe that those that are the best breeders, and the best layers, are to be chosen, the oldest being always the best sitters, and the youngest the best layers; but no sort will be good for either if they are kept too fat. The best age to set a hen for chickens, is from two years old to five; and the best month to set them in, is February, though any month between that and Michaelmas is good. A hen sits twenty days; whereas geese, ducks, and turkeys, sit thirty. Observe to let them have constantly meat and drink near them while they sit, that they may not straggle from their eggs, and chill them. One cock will serve ten hens.

If fowls are fed with buck or French wheat, or with hemp, canary, or millet-seed, which is commonly sown in March, it is said they will lay more eggs than ordinary; and buck-wheat, either whole or ground, and made into paste, which is the best way, is a grain that will fat fowls or hogs very speedily; but the common food to fat them with is barley-meal wet with milk or water; but wheat-flour is better: yet if you design to bring up chickens, give a barley-corn or two to each of them, as you take them out of the nest, and so continue to feed them till they are fit for fattening.

For the best methods of breeding ducks, geese, turkeys, pigeons, swans, peacocks, &c. See **POULTRY**, and each under its proper article **DUCKS**, **GEES**, **TURKEYS**, &c.

FOWL's Dung. See the article **Dung**.

FOX, a well known animal of the canine kind, with sharp ears and a bushy tail.

The fox is very prejudicial to the husbandman, by taking away, and destroying of his lambs, poultry, geese, &c. especially in places that are near forest-woods, and covert places. The best way of destroying them is with guns or traps, after this manner: if you design to shoot them, procure a sheep's paunch, and tying of it to a long stick, rub your shoes well upon it, that the fox may have no scent of your feet, and draw the paunch after you, with which make a trail a mile or two in length; and order it so as to bring it near some thick-headed tree. At which place, when you have made your trail, leave your paunch, and with your gun get up into the tree; and as soon as it begins to be dark, you will see him come by you upon the scent of the trail, where you may shoot him. Observe that you draw the trail to windward of the tree, if you can.

But if you have a mind to catch them with a steel-trap, which is the surest way, choose a place to set it in a plain part of a large field; let it be out of the way of all paths, but not near either a hedge or any shelter. Open your trap, and lay it upon the ground, and cut out in the turf just the form thereof, and take out so much earth as may make room to lay it, covering it again very neatly with

the turf you cut out; and because the joints of the turf will not close exactly, get some of the fine mould that is to be found in a new cast up mole-hill, and fill the joints with it, taking some grass, and sticking it in the mould, as if it grew there. Make all so fine and plain, as that it may deceive your own eye to look upon it. About eight or ten yards from the trap, three several ways, scatter some of the fine mould that you had out of the mole-hill, very thin upon a place about fourteen or fifteen inches square; and upon these places, and where the trap is, lay two or three small bits of cheese, and with a sheep's paunch, as is before directed, draw a trail of about a mile long to each of the three places, that are at a distance from the trap, and from thence to the trap, that so the fox may come upon one of those places first, which will make him approach the trap with more boldness, where you will seldom fail of him; only you must observe not to fasten your trap, but to leave it loose, that he may draw it to the hedge-side, or to some cover, or else he will bite off his leg, and be gone.

Some bend down a stick in the wood, and set a trap for them in their paths, like that which is set for woodcocks, which hangs them up, or any other sort of vermin. *Mortimer's Husbandry*, vol. I. p. 312.

FOX-TAIL GRASS, the same with cow-wheat. See the article **COW-WHEAT**.

FREE-MARTIN, a barren heifer; being a twin with a bull-calf.

FRENCH BARLEY, a species of barley called by botanists *tritico speltum*. Some call it wheat-barley. It is naked, and the grain like wheat, but the ear shaped like that of the common barley. This species is often sown about Rowley, Hamstal, and Redmore, in Staffordshire. It yields a large increase, and makes good bread and good malt. See the article **BARLEY**.

FRENCH BEANS. See the article **BEANS**.

FRITH, an arm of the sea running into the land.

FROST, the last effect of cold; the power or act of congelation.

Frost is a great fertilizer of land, and therefore when the soil is a harsh, churlish, or obstinate clay, it should be turned up in ridges at the beginning of winter, which will greatly tend to remove its bad qualities, and separate its particles.

Hard winters are generally of service to corn in many respects; especially if the land has been thoroughly drained, and is well covered with snow. This last mellows the ground and keeps it warm; while frost, neither the rigour nor duration of which need be feared if it comes on gradually, and the land is dry, not only kills great numbers of vermin and insects, but, by leaving the earth in a loose state, fits it for roots to extend themselves therein, as the warmth of the spring approaches, and thereby enables them to produce strong plants; whereas frequent rains in winter, without frost, sodden the earth, which afterwards produces nothing but blades, soon to be destroyed by the hoar frosts of the spring, by insects, and by weeds; or which would yield at most only straw without grain. The winter's frosts may indeed nip off the blades; but then the roots being unhurt, new ones will shoot up in the spring. This was the case in the remarkably severe winter of 1608, of which Mezeray speaks, and which, notwithstanding its extreme severity, was followed by a plentiful harvest; and such also, or nearly such, was the long winter of 1739.

The great danger from frosts is, when the earth is wet, and not covered with snow. For example, if a strong frost returns after a sudden thaw, the fibres of the roots are broken by the expansion of the surrounding water when frozen, and the too great abundance of moisture in the plants themselves when frozen, tears their fibres to pieces by the same expansion. This was what happened in 1684.

Early in the spring of 1710, the parliament of Paris, hoping that the corn cut off by the preceding winter would shoot out again, as it did after the winter of 1608, mentioned by Mezeray, forbid sowing anew the lands which had been sown the autumn before: but the expectation now proved groundless, the plants having been totally destroyed by repeated frosts, intermixed with frequent thaws, so that had it not been for the barley that was sowed afterwards, which yielded such prodigious crops, that the French still call that year the year of barley, the dearth must have been much more dreadful than it was. In that very spring, after the hard winter, several people in the dutchy of Berry, and elsewhere, sowed wheat, which

sprouted well, and grew, but did not spindle; whereupon, some mowed their crops, and others turned in cattle to feed as in a meadow: but after another winter had passed over them, these very fields yielded the next year as plentifully, as if they had been sown anew. In inclosed grounds, the corn near hedges, which secured it from the north wind, resisted all the rigour of that excessive cold; and in other places, where the poor peasants raked up all the snow they could collect, and spread it with their hands upon the uncovered spots of their small fields, their corn was preserved, and yielded a good crop.

A gentleman, now living in England, had a field of wheat so greatly damaged by alternate frost and thaw, that the neighbouring farmers thought he could not do better than plough it up for spring corn; but observing that many of the plants were yet alive, and in a condition to be recovered, though thinly scattered, he hand-hoed the whole, and reaped three quarters of corn from each acre of this land.

Wheat is very hardy, and rarely injured by frost, if the land upon which it grows is not wet. In the great frost of the year 1739-40, the frost was often intense in the nights, and in the days a bright sun-shine; these alternate changes reduced the surface of the land to dust, which was so light, that the wind blew the mould off the south sides of the ridges that lay east and west; but on the north sides, that were not so much exposed to the sun, the mould not being so much pulverised, was not blown off, and the wheat there was very little hurt; while the roots of the wheat on the south sides was laid bare, and the plants in general were killed by the frost. The blades of all the wheat were destroyed, and nothing green to be seen, and many farmers ploughed up their wheat, thinking it was all dead: others, more curious, finding upon examination, that the roots were still alive, suffered their wheat to remain, which, upon the frost going off, recovered, shot up new stalks, which branched greatly, and produced very large ears, and very full grained corn, so that upon the whole there was a plentiful crop. From this and other instances it appears, that wheat upon dry healthy land is not killed by frost, unless its roots are all, or most of them, exposed to it.

Mr. Marshall, in his Minutes of Agriculture, makes the following remarks, "October 3. 1785. The barley had not ripened, perceptibly, for some weeks before the late sharp frosts; since which it has ripened daily. There are twice the number of ripe ears, now, there were a week ago: they are not only changed as to colour, but the corn is obviously plumper. Before the frosts, the heads seemed slender and puny; so much so, that I had consigned the whole to the miller: now I begin to hope that some of it may, this year of scarcity, be fit for the maltster."

"It was a general observation, it seems, in this country, in the year 1782, (a wet backward summer) that the late ripe crops did not ripen until frost came: even wheat was cut in December."

"How is this to be explained? Frost, we scarcely can doubt, compresses the sap vessels of vegetables, and, probably, forces the sap out of them, back to the earth, it is generally supposed; but, perhaps the natural receptacles of the plants are first supplied."

"It is observable that fruits ripen, leaves fall, lattermath shrinks, by frost."

FROWAR, the name of an edge tool, used in cleaving laths.

FRUNDELE, two pecks, or half a bushel.

FRUSHES. See **RUNNING-THRUSH**.

FUDDER, a load. It properly relates to lead, and signifies a certain weight, viz. eight pigs, or sixteen hundred weight.

FULLERS EARTH, a native earth found in many parts of England, and much used by fullers in cleaning and scouring their cloth. It is of a very fat nature, and very full of that vegetative salt that helps the growth of plants; and therefore may be used with advantage, where it is found in plenty, on some sorts of land.

FURLONG, the eighth part of a mile.

FURROW, a trench made by the plough.

FURROWING PLOUGHS. Of these, Mr. Young, in his Annals of Agriculture, Vol. IV. says, "That used for pease makes only one furrow at a time, and drills the pease; with the same plough the bean furrows are made, but, instead of drilling, they are dropped. The plough used for wheat, barley, oats, and canary (and one plough answers

answers the purpose for these several sorts) makes two furrows at a time; the seed is then sowed by hand, and grows regularly in them. The barley I generally drill, not sow. It must be harrowed with the furrow. Observe, I dung my clover-lay, and plough it six weeks or two months before I furrow and sow canary, and if the ground is well ploughed, there is not any the least difficulty in furrowing a clover lay. What I mean by ploughing well, is making small furrows, and laying them with a comb; not great, broad, flat furrows."

FURZE, *whins* or *gorse*, to which C. Bauhin and Mr. Ray, gives the name of *genista spinosa*, and which Linnaeus and Miller call *ulx*, propagate themselves so rapidly, by sowing their seeds, that, where they are once established in a spot of ground, they soon over-spread the whole place; for, as the seeds ripen, their pods are opened by the warmth of the sun, and they are thrown out with an elastic jirk to a considerable distance all around. There they vegetate, and the ground is soon filled with young plants, which are not easily destroyed after they have taken good root. The only way of extirpating them, is by paring off and burning the surface of the ground. See the article BURN-BAKING.

This is by so much the more advisable, as these seeds will otherwise remain a long while found in the earth, and grow whenever they are brought up by ploughing; and also because the smallest fragments of this plant will strike out fresh roots, and shoot up anew; but when a good thickness of the surface is pared off, and burnt, the seeds are so effectually destroyed, and the roots are killed to so considerable a depth, that neither can again give rise to new plants; and if a few of these do appear, a summer fallow will put an entire end to their growth. Their increase may likewise be prevented by good manuring with marl, chalk, or lime, especially in sandy soils, which are most apt to produce this plant, and which are at the same time the most benefited by these helps.

However, this very plant, formerly deemed a great nuisance, is now cultivated to advantage on light, sandy, dry soils, which would otherwise turn to little account.

The tops of the common English furze, bruised a little to take off, or to blunt their prickly tips, have been found to be excellent fodder, even for lean sickly beasts, and particularly horses, which they have frequently recovered, and plumped up in a short time. This custom is much practised in several foreign countries, where furze are cultivated purposely for fodder; and the peasant thinks it a happiness that his breaking their pipes with a mallet enables him to give this wholesome green food to his cattle in the winter, when often no other succulent plant can be had fit for that use. The mills which Sir Capel Hanbury has lately erected for this end in Wales, with a patriotic spirit, well suited to his distinguished zeal for the public welfare, will save the countryman that laborious task, and prove highly beneficial to those who follow his judicious example.

When furze are raised on purpose for the food of cattle, and especially on soils like the above mentioned, their seeds should be sown in February, March, or April, and the ground should be prepared as for barley. Six pounds of them will be sufficient for an acre of land; and they should be but barely covered over. The young plants must be preserved from cattle during the first year, and they will be fit to mow or cut in the next. October is the proper time to begin cutting them. They will con-

tinue to shoot till Christmas, and be fit for use till March. Horses eat them as readily as they do hay, after they have been bruised, or pounded, so as to take off their sharp points; and it is said, that an acre of ground, will produce fifteen tons of this fodder, and it will go as far as an equal quantity of hay. Some mix the bruised furze with chopped straw; an hundred of straw to a ton of furze; but only the growth of the year should be cut for cattle.

Poor hungry gravelly soils, which would not have let for five shillings an acre, have been rendered worth twenty shillings an acre, by sowing of them with furze seed, in places where fuel has been scarce; this being frequently used for heating ovens, burning lime and bricks, and also for drying malt; but it is not worth cultivating in countries where fuel of any kind is cheap, or upon such lands as will produce good grass or corn.

Some years ago, the common furze used to be much sown for hedges about fields; and where the soil was light, the plants soon became strong enough for a fence against cattle: but as these hedges grow naked at the bottom in a short time, and the plants frequently failed, so as to leave considerable gaps, this practice has of late been greatly disused. The species commonly called French furze is the best for this purpose, because it thickens more near the ground, and grows to a greater height; but its shoots are not tender enough for cattle to eat them. This is also considered as the most difficult to extirpate; though Mr. Bradley, who tells us he had seen fields of one hundred and fifty acres planted with it in Devonshire, says, that it may be killed by cutting the woody stalks within a foot of the root in summer time; for that it will not then spring up again like the small wild furze or whins, by which name Mr. Markham distinguishes the smaller from the larger sort. This begins to blow in the middle of January, and continues in blossom all the summer; while the English furze does not bloom till towards the end of the spring, and finishes its blossoming at the same time as the other.

The marquis of Tourbilly observes, that cows, oxen, and most other cattle, as well as horses, feed heartily upon, and are well fed by the bruised tops of furze; and that we may be sure corn will do well wherever this plant is met with: for be the surface of the ground what it will, the spontaneous growth of the furze always indicates a depth of good mould underneath; and the continual dropping and rotting of the leaves, will infallibly improve and enrich the surface. The flowers of the furze are excellent for bees.

FURZE GROUNDS. Mr. Marshall, in his Rural Economy of Yorkshire, Vol. I. says, "It is the opinion of one who has paid close attention to the subject, that old furze-grounds, off which fuel having been repeatedly carried, are of course much depauperated, may in general be improved in the following manner:

"Grub; sow grass seeds, on the grubbed surface, without ploughing; and let the land remain in this state until it has acquired a degree of firmness, the smaller roots left in it are decayed, and the surface has got a covering. Then sod-burn, lime, &c. and break up the soil for a course of arable crops; closing with cultivated grass. When the furzes begin again to grow troublesome repeat the sod-burning."

FUZZEN, or FUZEN, the natural juice or nourishment of any thing; the strength of it.

G.

GALLERY, a kind of covered walk in a garden, formed into porticoes or arches, with horn-beams, lime-trees, or the like.

GALLING of a horse's back, a disorder occasioned by heat, and the chafing or pinching of the saddle.

In order to prevent it, some take a hind's skin well covered with hair, and fit it neatly under the pannel of the saddle, so that the hairy side be next the horse.

This does not harden but sweat, and so not only keeps that part from galling, but is good for such horses as have been lately cured, which would otherwise gall again.

After a journey you ought to take off the saddle and feel the horse's back, whether he has been pinched or galled or not, which will be the best discovered after he has stood an hour or two unsaddled, by the swelling of the part oppressed.

If it be only swelled, fill a bag with warm dung, and tie it upon the swelling, which will not only prevent it from growing worse, but also probably quite disperse it.

Or you may rub and chafe the swelling with good brandy, or spirit of wine, and having soaked the place well with it, set fire with a lighted paper to what remains of it, and the swelling will disappear, when the fire extinguishes of itself; but if the skin be broke, wash it with warm claret, mixed with a fourth part of fallad oil, or fresh butter; or bathe it often with brandy if the horse will endure it.

When a horse's back is galled upon a journey, take out a little of the stuffing of the pannel over the swelling, and sew a piece of soft white leather on the inside of the pannel; anoint the part with salt butter, and every evening wipe it clean, rubbing it till it grow soft, anointing it again with butter, or, for want of that, with grease: wash the swelling, or hurt, every evening with cold water and soap, and strew it with salt, which should be left on till the horse be saddled in the morning.

GALLON, a measure of capacity both for dry and liquid things, containing four quarts; but these quarts, and consequently the gallon itself, are different, according to the quality of the thing measured: for instance, the wine gallon contains 231 cubic inches, and holds eight pounds avoirdupoise of pure water: the beer and ale gallon contains 282 solid inches, and holds ten pounds three ounces and a quarter avoirdupoise, of water; and the gallon for corn, meal, &c. 272 cubic inches, and holds nine pounds thirteen ounces of pure water.

GALLOWS of a plough, a part of the plough-head so called by farmers, from its resemblance to the common gallows, as consisting of three pieces of timber, of which one is placed transversely over the heads of the other two. See **PLOUGH**.

GAME-LAWS. For the information and satisfaction of all gentlemen farmers, and others, we have here inserted abstracts of all the acts of parliament relating to the game, whereby they and sportsmen may know the respective times when they are to begin, and when they are to leave off sporting, and also the penalties and punishments of infringing or breaking the above acts. Agreeable to the act of 24 Geo. III. certificates required before the first day of October, 1784, shall bear date on the day of the month on which the same shall be issued, and shall remain in force until the first day of July next following. No certificate shall issue between the first day of October, 1784, and the first day of March 1785; and every certificate which shall issue after the said first day of March, 1785, shall be issued between the first day of March and the first day of July in each year, and shall bear date on the day of the month on which the same shall be issued, and shall be in force for twelve calendar months, commencing from the date; and if any clerk of the peace, his deputy, or steward clerk, issuing certificates, otherwise than directed, to forfeit 50*l*. 24 Geo. III. *sess*. 2. c. 43. f. 5. But certificates may issue

to any person beyond the seas, who hath, or shall have, in any year, first arrived into England, any time after the first day of July in such year; but in every such case, the cause shall be specified, either in the body or at the foot of such certificate; to bear date on the day it is issued, being stamped with double duties, and to be in force till the first day of July next following the date thereof, 24 Geo. III. *sess*. 2. c. 43. f. 6. Every qualified person, after the said first day of October, 1784, shooting at, killing, taking, or shooting any pheasant, partridge, heath-fowl, or black game, or any grouse, or red game, or any other game, or killing, taking, or destroying, any hare, with any greyhound, hound, pointer, spaniel, setting-dog, or other dog, without having obtained such certificate, shall forfeit the sum of 50*l*. 24 Geo. III. *sess*. 2. c. 34. f. 7. Clerk of peace, &c. shall on or before November 1, 1784, and in every subsequent year, on or before August 12, in each year, make out and transmit to the stamp office, London, alphabetical lists of the certificates so granted by them, distinguishing the duties paid on each respective certificate so issued, and on delivery thereof, the receiver-general of the stamp duties shall pay to clerk of peace, &c. for the same, one farthing a name; and in case of neglect or refusal, or not inserting a full, true, and perfect account, he shall forfeit 20*l*. 24 Geo. III. *sess*. 2. c. 43. f. 9. Lists may be inspected at stamp office for 1*s*. each search, 24 Geo. III. *sess*. 2. c. 43. f. 10. If any qualified person, or having a deputation, shall be found in pursuit of game, with gun, dog, or net, or other engine for the destruction of game, or taking or killing thereof, and shall be required to shew his certificate, by the lord or lady of the manor, or proprietor of the land whereon such person shall be using such gun, &c. or by any duly appointed game-keeper, or by any qualified and certified person, or by any officer of the stamps, properly authorised by the commissioner, he shall produce his certificate; and if such person shall refuse, upon the production of the certificate of the person requiring the same, to shew the certificate granted to him for the like purpose; or in case of not having such certificate to produce, shall refuse to tell his christian and surname, and his place of residence, and name of the county where his certificate was issued, or shall give in any false or fictitious name, he shall forfeit 50*l*. 24 Geo. III. *sess*. 2. c. 43. f. 12. Certificates do not authorise any person to shoot at, kill, take or destroy any game, at any time that is prohibited by law, nor give any person a right to shoot at, &c. unless he be duly qualified by law, 24 Geo. III. *sess*. 2. c. 43. f. 13. No certificate, obtained under any deputation, shall be pleaded or given in evidence, where any person shall shoot at, &c. any game out of the manor or lands for which it was given, 24 Geo. III. *sess*. 2. c. 43. f. 14.

Lord Mansfield has given it as his opinion, that an unqualified person may go out to beat the hedges, bushes, &c. with a qualified person, and to see the game pursued or destroyed, provided the unqualified person has no gun or other engine with him for the destruction of the game, without being subject to a penalty.

Destroying conies, transportation, 5 Geo. III. c. 14. Robbing warrens, felony without clergy, 9 Geo. I. f. 22. Killing them in the night, or endeavouring to kill them, fine of 10*s*. or commitment, 22 and 23 Car. II. c. 25. f. 5, 6. Unqualified persons using guns to kill them, same may be seized, 3 Jac. I. c. 13. f. 5. Stalking deer without leave, 10*l*. 19 Hen. VII. c. 11. Hunting or killing them, 10*l*. costs, and sureties for good behaviour, 5 Eliz. c. 21. Buck-stalls or engines kept by unqualified persons, may be seized, 3 Jac. I. c. 13. Selling, or buying them to sell again, 40*s*. 3 Jac. I. c. 27. Courting, or killing them without consent, 20*l*. 13 Car. II. c. 10. Hunting, taking, killing, or wounding, 30*l*. or transportation, 3 Will. III. c. 10. 5 Geo. I. c. 15. 9 Geo. I. c. 22. 10 Geo. II. c. 32. Destroying pales or walls of inclosed grounds without consent,

sent, 30*l.* 5 *Geo. I. c. 15. f. 6.* Keeper of park killing or taking them, 50*l.* 5 *Geo. I. c. 15.* Robbing places, where kept, felony without clergy, 9 *Geo. I. c. 22.*

All lords of manors or other royalties may appoint game-keepers, 22 and 23 *Car. II. c. 25. f. 2.* and empower them to kill game, 2 *Burn's Just. 225.* But if he disposes of game without the lord's consent, he shall be committed for three months, and kept to hard labour, 5 *Anne, c. 14. f. 4.* But no lord shall make above one game keeper within one manor, with power to kill game, and his name shall be entered with clerk of peace; certificate whereof shall be granted by clerk of peace, on payment of one shilling. Unqualified game-keepers killing or selling hare, pheasant, partridge, moor, heath-game, or grouse, he shall forfeit 5*l.* by distress, or commitment for three months, for the first offence, and for every other four, 9 *Anne, c. 21. f. 1.* No lord shall appoint unqualified game-keeper, or one who is not *bona fide* servant to such lord, or immediately employed and appointed to take and kill game for the sole use of lord; other persons under colour of authority for taking and killing game, or keeping any dogs or engines whatsoever for that purpose, shall forfeit 5*l.* In like manner, 3 *Geo. I. c. 11. f. 1.* Every deputation of a game-keeper to be registered with clerk of the peace, or in the sheriff or steward's court-books of the county where lands lie, and annually take out certificate thereof, stamped with an half-guinea stamp, 24 *Geo. III. f. 2. c. 43. f. 1.* and by the 31 of *Geo. III. c. 21.* with an additional half-guinea stamp, making in the whole one guinea. Every game-keeper, from and after the passing of this act, who shall so deliver his name and place of abode as aforesaid, and require a certificate, shall be annually entitled thereto, stamped as before directed, from clerk of peace or his deputy, sheriff, or steward's clerk to the effect of the form in the act set forth, 24 *Geo. III. f. 2. c. 43. f. 3.* Clerk of peace, &c. after signing certificate, shall issue same stamped to person registering deputation, on requiring same, for which he may receive 1*s.* 24 *Geo. III. f. 2. c. 43. f. 4.* Neglecting, or refusal of issuing certificates, incurs a forfeiture of 50*l.* 24 *Geo. III. f. 2. c. 43. f. 4.* recoverable in courts of *Westminster*, court of Session, of Justiciary, or Exchequer in *Scotland*, by action of debt or information, for the use of the plaintiff, with double costs of suit, 24 *Geo. III. f. 2. c. 43. f. 18.* And moreover be liable to pay the duty on such certificate, 24 *Geo. III. f. 2. c. 43. f. 4.* Clerk of peace, &c. may issue his certificate to any game-keeper first appointed in any year after first *July* in that year, 24 *Geo. III. f. 2. c. 43. f. 6.* If any lord or lady of a manor, or proprietor of land, shall make any new appointment of a game-keeper, and shall register deputation with clerk of peace, &c. and obtain a new certificate thereon, the first shall be void; any person acting under the same, after notice, shall be liable to all the penalties of the game-laws, and those against unqualified persons, 24 *Geo. III. f. 2. c. 43. f. 11.*

Every person tracing or coursing hares in the snow shall be committed for one year, 31 *Eliz. c. 5.* unless he pay to church-wardens, for the use of the poor, 20*s.* for every hare, or become bound by recognizances with two sureties in 20*l.* a-piece, not to offend again; and every person taking or destroying hares with any sort of engine, shall forfeit, for every hare, 20*s.* in like manner, 1 *Jac. I. c. 27. f. 2.* Persons found using engines liable to punishment inflicted by 31 *Eliz. c. 5.* See above, and 22 and 23 *Car. II. c. 25. f. 6.* Unqualified persons keeping or using shooting dogs, or engines to kill or destroy hares, shall forfeit 5*l.* to the informer, with double costs, 2 *Geo. III. c. 19.* by distress, or committed for three months for first offence, and for every other four, 5 *Anne, c. 14. f. 4.* Taking or killing hare in the night-time, forfeit 5*l.* 9 *Anne, c. 25. f. 3.* The whole to the informer, with double costs, 2 *Geo. III. c. 19.* as directed by 5 *Anne, c. 14. f. 4.* 9 *Anne, c. 25. f. 3.* Killing or taking with gun, dog, or engine, hare in the night, between the hours of seven at night and six in the morning, from *October 12* to *February 12*, and between the hours of nine at night and four in the morning, from *February 12* to *October 12*, or in the day-time upon *Sunday* or *Christmas-day*, to forfeit not less than 10*l.* nor more than 20*l.* for the first offence; nor less than 20*l.* nor more than 30*l.* for the second offence; and 50*l.* for the third offence; with costs and charges; and upon neglect or refusal, be committed for six or twelve calendar months, and may be publicly whipped; final appeal to quarter sessions, 13 *Geo. III. c. 80.* Persons armed and disguised, stealing them, felony without clergy, 9 *Geo. I. c. 22.* Higler, chapman, carrier,

inn-keeper, victualler, or alehouse-keeper, having in his custody, or buying, selling, or offering to sale, any hare, unless sent up by some person qualified, (or any person selling, exposing, or offering to sale, hares, 28 *Geo. II. c. 22.*) shall forfeit for every hare, 5*l.* the whole to informer, 2 *Geo. III. c. 19.*

For preserving heath-cocks or polts, no person whatsoever, on any waste, shall presume to burn, between *February 2* and *June 24*, any grig, ling, heath, furze, goss, or fern, on pain of commitment for a month, or ten days, to be whipped and kept to hard labour, 4 and 5 *W. and M. c. 23. f. 11.* Shooting heath-cocks, grouse, or moor-game, contrary to 1 *Jac. I. c. 27. f. 2.* and killing any of them in the night, or using gun, dog, or engine, with such intent, contrary to 9 *Anne, c. 25.* and 13 *Geo. III. c. 80.* And carriers and others having such game in their possession, contrary to 9 *Anne, c. 14.* are all liable to the same penalties, and recoverable in the same manner as those offences are subjected to in regard to shooting, &c. hares.

Officers of the army, without leave of the lord of the manor, destroying coney, hare, pigeon, pheasant, or partridge, or his Majesty's game, shall forfeit 5*l.* to the poor; and the commanding officer, for every offence, committed by any soldier under his command, shall forfeit 20*s.* in like manner; and if, upon demand, he shall not in two days pay said penalty, he shall forfeit his commission. *Vide* The yearly Mutiny Act.

Taking partridges, by nets or other engines, upon another's freehold, without special licence of owner of same, 10*l.* half to him who shall sue, and half to owner or possessor, 11 *Hen. VII. c. 17.* Shooting at, &c. partridges, with gun or bow, or taking, &c. them with dogs or nets, by 7 *Jac. I. c. 11.* or taking their eggs out of their nests, liable as persons shooting at, &c. hares, and also 20*s.* for every bird or egg, as is shewn in the preceding column concerning Hares. Selling, or buying to sell again, a partridge, (except reared and brought up in houses, or from beyond sea) forfeit for every partridge 10*s.* half to him who will sue, and half to informer, 1 *Jac. I. c. 27. f. 4.* Taking, killing, or destroying partridges in the night, forfeits for every partridge, 10*s.* half to him who will sue, and half to lord of the manor, unless he licence, or cause the said taking or killing, in which case this half shall go to the poor, recoverable by church-warden; and if not paid in ten days, to be imprisoned for one month; and moreover, shall give bond to justice, with good sureties not to offend again for two years, 23 *Eliz. c. 10.* To kill a partridge in the night is 5*l.* penalty, 9 *Anne, c. 25. f. 3.* the whole whereof is given to the informer, 2 *Geo. III. c. 19.* and may be recovered within three months, 5 *Anne, c. 14.* before a justice of peace, or within six months, by action in Court of Record at *Westminster*, 9 *Anne, c. 25.* with double costs, 2 *Geo. III. c. 19.* Keeping or using any greyhounds, setting-dogs, or any engine for destroying partridges, 5*l.* to be levied and recovered as the like penalty for killing hares, by 5 *Anne, c. 4. f. 4.* as before is shewn. Penalties for using gun, dog, snare, net, or other engine with intent to take or destroy partridges in the night, or on *Sunday* or *Christmas-day*, same as using them against hares, by 13 *Geo. III. c. 80.* as in the foregoing column. Carriers and others having partridges in their possession, liable to same forfeitures as having hares; and the same laws against shooting them as for shooting hares.

All the laws respecting the penalties and recovery of them, for taking them by nets, snare or other engines, without license of the owner, by *Hen. VII. c. 17.* And for shooting, or destroying them with dogs or snares, &c. by 7 *Jac. I. c. 11.* or taking their eggs, by 1 *Jac. I. c. 27. f. 2.* And for selling, and buying them to sell again, by last cited act (except that the penalty for a pheasant is 20*s.*) and for destroying them in the night (excepting as aforesaid,) by 23 *Eliz. c. 10.* 9 *Anne, c. 25. f. 3.* and 13 *Geo. III. c. 80.* And for keeping or using sporting-dogs or engines for destroying them, by 5 *Anne, c. 14. f. 4.* Or for using gun, dog, or net, for destroying them on *Sunday* or *Christmas-day*, by 13 *Geo. III. c. 80.* and for carriers and others having them in their possession; all these laws are *mutatis mutandis verbatim*, the same as those respecting partridges.

Person prosecuted for any thing done in pursuance of this act, he may plead the general issue, and give the special matter in evidence for his defence; and if upon trial verdict puts for defendant, or plaintiff become non-suited, defendant shall have treble costs of plaintiff, 24 *Geo. III. f. 2. c. 3. f. 24.*

Qualifications for killing game (besides the late new tax) are, 1. Having a freehold estate of 100*l.* *per annum*, 22 and

23 *Car. II. c. 25.* 2. A leasehold estate, for 99 years, of 150*l. per annum.* 3. The eldest son or heir-apparent to an esquire, or person of superior degree. 4. The owner or keeper of a forest, park, chace, or warren. See *Bl. Com.* 174, 175. Unqualified person keeping dogs or engines to destroy the game, to forfeit 5*l.* 5 *Anne, c. 14.* Restrictions in the laws concerning the preservation of game, seems to affect all persons whomsoever, whether qualified or not, 2 *Burn's Just.* 219, 248. No person (other than the King's son,) unless he have lands of freehold to the value of five marks a year, shall have any game of swans, on pain of forfeiting them, half to the king, and half to any person (so qualified) who shall seize the same, 22 *Edw. IV. c. 6.* Any gentleman or other that may dispend 40*s.* a-year freehold, may hunt and take wild-fowl with their spaniels only, without using a net or other engine, except the long-bow, 25 *Hen. VIII. c. 11.* From persons not having lands of 40*l.* a-year, or not worth in goods 200*l.* using gun or bow to kill deer, any person having 100*l.* may seize same to his own use, 3 *Jac. I. c. 13.* Killing in the night, between the hours of nine at night, and four in the morning, from February 12 to October 12, any game, by any person, whether qualified or not, subject to same penalties as killing hares at that time of night, by 13 *Geo. III. c. 80.* as has been already shewn. Every person qualified to kill game, shall, previous to his shooting at, killing or destroying any game, deliver in writing his name and place of abode, if in *England*, to the clerk of the peace, if in *Scotland*, to the sheriff or steward clerk of the county where resident, and annually take out a certificate thereof, stamped with a two guinea stamp, 24 *Geo. III. sess. 2. c. 43. s. 1.* and the 31 of *Geo. III. c. 21.* an additional stamp of one guinea, making in all three guineas, and from and after the passing of this act, every such qualified person who shall so deliver in *England* or *Scotland*, his name and place of abode as aforesaid, and require a certificate thereof, shall be annually entitled thereto, stamped as aforesaid, from clerk of peace or his deputy, sheriff, or steward clerk, to the effect of the form in the act set forth, 24 *Geo. III. sess. 2. c. 43. s. 3.* Clerk of peace, &c. after he shall have signed such certificate, shall forthwith issue the same, stamped, to the person so delivering in his name and place of abode, and requiring the same, for which he shall be entitled to receive 1*s.* for his own trouble, 24 *Geo. III. sess. 2. c. 43. s. 4.* Neglect in, or refusing certificates, incurs like forfeiture, and which are recoverable in like manner, and with same costs as to gamekeepers, as before mentioned; besides liable to pay the duty on such certificate, 24 *Geo. III. sess. 2. c. 43. s. 4.*

The time for sporting in the day is, from one hour before sun-rising, until one hour after sun-setting, 10 *Geo. III. c. 19.* The sporting season for bustards is from December 1 to March 1. For grouse or red-game, from August 12 to December 10. Hares may be killed all the year, under the restriction in 10 *Geo. III. c. 19.* Heath-fowl, or black game, from August 20 to December 20, 13 *Geo. III. c. 55.* Pheasants, from October 1 to February 1. Partridges, from September 1 to February 12, 2 *Geo. III. c. 19.* Fowls, widgeons, wild-ducks, wild-geese, at any time, but in June, July, August, and September, 10 *Geo. III. c. 32.*

From and after October 1, 1784, in all cases where the penalty by this act, does not exceed 20*l.* justice of peace shall, upon information or complaint, summon the party and witnesses to appear, and proceed to hear and determine the matter in a summary way, and upon due proof by confession, or upon the oath of one witness, give judgment for the forfeiture; and issue his warrant for levying the same on offender's goods, and to sell them, if not redeemed within six days, rendering to party overplus, and if his goods be insufficient to answer the penalty, shall commit offender to prison, there to be for six calendar months, unless penalty be sooner paid; and if party be aggrieved by the judgment, he may upon giving security amounting to value of forfeiture, with the costs of assurance, appeal to the next general quarter sessions, when it is to be heard and finally determined; and in case the judgment be affirmed, sessions may award such costs incurred by appeal as to themselves shall seem meet, 24 *Geo. III. sess. 2. c. 43. s. 19.* Witnesses neglecting or refusing to appear, without reasonable excuse, to be allowed of by the justice, shall respectively forfeit, for every offence, 10*l.* to be levied and paid as other penalties by this act 24 *Geo. III. sess. 2. c. 34. s. 20.* Justice to cause conviction to be made out to the effect of the form set forth in the act 24 *Geo. III. sess. 2. c. 43. s. 21.* Justice may mitigate penalties as he thinks fit, so that

the reasonable costs and charges of officers and informers for discovery and prosecution, be always allowed, over and above mitigation, and so as same does not reduce the penalty to less than a moiety, over and above the costs and charges, 24 *Geo. III. sess. 2. c. 43. s. 22.*

It is felony to take any swans that be lawfully marked, though they be at large; and so it is unmarked swans, if they be domestical or tame, so long as they keep within a man's manor, or within his private rivers, or if they happen to escape from them, and are pursued and taken, and brought back again; but if they be abroad, and attain their natural liberty, then the property of them is lost, and so long felony cannot be committed by taking them, *Burn's Just. Tit. Game.*

Same laws against shooting wild-fowls as for shooting hares, by 1 *Jac. I. c. 27. s. 2.*

I have here also added an abstract from the late act of parliament for preventing the stealing of dogs, which shews the great regard the legislator has to the canine race.

By the statute of 10 *Geo. III.* for preventing the stealing of dogs, it is enacted, that after the 1st day of May 1770, if any person shall steal any dog or dogs of any kind or sort whatsoever, from the owner thereof, or from any person intrusted by the owner thereof with such dog or dogs; or shall sell, buy, receive, harbour, detain, or keep any dogs of any kind or sort whatsoever, knowing the same to have been stolen as aforesaid, every such person being convicted thereof upon the oath of one credible witness, before two justices of the peace, shall for the first offence forfeit and pay any sum, not exceeding 30*l.* nor less than 20*l.* and the charges of conviction. And in case such penalty shall not be forthwith paid, the offender to be committed to goal for any time not exceeding twelve months, nor less than six, or until the penalty and charges are paid. Any person guilty of a subsequent offence, to forfeit and pay any sum not exceeding 50*l.* nor less than 30*l.* together with the charges, which penalties to be paid, one moiety thereof to the informer, and the other to the poor of the parish. On non-payment, the offender to be imprisoned for any time not exceeding 18 months, nor less than 12, or until the penalty and charges shall be paid, and be publicly whipped.

Justices to grant warrants to search for dogs stolen. And in case any such dog or dogs, or their skins, shall upon such search be found, to take and restore every such dog or skin to the owner, and the persons in whose custody any such dog or skin shall be found, are liable to the like penalties and punishments. Persons aggrieved may appeal to the quarter-sessions, and the determination there to be final.

GAP, a breach or opening made in a hedge.

GARGET, or Gargol, a distemper incident to hogs; and is known by the creature's hanging down his head, and carrying it on one side, moist eyes, staggering, and loss of appetite.

It is occasioned by a corruption of the blood, engendered by the eating of rotten fruits, garbidge, carrion, or rank grass, wherein is much hemlock, &c.

In order to cure this disease, let the creatures be first blooded both under the tail and under the ears, and then the following drink given them:

Take of chamber-lye one pint; rue and southern-wood, cut small, of each a handful; wood-foot from an oven, and common salt, of each a spoonful; hen's dung, near two spoonfuls; flour of brimstone one ounce: stir the whole together, and give two or three horns to each, proportional to their size. It is also good for a cow to cure the gargol or murrain.

Or you may use the following drink in the room of the above:

Take angelica, flavewort, or hog's madder, and May-weed, of each one handful; shred them together very small, and boil them very well in a pint of milk; and when it is cold enough, add to it a penny-worth of sallad-oil, and the same quantity of treacle. *Mor-timer's Husbandry, vol. 1. p. 250.*

GARTH, a yard, a backside, a croft.

GARNER, a granary, or repository for corn.

GARZIL, hedging wood.

GASCOIN, the inner thigh of an horse, which begins at the iliac, and reaches to the pla or bending of the ham.

GAUNT

GAUNT BELLYED, OR LIGHT BELLYED HORSE, is one whose belly shrinks up towards his flank; whence you may conclude he is extremely costive, and annoyed with much unnatural heat, so as to be always very watthy, tender, and unhealthy, after hard labour.

In order to the cure of it, it must be observed, that all horses have two small strings, reaching from the cuds to the bottom of the belly, one on each side; you must therefore with your finger break these strings, and then anoint the part every day with fresh butter and the ointment *populneum* mixed to equal quantities.

GAFEL, a frame of timber upon hinges to give a passage into inclosed ground. See **HANGING GATES**.

GATEWAY, the passage through gates of inclosed grounds.

GATTERIDGE-TREE, prickwood.

GAVEL, a row, or swarth of corn, cut down with the scythe.

GAVEL, is also a provincial word, signifying ground.

GAVEL-KIND, a custom whereby the lands of the father are equally divided at his death among all his sons.

GAVELOCK, a pitch, or iron-bar for entering stakes into the ground.

GEESE, birds too well known to need any description here. They are very profitable to the farmer many ways, for their flesh, their feathers, and their grease. They will live upon commons or any sort of pastures, and need very little care or attendance; only they should have plenty of water. The largest geese are reckoned the best: but there is a sort of Spanish goose, that is a much better layer and breeder than the English, especially if the eggs are hatched under an English goose.

Geese lay in the spring, the earlier the better; because of their price, and their having a second brood. They commonly lay twelve or sixteen eggs apiece. You may know when they will lay, by their carrying straw in their mouth; and when they will sit, by their continuing on their nests after they have laid. A goose sits thirty days; but if the weather be fair and warm, they will hatch three or four days sooner. After the goslings are hatched, some keep them in the house ten or twelve days; and feed them with curds, barley meal, bran, &c. and after they have acquired some strength, let them out four or five hours a day, taking them in again till they are big enough to defend themselves from vermin. Others put them out at first, and perhaps succeed as well as the former. One gander will be sufficient for five geese.

If you would fat green geese, you must shut them up when they are about a month old, and they will be fat in about a month more. Be sure to let them have always by them, in a small rack, some fine hay, which will much hasten their fattening. But for fattening of older geese, it is commonly done when they are about six months old, in or soon after harvest, when they have been in stubble fields, from which food some kill them, which is a good way. But those who are desirous of having them very fat, shut them up for a fortnight or three weeks, and feed them with oats, split beans, barley-meal, or ground malt mixed with milk; but the best thing to fatten them with is malt mixed with beer. You must however observe in fattening all sorts of water-fowl, that they usually sit with their bills upon their rumps, where they suck out the greater part of their moisture and fatness, at a small bunch of feathers, which you will find standing upright on their rumps, and always moist, with which they trim their feathers, which renders them more oily and slippery than the feathers of other fowls, and causes the water to slip off them. If therefore these upright feathers are cut away close, they will become fat in less time, and with less meat than otherwise. Geese will likewise feed on, and fatten well with carrots cut small and given them; or if you give them rye before, or about Midsummer, it will strengthen them, and keep them in health, that being commonly their sickly time.

In some countries they shear their geese for feathers, and some pull them twice a year; but the latter is more injurious to them, and therefore it is better staying till their moulting time, and till their death, for the feathers. *Mortimer's Husbandry*, vol. I. p. 255.

Mr. Young, in his *Annals of Agriculture*, vol. xiv. speaks of the treatment of geese in Lincolnshire, to the following effect:

"It is generally allowed that three geese to one gander is sufficient, more geese would be too many so as to render the

eggs abortive. The quantity of eggs to every goose for sitting, about 12 or 13.

"They must be fed with corn in their water whilst sitting; near them, so as to feed at pleasure. The ganders should be allowed to keep near them, so that they can see them, as they will naturally watch as guard over their own geese.

"Their nests should be made for them of straw, and confined so as the eggs cannot roll out when the geese turn them, which they do every day.

"When near hatching, the shell should be broke a little against the beak, or nib, of the gosling to give air, or to enable it to receive strength, to throw off the shell at a proper time. The method of plucking them; about the beginning of April: pluck gently and carefully, the fine feathers of their breasts and backs, but be careful not to pull or interrupt their down, nor pen feathers.

"You also pull their quills, five out of a wing, but I think four would be better. The quills will bear pulling in 13 or 14 weeks again, twice in a year; the feathers three times a year, of the old geese and ganders, seven weeks from the first pulling; and then again seven weeks after, which is the last pulling of the year.

"The young geese may be pulled once at 13 or 14 weeks old, but not quilled, being hatched in March.

"If the geese are late in hatching, I expect the brood geese should not be plucked so soon as April, but the month after.

"If they are fed with barley and oats, as they ought to be, they will thrive and do the better, and their feathers will grow faster and be better in quality. They must have plenty of grass and water."

GELDING, a castrated animal. In the performing of this, three things are to be observed; first the age, then the season of the year, and lastly the state of the moon.

As to the first, if it be a colt, he may be gelded at nine days old, or fifteen, if his stones be come down; for the sooner you geld him, the better, for the growth, age, and courage; but a farrier may geld a horse at any age whatever, if he be careful of the cure.

As to the time of the year, it should be done between April and May, or in the beginning of June at farthest; or at the fall of the leaf, which is about the latter end of September.

But for the third thing, viz. the state of the moon, the fittest time is always when the moon is in the wane or decrease.

As to the manner of gelding, whether it be a foal, colt, or horse, after you have cast him upon some soft place, take the stones between your foremost finger and your great finger, then slit the cod and press the stones forth; when that is done, with a pair of small nippers made of steel, box, or brazil wood, being very smooth, clap the strings of the stones between them very near, cut to the setting on of the stones, and press them so hard, that there may be no flux of blood, then with a thin drawing cauterizing iron, made red hot, sear away the stone: after that take an hard plaister, made of rosin, wax, and washed turpentine, well dissolved together, with your hot iron, melt it upon the head of the strings; that being done, sear them, and melt more of the salve, till such time as you have had a good thickness of the salve upon the strings.

Lastly, loose the nippers, and do so to the other stone; fill the slits of the cod with white salt, anoint all the outside of the cod with hog's grease, and then let the horse rise; keeping him in a warm stable loose, that he may walk up and down, for there is nothing better for him than moderate exercise.

But if you perceive that he swells in the cod and sheath very much, walk him up and down, and make him trot an hour in a day, which will soon recover him and make him sound.

GELT-GIMMER, a barren ewe.

GEOFF, or *Goffi*, a mow of hay or corn.

GERMINATION, the act of sprouting or shooting: growth.

GERMINS, buds, tender shoots.

GIGGS, small swellings, or bladders on the inside of the lips and palate of a horse.

They are cured by slitting them open with a knife or lancet, and washing them afterwards with salt and vinegar.

GILL, a rivulet, a beck. It is also a name for ground-ivy, or hale-hoof.

GIMMER-LAMB, or *Gammer Lamb*, an ewe-lamb.

GIN.

GIN. Mr. Young, in his *Annals of Agriculture*, says, it is asserted to be a custom with some farmers, who fatten much veal, to give the calves little balls of barley-meal dipped in gin; and it is founded upon experience, that they fatten much the speedier.

GLANDERS, a very obstinate and loathsome disease incident to horses.

The cause and seat of the glanders has till lately been so imperfectly handled, and so little understood by the writers on this distemper, that it is no wonder it should be ranked among the incurables; but a new light having been thrown on this whole affair by the study of M. La Fosse, the king of France's farrier, who has been at the pains to trace out, and discover, by dissections, the source, and cause of this disorder, we hope the method he has proposed, with some further experiments and improvements will soon bring to a certainty of cure (in most cases at least) a distemper so dangerous to our horses, and that hitherto has eluded the force of art.

Before we make mention of this work which, has the approbation of the Royal Academy of Sciences, it will not be unacceptable to our readers, we apprehend, to have a more particular account of the symptoms of this disorder from M. La Fosse, that we may the better judge of the merit of our author and his discoveries.

This gentleman then has distinguished seven different kinds of glanders, four of which are incurable.

The first proceeds from ulcerated lungs, the purulent matter of which comes up the trachea, and is discharged through the nostrils, like a whitish liquor, sometimes appearing in lumps and grumes. In this disorder, though the matter is discharged from the nostrils, yet the malady is solely in the lungs.

The second is a wasting humour, which usually seizes horses at the decline of a disease, caused by too hard labour; this defluxion also proceeds from the lungs.

The third is a malignant discharge, which attends the strangles sometimes, and falls upon the lungs, which runs off by the nostrils.

The fourth is, when an acrimonious humour in the farcy seizes these parts, where it soon makes terrible havoc.

The fifth kind we shall describe by and by, as arising from taking cold.

The sixth kind is a discharge from the strangles, which sometime vents itself at the nostrils.

These are the various disorders which have been observed sometimes to throw matter out from the nostrils; let us now describe the real glanders:

The matter then discharged from the nostrils of a glandered horse, is either white, yellow, or greenish, sometimes streaked, or tinged with blood; when the disease is of long standing, and the bones are fouled, the matter turns blackish, and becomes very foetid; and is always attended with a swelling of the kernels or glands under the jaws: in every other respect the horse is generally healthy and sound, till the distemper has been of some continuance.

It is always a bad sign, when the matter sticks to the inside of the nostrils, like glue or stiff paste; when the inside of the nose is raw and looks of a livid, or lead colour, when the matter becomes bloody, and stinks, and when it looks of an ash-colour. But when only a limpid fluid is first discharged, and afterwards a whitish matter, the gland under the jaw not increasing, and the disorder of no long continuance, we may expect a speedy cure; or in this case, which arises from taking cold, after a horse has been over-heated, the pituitary membrane is but slightly inflamed, the lymph in the small vessels condensed, and the gland overloaded, but not yet ulcerated.

From these symptoms and some observations made both by Bracken and Gibson, it is plain they were not absolute strangers to the seat of this disorder, though they neglected pushing their inquiries to the fountain-head, and consequently were at a loss to know how to apply the remedy to the parts affected.

But our author, after examining by dissection the carcasses of glandered horses, and making a strict scrutiny into the state of the viscera, assisted for that purpose by ingenious and expert anatomists for ten years together, affirms this disease to be altogether local; and that the true seat of it is in the pituitary membrane, which lines the partition along the inside of the nose, the maxillary sinusses or cavities of the cheek-bones on each side the nose, and the frontal sinusses or cavities above the orbits of the eyes;

that the viscera, as liver, lungs, &c. of glandered horses are in general exceeding sound: and consequently that the seat of this disorder is not in those parts, as has been asserted by most authors; nor indeed is it probable it should: for how could such horses preserve their appetite, their good appearance, sleek and shining coats; in a word, all the signs of health for many years together (which many glandered horses are known to enjoy) with such distempered bowels.

But on nicely examining the heads of such horses, he found the cavities above-mentioned, more or less, filled with a viscous slimy matter, the membrane, which lines both them and the nostrils inflamed, thickened, and corroded with sordid ulcers, which in some cases had eat into the bones. These sinusses or cavities will be better understood by referring to the annexed plate.

He observes, that when glandered horses discharge matter from both nostrils, both sides of the membrane and cavities were affected; but when they ran at one nostril only, that side only was found distempered.

It is a curious remark of our author, that the sublingual glands, or the kernels situated under the jaw-bone, which are always swelled in this distemper, do not discharge their lymph into the mouth, as in man, but into the nostrils; and that he constantly found their obstruction agreed with the discharge; if one gland only was affected, then the horse discharge from one nostril only; but if both were, then the discharge was from both.

He sometimes, though rarely, found the boney partition of the nose carious or rotten; but that the spongy bones about this part must suffer from the acrimony of matter long pent, is not at all to be doubted, though the more solid ones may escape.

The seat of this disorder thus discovered, our author, with great ingenuity, has paved the way for cure, by trepanning these cavities, and taking out a piece of bone, by which means the parts affected may be washed with a proper injection: and, in fine, the ulcers deterged, healed, and dried up.

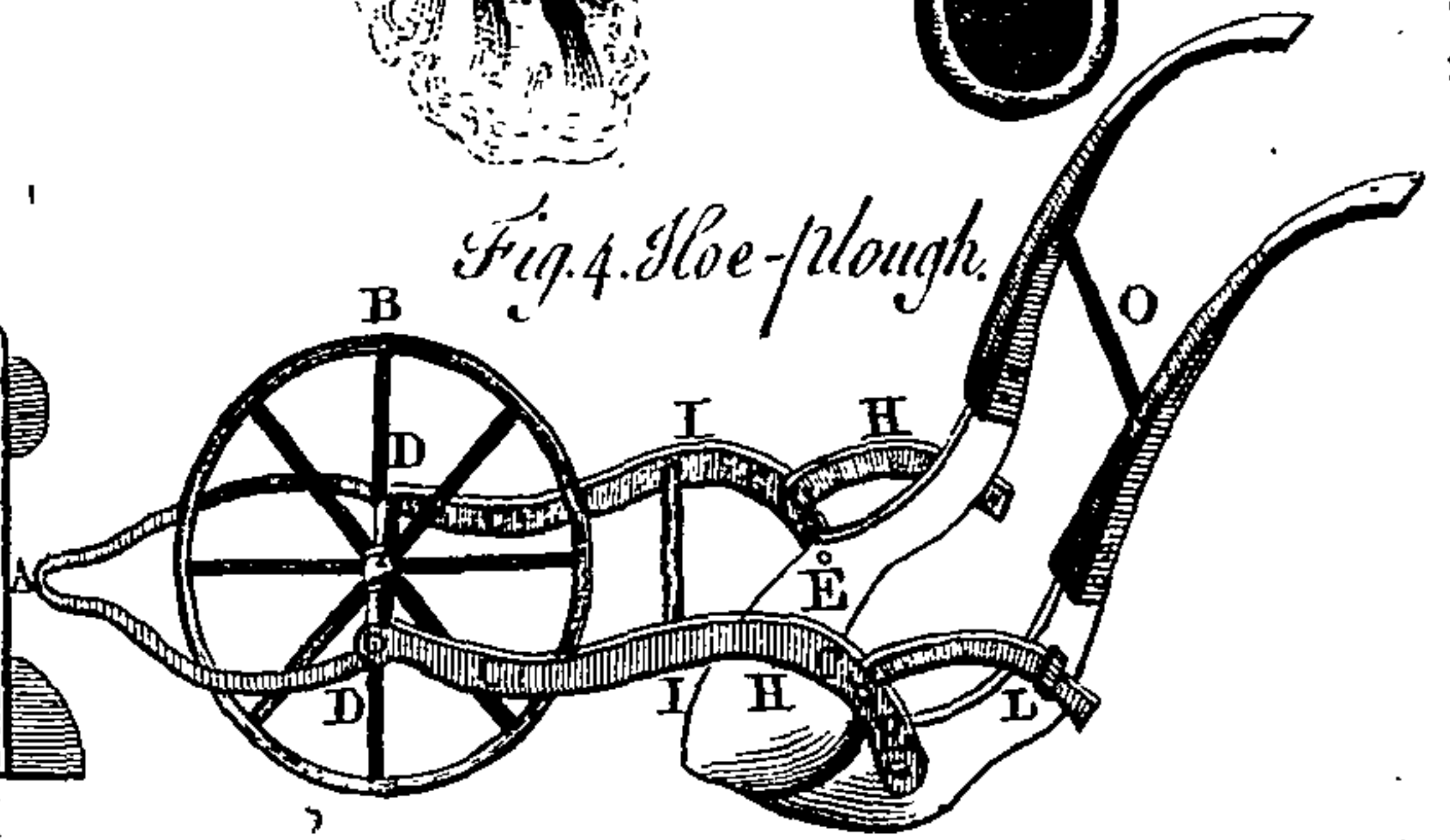
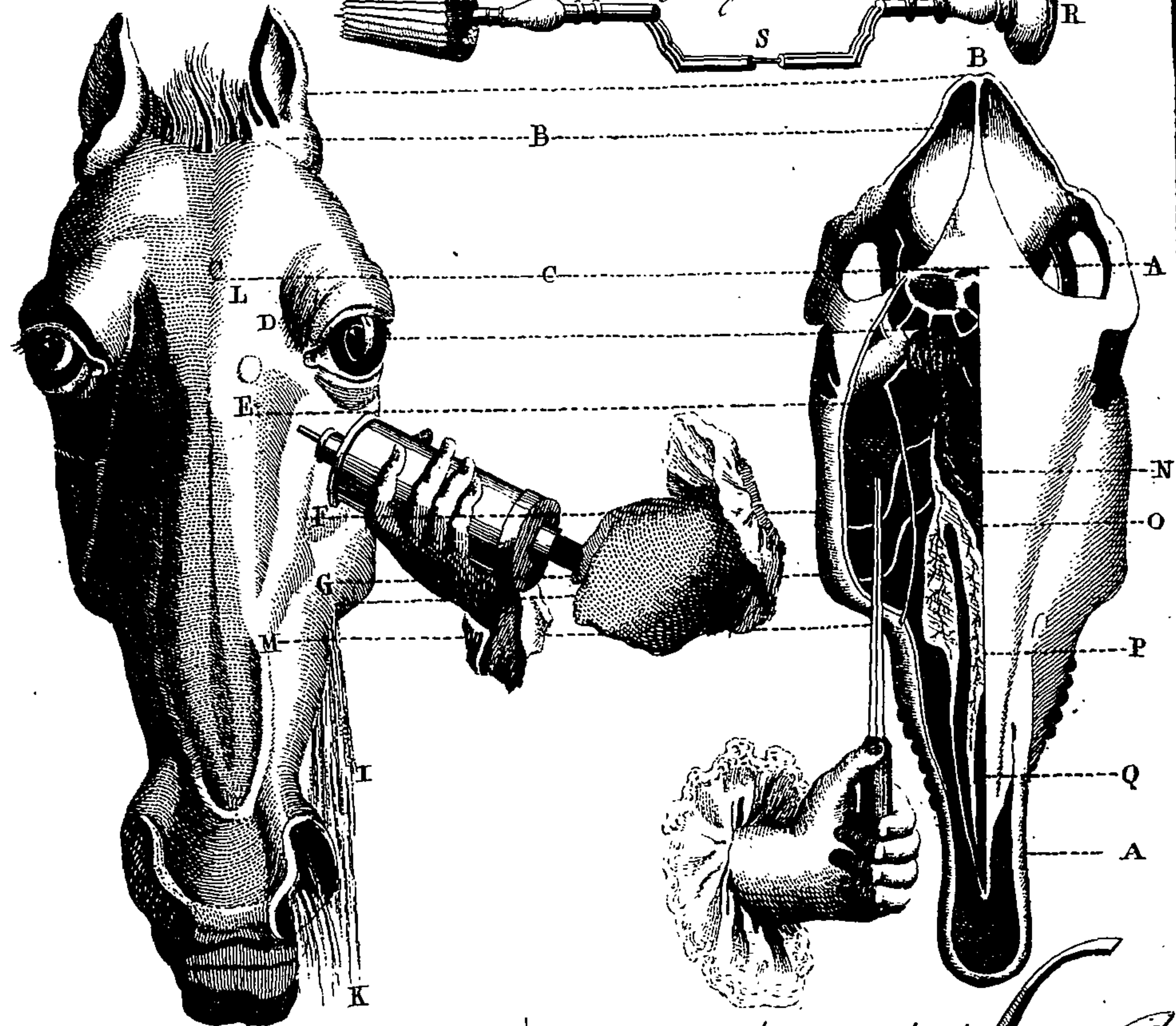
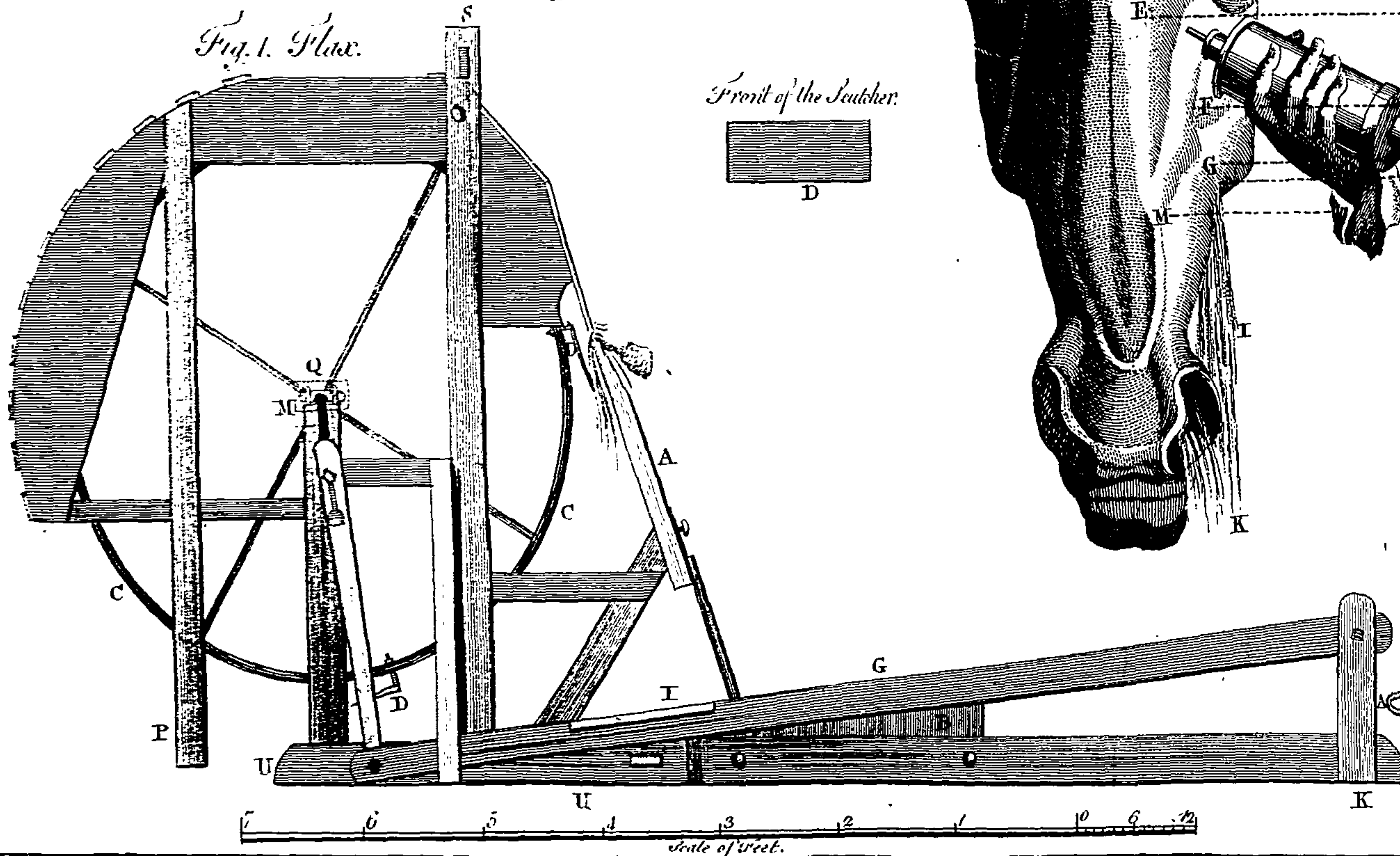
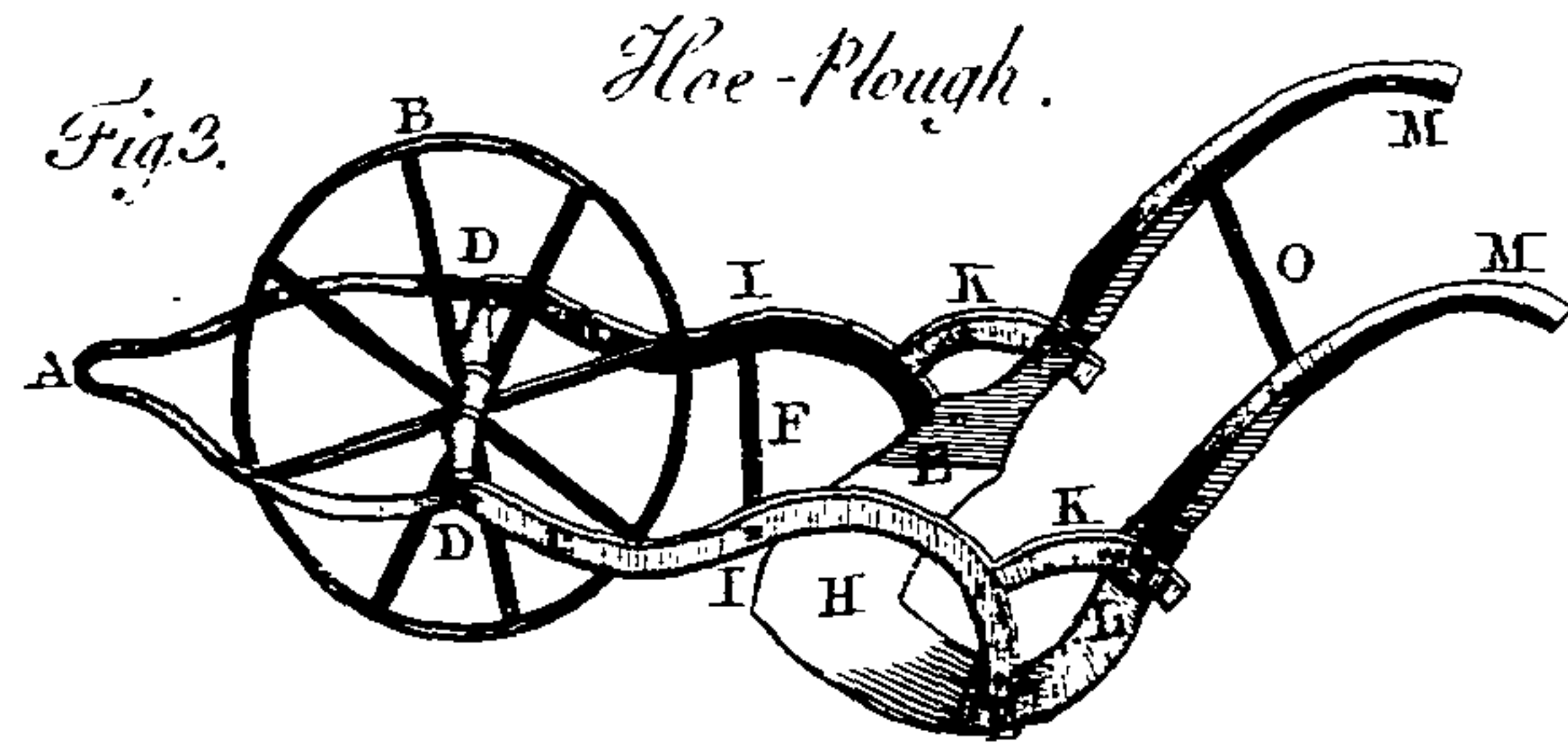
But as from the observations since made by this gentleman, there are different species of the glanders, so the cure of the milder kinds may first be attempted by injections and fumigations. Thus, after taking cold, should a horse for fifteen or twenty days discharge a limpid fluid, or whitish matter from one or both nostrils, the glands under the jaw rather growing harder than diminishing, we may expect it will degenerate into true glanders: to prevent which, after first bleeding, and treating him as we have directed for a cold, let an emollient injection, prepared with a decoction of linseed, marshmallows, elder, chamomile flowers, and honey of roses, or such like, be thrown up as far as possible with a strong syringe, and repeated three times a day: should the running not lessen, or be removed in a fortnight by the use of this injection, a restraining one may now be prepared with tincture of roses, lime-water, &c. and the nostrils fumigated with the powders of frankincense, mastich, amber, and cinnabar, burnt on an iron heated for that purpose, the fume of which may easily be conveyed through a tube into the nostrils.

This method has been found successful when used in time; but the methods of cure depend on the stubbornness of the disorder; and, when inveterate, recourse must be had to the operation above described.

This operation he has performed on three horses, two of whom discharged from one nostril only, and the third from both; the two first he trepanned on that side of the head which was affected, and to the other he performed it on both, and found that the wound and perforation filled up with good flesh in twenty-six days, and the horses suffered no inconvenience from the operation; though after this experiment they were put to death.

The directions and orders of the civil government of France, which hindered people from keeping glandered horses, long prevented M. La Fosse repeating his attempts, and pushing his experiments further; but it is to be hoped that so useful a project will be pursued to its utmost extent, as it seems so promising in the execution, and is so important in its consequences: to which end we shall beg leave to animadvert on what has been said, and offer our opinion both in relation to the disease, the operation, and the manner in conducting the cure.

In order to prove that a great inflammation of the pituitary membrane is always the cause of the glanders, M. La Fosse has attempted to bring on an inflammation upon the



the same membrane, by a corrosive injection; and when the injection was only thrown into one side, the maxillary lymphatic glands were swelled on the same side, and that nostril only produced the discharge; but when both nostrils were injected, these symptoms appeared on both sides. This gentleman has also observed, that the bone of the maxillary sinus being broke by the kick of another horse, the usual symptoms of the glanders soon appeared, from the inflammation the pituitary membrane suffered on the occasion.

The original source and cause then of this disorder seems to be an inflammation in the glands and membrane that lines the nostrils and these cavities, which, if not dispersed in time, will form matter, that will ulcerate and erode the bones, for want of a free discharge to unload the cavities, and of proper applications to cleanse and deterge the ulcers: violent cold, or a feverish translocation settling here, may also occasion the same complaint, and are probably the general causes.

There is a disorder in men called *Ozæna*, that has great similitude to this in horses, and arises from an inflammation in the maxillary sinusses, or cavities in the cheek-bones, from whence ensues a collection of matter, which, when the cavity is full, or the head properly inclined, runs over into the nose, and would constantly discharge thence like a glandered horse, was the head continued in the same position. The surgical cure is the taking out one or more teeth from the upper jaw, and perforating the cavity with a proper instrument, in order to make a depending orifice for the matter to flow through; and to make way for syringing the parts effected with proper injections which in this case are thrown through the cavity into the nose.

The similarity of these two cases, with the method of cure, and the success attending the surgical treatment (which was first invented and perfected by our countrymen Drake and Cowper) undoubtedly gave the first hint for trepanning, and syringing these cavities in horses; and it is most probable, that when the operation is attempted in time, before the bones become rotten, it will be attended with equal success; but after opening the cavities, should it by probing be discovered, that the bones are in that state, the best way then would be to dispatch the horse, to prevent unnecessary trouble and expence.

The parts fixed on for applying the trepan are pointed out in the plate, and the manner of sawing out the bone will easily be understood by a view of the instrument, and the explanation annexed.

The perforations being made, our next business is to prevent their filling up too fast, as it may be necessary to keep them open for some weeks before a cure can be effected; for which purpose, after the use of the injections, let the upper one be filled up with a piece of cork, waxed over, and adapted exactly to its size, the lower one may be kept open with a hollow leaden tent, through which there will be a constant drain of matter from the sinusses, which will be greatly favoured by this depending orifice, and both be detained by a proper bandage.

If this method should not prevent the granulations, or shoots of the flesh, from filling up so fast as to choak up the perforation, and by that means hinder the injections passing freely, they must be suppressed by rubbing with caustic medicines, or touching with the actual cautery; as may also the bony edges, which, by obliging them to exfoliate or scale off, will retard the healing.

The injection first made use of, should be of a deterfive nature; as a decoction of birth-wort, gentian, and centaury; to a quart of which, if two ounces of *Egyptiacum* and tincture of myrrh are added, it may be as proper as any; and when the discharge is observed to abate, and the colour alter to a thick white matter, the injection may be changed for barley-water, honey of roses, and tincture of myrrh; and, finally, to dry up the humidities, and recover the tone of the relaxed glands, Bate's allum-water, or a solution of calcothar, vitriol, lapis medicamentosus, or such like, in lime-water, will most probably complete the cure. Dr. Bracken recommends the following:

Take of allum and white vitriol powdered, of each four ounces; calcine them in a crucible when cold, powder the calx, and mix it with a gallon of lime-water and a quart of vinegar; decant the clear for use.

But whoever is at all acquainted with practical surgery, well knows, that without the assistance of internals, especially in glandular disorders, the cure is not so easily effected, nor rendered complete or lasting: we therefore advise a strong decoction of guaiacum chips to be given every day, to a quart or three pints, throughout the cure, and when the matter lessens, to purge at proper intervals, and put a rowel into the horse's chest, in order to divert the fluids from their old channel: if these should not succeed, mercurials may be given with the phytic, and the alterative powders with lime-water may be taken for a time, if the horse is worth the expence.

An explanation of the Heads and Trepan. See Plate XVII. Fig. 2.

B. B. two lines representing the bounds of the cerebellum, or back part of the brain, which is very small in a horse, in proportion to that of a man, as well as the brain itself, which commences from the line D.

C. C. a line where the superior part of the sinus frontalis commences, together with a view of the bottom of the sinus, which terminates between the lines D and E, where there appears a substance in the form of a pear, which is the *os ethmoides*, or sieve-like bone, through which the olfactory nerves pass, by which the pituitary membrane receives its sensibility, and the sense of smelling is performed.

E. represents the beginning of the maxillary sinus, which terminates at M.

The shaded space, which may be observed between these two lines, represents the great cavities. The oblique ray marked F, is a bony partition, which separates this sinus into two parts, that have no communication; and sometimes it happens (though but rarely) that there are two bony partitions; and for this reason they are represented by the lines marked F and G. It also sometimes happens (but still more seldom) that there are horses, in whose heads we do not find any of these bony partitions.

N. points out the place of the cornets or horns. O, the redoublings. F, their middle part. Q, the inferior part of them. M, the bony canal or pipe which guards the maxillary nerve.

A. A. the septum narium, or partition, which divides the nose from top to bottom, and constitutes the two nostrils.

L, in the head that is intire, points out where the trepan should be applied on the frontal sinus, when we have reason to believe the glanders is spread into this sinus. However, I think it safest to apply it first on E, for the reasons mentioned in the next explanation, and because the brain may be endangered, should the sinus be mistook.

E, the place where the trepan may be applied, in order to cleanse the maxillary sinus. The round mark between D and E (which is the impression of the trepan) is, however, on experience, preferred by the author, as the properest place, as one orifice would then be sufficient to wash all the parts, both above and below, with the injection.

But in general, when the maxillary sinus is only affected, penetrate but the upper part, where the syringe points, or thereabouts, and your expectations will be answered; should they not, there seems so little danger in the operation, that you may again perforate at the places above-mentioned, higher up. But a proper number of experiments will soon settle this point with certainty.

H, in the head that is intire, points out the place where another hole, or perforation should be made, as a drain to give issue to the glanderous matter washed away by the injection which could not be discharged without such a depending orifice; and perhaps this perforation alone, in many recent cases, would be sufficient, provided the injection passed freely upwards, and the hole was kept open by means of a hollow leaden pipe constantly retained in it for that purpose, and to procure a free passage for the matter.

I, represents the injection pushed in by the syringe, which flows out by the orifice and the nostril K; during the use of the syringe, it is necessary to hold the nostrils close.

If, in the maxillary sinus, instead of one there happens to be two bony partitions, it is absolutely necessary to

pierce through them both, by means of a filetto, or sharp-pointed tuck, as in the manner represented in the cut of a horse's head opened, though this conformation seldom occurs.

As these bony partitions may in some particulars vary, should the filetto not have the desired effect, and the injection thrown in by the syringe not come out at H; in such case the liquor should be injected upwards, through the orifice made by the filetto or trepan at H.

As in young horses the frontal and maxillary sinusses are very small, it will be proper to direct the trepan towards the interior part of the nose, otherwise the instrument might work upon the roots of the teeth, which incline towards the sinus, and would in such case be an insurmountable obstacle to the operation.

R, the instrument or trepan. S, the handle which turns it. T, the saw-part to be applied to the bone.

From a view of this instrument, the manner of working it will appear simple and easy; the cooper's managing his wimble being a proper directory.

The instrument called the trephine, which is chiefly used by our English surgeons in perforating the skull, will equally answer this purpose; and if any difficulties should arise, notwithstanding this description, the gentlemen of the faculty will soon make it familiar and intelligible.

Before the application of the trepan, or trephine, it is quite necessary to observe, that a circular piece of the skin should first be cut off, with the membrane which covers the bone, about the size of a half-crown-piece, in order to make the instrument work the easier, and to prevent the inconveniencies which might arise from the external wounds healing up too fast.

The syringe should be large enough to contain half a pint of injection.

GLANDIFEROUS, an epithet applied to such trees as bear mast or acorns. Thus the oak, beech, &c. are called glandiferous trees.

GLEANNING, the action of picking up the ears of corn left behind by the gatherers.

GLEBE, properly signifies the soil or ground in general; but is particularly applied to the land possessed as part of the revenue of an ecclesiastical benefice.

GLEBOUS, or *gleby*, turfy.

GLEDE, a kite.

GLEN, a valley, a dale.

GLYSTER, or *Clyster*, a medicine injected into the anus of an animal.

Glysters are often necessary for horses in various disorders, and may be reduced to these different kinds, viz. laxative and emollient, purgative and restraining.

But it should be observed, that before the administration of emollient glysters in costive disorders, a small hand well oiled should be passed up the horse's fundament, in order to bring away any hardened dung, which otherwise would be an obstacle to the clyster's passage.

A bag and a pipe of a proper form, is to be preferred to a syringe, which throws up the clyster with so much force, that it often surprises a horse, and makes him reject it as fast as it goes in: whereas the liquor, when pressed gently from the bag, gives him no surprize or uneasiness, but passes up easily into the bowels, where it sometimes remains a long time, and is extremely useful, by cooling and relaxing them; and will sometimes incorporate so with the dung, as not easily to be distinguished from the other contents of the guts. These emollient clysters are extremely serviceable in most fevers, and greatly preferable to purging ones; which in general are too pungent, and stimulate too much, especially if aloes are a part of the composition.

Nutritive clysters are very necessary, and often save a horse from starving, when his jaws are so locked by convulsions, that nothing can be conveyed by the mouth.

They should not exceed a quart or three pints at a time, but be often repeated: nor should they be too fat; but made of sheeps-heads, trotters, or any other meat-broths, milk-pottage, rice-milk strained, and many other such nourishing things. For an emollient clyster take the following:

Take marshmallows and camomile flowers, each a large handful; bay-berries and sweet fennel-seeds bruised, each an ounce, boil in a gallon of water to three quarts, pour off into a pan, and dissolve in it

half a pound of treacle, and a pint of linseed oil, or any common oil.

To make it more laxative, add four ounces of lenitive electuary, or the same quantity of cream of tartar, or common purging salts.

Take two or three handfuls of marshmallows, fenna one ounce, bitter-apple half an ounce, bay-berries and aniseed bruised, each an ounce, salt of tartar half an ounce; boil a quarter of an hour in three quarts of water, pour off, and add four ounces of syrup of buckthorn, and half a pint of oil.

This clyster will purge a horse pretty briskly; and may be given successfully, when an immediate discharge is wanting; especially in some fevers with inflamed lungs, or other disorders, which require speedy relief.

But it is necessary to caution against a solution of coarse aloes for this purpose, as it has been found to gripe horses violently, and excite feverish, and sometimes convulsive symptoms; and indeed all pungent and stimulating medicines, as the stronger purgatives generally are, should be given in this form with great caution.

But the generality of emollient clysters may be prepared with much less trouble; as two quarts of water-gruel, with half a pound of treacle, a pint of oil, and a handful of common salt, will as effectually answer every purpose. The following is a restraining clyster.

Take pomegranate-bark, or oak-bark, two ounces; red rose-leaves, fresh or dry, a handful; balustines, an ounce; boil these in two quarts of water, till one is nearly consumed; then pour it off, and dissolve in it four ounces of diascordium; to which may be added a pint of Port-wine.

This will answer all common cases, where restraints are necessary, but should never be given in larger quantities; for the longer clysters of this kind lie in the bowels, the more efficacious they are. *Bartlet's Farriery*, p. 22.

Take of chamomile-flowers, sweet fennel, and coriander-seeds bruised, of each one ounce; caraway-seeds half an ounce; boil in two quarts of water, till reduced to three pints; then strain, and add for solution, while hot, of Epsom salts two ounces; and, when nearly cool enough to administer, add of olive-oil and tincture of fenna, commonly called Daffy's Elixir, of each a quarter of a pint.

GNATS, are troublesome to those who live near watery places, and they likewise destroy the leaves and vegetables as soon as they appear, especially turneps; to remedy which, burnt straw or dried fern will drive them away. To clear the house of them, the smoke of tobacco will effectually answer, when by closing our doors and windows they cannot re-enter. They are easily attracted by ash-leaves hung up in a room, or balls made of new horse-dung, so that you may cover them with a basin and destroy them.

GOAD, a pointed instrument with which oxen are driven forward.

GOAR-VETCHES, the same with summer-vetches. See the article VETCHES.

GOAT, a genus of animals, the characters of which, according to Mr. Ray, are these; that it is covered with hair, not with wool; that its horns are less crooked than those of a sheep, and that it has a beard hanging down from its chin, and is of a strong smell.

It is very singular that this genus of animals are all able to run and climb about the rugged parts of mountains without falling, though their feet seem by no means contrived by nature for any such purposes.

Goats may be of great advantage to the farmers in some parts of the kingdom, as they will live in rocky barren countries, where nothing else can get a support for life. They will climb the steepest rocks, and there browse upon briars, heath, and shrubs of various kinds, which other creatures will not taste of. They will feed on grass in pastures; but, as they love browsing on trees much better, great care must be taken to keep them from valuable plantations.

The greatest advantage of these creatures is their milk, which

which they yield in large quantities: and which is accounted the best milk of all animals. They mix this and cows milk together in many parts of the kingdom, and a very valuable kind of cheese is made of it. Beside this, the kids or young goats are very fine food, and the best kinds bring forth these two or three at a time, and that twice a year.

Goats hair also is valuable; it may be sheared as the wool from sheep, and is excellent for making ropes that are to be used in the water, as they will last a great while longer than those made the common way. A sort of stuff is also made of it in some places. The best kind of goats for keeping to advantage should be chosen in this manner: the male should have a large body, his hair should be long, and his legs straight and stiff; the neck should be plain and short, the head small and slender, the horns large, the eyes prominent, and the beard long. The female should have a large udder, with large teats, and no horns, or very small ones. They should be kept in flocks, that they may not straggle; and they should have good shelter both in summer and in winter, the heat and cold being both prejudicial to them. They should be coupled in December. They should have no litter in winter, but only a paved floor kept clean. The kids are to be brought up for the table in the same manner as our lambs are. They are recommended to lie among horses, their smell, as supposed, preventing many distempers in those cattle. *Mortimer's Husbandry*, vol. I. p. 244.

GOAT, the utility of. See STAGGERS.

GOD's-GOOD, yeast, or barm.

GOFFE, the same with geoff. See GEOFF.

GOOL, a ditch.

GOOSE. See the article GESE.

GOOSE-GRASS, or wild tanfy, the name of a troublesome weed very frequent in clay-grounds. The best method of destroying it is to mow it in summer, well dung the land, and never plough it out of heart.

GOSS, or *Gorse*, the furze.

GOULANS, corn-marigolds.

GOURDY-LEGS. A distemper in horses, caused by pains and other fleshy sores.

The way to cure them, is first to shave away the hair upon and about the sore place, as close as may be, and then to anoint it with linseed oil and aqua vitæ, shaken together till they are perfectly mixt; and renew the mixing of it as often as you have occasion to use it, because they will separate by standing, without being shaken; anoint the sore place with this every day till the sore be made whole.

GRAIN, a general name for all sorts of corn, as wheat, barley, &c.

GRAINS. See FATTENING CATTLE.

GRANARY, a building to lay or store corn in, especially that designed to be kept a considerable time

Experimental philosophy has proved, that the air is the great source of corruption; keep out that, and all is kept out; and the most corruptible substances, such as meal, butter, milk, and the like, have been preserved fresh four months in the exhausted receiver of an air-pump.

They have near Grand Cairo, a magazine or granary, defended with good walls, and called Joseph's granaries. It is not probable that they are quite so old as the days of that patriarch; but they abundantly prove the utility of such store-houses, by the vast quantities of grain annually preserved in them.

Many parts of Africa abound with granaries of this kind.

They are so many deep pits made in the solid rock; the descent into them is but just large enough for a man to go down into them; but they grow larger as soon as the person is in, and are usually square, from thirty to forty feet in diameter. In these the great men of the country preserve their corn; they first strew over the floor with straw, then they lay on the corn, till as the heap rises, placing a thin bed of straw between the corn and the sides, as they did at the bottom. In this manner they proceed till the whole cavity is filled: when this is done, they cover the mouth of the entrance with a sort of hurdle of green boughs of trees, interwoven one with another. This they cover with about two feet thickness of sand, and over this raise a ridge of earth, well beat together, in order to throw off the rain both ways, that none may settle on the place and soak into the magazine.

The corn thus stored up always keeps three, four, or more years very good; and, not unfrequently, the pro-

prietor being taken off by the severity of the eastern governments, under which they live, the magazine is forgotten, and some accident discovering it many years afterwards, the corn is almost always found perfectly good in it. All the care they take, in regard to the corn, is to expose it two or three days to the sun's heat, to dry it, thoroughly, before they carry it into a magazine.

In the dutchy of Lithuania, and in the Ukraine, the people always preserve their corn in the same manner in wells or pits made in dry places: but in these countries great care is to be taken in the opening these store-rooms; for if people descend into them before they have had sufficient communication with the fresh air, they are often killed by the damps; this, however, is easily guarded against. By these, and numerous other instances of the practice of other countries, it appears evident, that the advantage of these subterranean granaries over all others is very great.

Though these are to be recommended before all others; yet the common granaries may, with proper care, be rendered greatly more useful than they are at present. The grand caution necessary to this purpose is, to guard against the too great humidity, which there always is in places where there is a great number of doors and windows. A too free access of the external air is also to be carefully guarded against; for this brings in with it the eggs of a vast number of different insects, which prey upon, and destroy the corn. A third caution is, when the corn is the produce of the country where it is preserved, not to fill the place with the crop of one place only, but to mix the harvests of two as different provinces as may be, the one dry, the other moist, or otherwise differing as much as may be; thus the contrary qualities of the one will prevent the destruction of the other. These are the three great rules to prevent the corrupting of corn; but when the mischief is once begun, it will prove very difficult to stop it; all the care that can be employed, should therefore be taken in regard to these.

The two great cautions to be observed in the erecting of granaries, are to make them sufficiently strong, and to expose them to the most drying winds. The ordering of the corn in many parts of England is thus: to separate it from dust and other impurities after it is threshed, they toss it with shovels from one end to the other of a long and large room; the lighter substances fall down in the middle of the room, and the corn only is carried from side to side, or end to end of it. After this they screen the corn, and then bring it into granaries, it is spread about half a foot thick, and turned from time to time about twice in a week; once a week they also repeat the screening it. This sort of management they continue two months, and after that they lay it a foot thick for two months more, and in this time they turn it once a week, or twice, if the season be damp, and now and then screen it again. After about five or six months, they raise it to five or six feet thickness in the heaps, and then they turn it once or twice in a month, and screen it now and then. When it has lain two years, or more, they turn it once in two months, and screen it once a quarter, and, how long soever it is kept, the oftener the turning and screening is repeated, the better the grain will be found to keep.

It is proper to leave an area of a yard wide on every side the heap of corn, and other empty spaces, into which they turn and toss the corn, as often as they find occasion. In Kent they make two square holes at each end of the floor, and one round in the middle, by means of which they throw the corn out of the upper into the lower rooms, and so up again, to turn and air it the better. Their screens are made with two partitions, to separate the dust from the corn which falls into a bag: and when sufficiently full, this is thrown away, the pure and good corn remaining behind.

Corn has, by these means, been kept in our granaries thirty years; it is observed, that the longer it is kept, the more flour it yields in proportion to the corn, and the purer and whiter the bread is, the superfluous humidity only evaporating in the keeping. At Zurich, in Switzerland, they keep corn eighty years or longer, by the same sorts of methods.

The public granaries at Dantzick are seven, eight, or nine stories high, having a funnel in the midst of every floor, to let down the corn from one to another. They are built so securely, that though every way surrounded with water, the corn contracts no damp, and the vessels have the convenience

nience of coming up to the walls for their lading. The Russians preserve their corn in subterranean granaries, of the figure of a sugar-loaf, wide below, and narrow at top: the sides are well plastered, and the top covered with stones. They are very careful to have the corn well dried before it is laid into these store-houses, and often dry it by means of ovens, their summer dry weather being too short to effect it sufficiently.

GRANGE, a house or farm furnished with granaries and barns for holding corn, stables for horses, stalls for cattle, &c.

GRANIFEROUS *Pods*, are such as contain small seeds resembling grain.

GRANIVOROUS, an epithet given to animals that feed on corn or feed.

GRASS, a general name for most of the herbaceous plants used in feeding cattle.

The best season for sowing grass-seed is the latter end of August, and the beginning of September, that the grass may be well rooted before the frost sets in, which is apt to turn the plants out of the ground, when they are not well rooted. This seed should be sown in moist weather, or when there is a prospect of showers, which will soon bring the grass up; for, the earth being at that season warm, the moisture will cause the seed to vegetate in a few days: but, where this cannot be performed in autumn, the seeds may be sown in the spring; towards the middle of March will be a good time, if the season proves favourable.

The land on which grass-seed is intended to be sown, should be well ploughed, and cleared from the roots of noxious weeds, such as couch-grass, fern, rushes, heath, gorse, broom, rest-harrow, &c. which, if left in the ground, will soon get the better of the grass, and over-run the land. Therefore, in such places where either of these weeds abound, it will be a good method to plough up the surface in April, and let it lie some time to dry; then lay it in small heaps, and burn it. The ashes so produced, when spread on land, will be a good manure for it. The method of burning the land is particularly useful; especially, if it is a cold stiff soil; but where couch-grass, fern, or rest-harrow, is in plenty, whose roots run far under ground, the land must be ploughed two or three times pretty deep in dry weather, and the roots carefully harrowed off each ploughing; which is the most sure method to destroy them. Where the land is very low, and of a stiff clayey nature, which holds water in winter, it will be of singular service to make some under-ground drains to carry off the wet; which if detained too long on the grounds, will render the grass sour. The method of making these drains is prescribed under the article DRAINING.

Before the seed is sown, the surface of the ground should be made level and fine, otherwise the seed will be buried unequal. The quantity of grass-seed for an acre of land is usually three bushels, if the seed is clean, otherwise there must be a much greater quantity allowed; when the seed is sown, it must be gently harrowed in, and the ground rolled with a wooden roller; which will make the surface even, and prevent the seeds from being blown in patches. When the grass comes up, if there should be any bare spots, where the seed has not grown, they may be sown again, and the ground rolled, which will fix the seeds; and the first kindly showers will bring up the grass, and make it very thick.

Some people mix clover and rye-grass together, allowing ten pounds of clover, and one bushel of rye-grass, to an acre: but this is only to be done where the land is designed to remain but three or four years, in pasture, because neither of these kinds are of long duration; so that, where the land is designed to be laid down for many years, it will be proper to sow with the grass-seed some white trefoil, or Dutch clover; which is an abiding plant, and spreads close on the surface of the ground, sending forth roots at every joint; and makes the closest sward of any, and is the sweetest feed for cattle: so that, whenever land is laid down to pasture, there should always be six or eight pounds of this seed sown upon each acre.

The following spring, if there should be any thistles, ragwort, or such other troublesome weeds, come up among the grass, they should carefully be cut up with a spaddle before they grow large; and this should be repeated two or three times in the summer, which will effectually destroy them; for, if these plants are suffered to ripen their seeds, they will be blown all over the ground; their seeds having

down adhering to them, which assists their transporation; so that they are often carried by the wind to a great distance, and thereby become very troublesome weeds to the grass. For want of this care, how many pastures may be seen almost over-run with these weeds, especially the ragwort; when a small expence, if applied in time, would have intirely extirpated them! for a man may go over several acres of land in one day with a spaddle, and cut up the weeds just below the surface of the ground, turning their roots upwards; which if done in dry weather, they will soon decay; but this must always be performed before the plants come to have their seeds formed; because after that many sorts will live long enough to nourish their seeds after they are cut, so as to ripen them: and there will be a supply of weeds for some years after, which cannot be extirpated without a much greater expence.

The proper management of pasture land is the least understood of any part of agriculture: the farmers never have attended to this, being more inclined to the plough; though the profit attending that has not of late years been so great as to encourage them in that part of husbandry: but these people never think of laying down land for pasture, to continue longer than three years: at the end of which time they plough it up again, to sow it with grain.

Their usual method is to sow rye-grass and trefoil with barley, when they intend to lay down the ground; or sometimes sow only clover with the barley; nor is it possible to convince these people of their error in sowing corn with this grass; which they affirm to be useful in shading the grass, not considering how much the corn draws away the nourishment from the grass: but it is in vain to write to these people, who are not to be convinced, either by argument or experiment; so much are they led by custom, as not to be easily driven out of their own methods; but, as their practice of husbandry has greatly lessened the circumstances of the farmers, so that the lands are daily falling into the hands of the owners, therefore this part of husbandry should by them be principally attended to, as it may be carried on with much less expence: for pasture land requires but few hands to manage; whereas the sowing of corn is attended with great expence, and the profit is very precarious: but when this is attended with success, and the grain at a moderate price, if the whole labour is to be paid for, there will be little coming to the owner for rent, when the balance is fairly stated; but in this most gentlemen deceive themselves, and often suppose they gain by farming, when, perhaps, the whole rent of the land is lost: therefore to avoid the trouble which attends this sort of husbandry, it will be the best method to turn as much of their land into pasture as they can; which, by grazing and feeding sheep, will be attended with little expence, and a sure profit.

It is not uncommon for the husbandman, for want of distinguishing grasses for seed, to fill his ground with either weeds or bad and imperfect grasses. Whereas by making a proper choice, he would always have the best grass, and in the greatest abundance his land will admit of.

In the common way of proceeding, if a farmer wants to lay down his land to grass, he either takes his seeds indiscriminately from his own foul hay-rick, or sends to his neighbour for a supply. By this means, besides a certain mixture of rubbish, which must necessarily happen; it is not unlikely but that what he intends for dry land may have come from moist, where it grew naturally, and so on the contrary: and the consequence of this slovenly method frequently is, that the ground, instead of being covered in one year with a good sward, is filled with weeds not natural to it, which would never have sprung up, if they had not been brought thither.

"Arguments, says Mr. Stillingfleet, are never wanting in support of ancient customs, and I am no stranger to those, such as they are, which prejudice and indolence have made use of on this occasion.

"1. Some say then, that if you manure your ground properly, good grasses will come of themselves. I own they will. But the question is, how long it will be before that happens: and why be at the expence of sowing what you must afterwards try to kill? which must be the case, so long as people sow all kinds of rubbish under the name of hay-seeds. Again, if the best way is to let the ground take its chance, why is the farmer at the expence of procuring the seeds of the white and broad clover, which com-

up in almost all parts of England spontaneously? But if this is allowed not to be the best way in relation to clover of any kind, what reason can be in nature, why grass-seeds only ought not to be sown pure?

"2. Others say, that it is better to have a mixture of different seeds. I will suppose this to be true. But cannot a mixture be had though the seeds be gathered, and separated? and is not a mixture by choice more likely to be proper, than one by one chance; especially after a sufficient experience has been had of the particular virtues of each sort, of the different kinds of cattle which each grass is most adapted to, of the different grounds where they will thrive best, &c. all which circumstances are now, in general, wholly unknown, though of the utmost consequence?

"3. It is said by some, that weeds will come up along with the grass. No doubt of it. Can any one imagine, that grass-seeds should be exempted from what happens to every other kind of seeds? But I will venture to say, that not near the quantity of weeds will spring up which they imagine, if the grass be sown very thick. Men must be very much put to it, when they make such objections as this last, or indeed any of the others. I am almost inclined to say with a great writer, 'It is a simple thing to take much pains to answer simple objections.'

"One would hardly think it possible, that the slovenly method of proceeding, here complained of, could prevail universally: yet this is the case as to all grasses, except the darnel (or rye) grass, and what is known in some few countries by the name of the Suffolk-grass; and this latter instance is owing, I believe, more to the soil than to any care of the husbandmen. Now, would the farmer be at the pains of separating, once in his life, half a pint, or a pint, of the different kinds of grass-seeds, and take care to sow them separately, in a very little time he would have wherewithal to stock his farm properly, according to the nature of each soil, and might at the same time spread these seeds properly over the nation, by supplying the feed-shops.

"I have had frequent experience how easy it is to gather the seeds of grasses, having several times employed children of ten or eleven years old, who have gathered many sorts for me without making any mistakes, after I had once shew them the sorts I wanted.

"I have procured thus the creeping bent, the fine bent, the sheep's fescue, the crested dog-tail, &c. in sufficient quantities, to begin a stock; but, for want of a proper opportunity of cultivating them myself, or meeting with any one who had zeal enough to bestow a proper care on them, my collections of this kind hitherto have only proved, that the scheme is in itself feasible.

"In the year 1761, a little boy gathered, by my directions, as much of the crested dog-tail, in three hours, by the side of a road, as, when shed; yielded, upon weighing, above a quarter of a pound avoirdupois, perfectly free from husks. As this seed is small, the skilful will easily judge how far such a quantity would go if properly employed.

"My very estimable and ingenious friend Mr. Aldworth, who was witness of the fact which I last mentioned, at my desire, ordered a small part of a meadow, near his seat at Stanlake, which had better grasses, and less mixed, than the rest, to be left unmowed till the seeds were fit for gathering. This piece yielded, upon threshing and sifting, a full bushel by measure, of almost pure seed of crested dog-tail.

"In case any one should be inclined to follow this example, I think it highly necessary to observe, that care must be taken to mow the grass before it sheds; that it be mowed very early in the morning, before the dew is off the ground, and that it ought not to be spread as in making hay, but left as it falls from the scythe during a sufficient time, and then be gently turned over.

"The number of grasses fit for the farmer is, I believe, very small; perhaps half a dozen, or half a score, are all he need to cultivate; and how small the trouble would be of collecting the seeds of these, and how great the benefit, must be obvious to every one at first sight. Would not any one be looked upon as wild, who should sow wheat, barley, oats, rye, pease, beans, vetches, buck-wheat, turneps, and weeds of all sorts together? Yet how is it much less absurd to do what is equivalent in relation to grasses? does it not import the farmer to have good hay and grass in plenty? and will cattle thrive equally on all sorts of food? We know the contrary. Horses will scarcely eat hay that will do well enough for oxen and cows. Sheep

are particularly fond of one sort of grass, and fatten upon it faster than any other in Sweden, if we believe Linnæus. And may they not do the same in England? How shall we know till we have tried? Nor can we say, that what is valuable in Sweden, may be inferior to many other grasses in England, since it appears by the Flora Suecica, that they have all the good ones that we have. But however this may be, I should rather choose to make experiments than conjectures."

The Society for promoting Agriculture, &c. in the province of Britany, had laid down the most rational plan yet formed by any body of men, nobly associated for the welfare of their country, and which promises the greatest advantages to mankind. A part of this plan is the cultivating separately most of the plants which grow naturally in the fields there, in order to know which of them will afford the most and the best food for cattle.

As the husbandman would not be benefited by knowing the particular classes, genera, &c. under which Ray, Linnæus, and other botanists have ranged the several species of grasses, we shall here give the names of such of them as may be cultivated to most advantage in this country, with the best drawings (for which we are indebted to Mr. Stillingfleet) for some of the most profitable sorts, which it will be of service to the farmer to be able to distinguish rightly.

The common dogs-grass, quich-grass, or couch-grass, (*Gramen spica triticea repens vulgare, caninum dictum*) common creeping-grass, with a spike like wheat, called dogs-grass, will thrive in almost any soil, and can scarcely be got out again, after it has once taken possession: so greatly does it multiply by its roots and trailing branches, which put forth roots and shoots at every joint. It grows to the height of four or five feet, with blades so rough and coarse, that few horses will eat them, especially while they are green: but it yields abundant crops of hay, which does well enough for oxen, and therefore deserves, perhaps, more attention than our farmers have yet bestowed upon it. M. Duhamel indicates the best way of making the most of it, when he directs the farmer always to mow it before its seeds ripen, or stalks grow hard; for after that cattle refuse it; adding, that it soon shoots up again, and will bear frequent cutting.

This plant is well known to all husbandmen to whom it is a sad plague, when it gets into their arable land. It is the chiendent of the French, who, I must observe here for the benefit of their husbandry, do not distinguish it sufficiently from our

Rye-grass, which is C. Bauhin's *Gramen loliaceum angustiore folio, et spica*, Darnel-grass, with a narrower leaf and spike; and Linnæus's *Lolium spica mutica*, Darnel with a chaffy spike: for darnel-grass, rye-grass, and ray-grass, are only different names of one and the same plant: though M. Duhamel, misled by the erroneous spelling of some writers, who have called rye-grass, ray-grass, has been mistakenly induced to think, that these are two different plants with us. We distinguish, indeed, two considerably different species of the rye-grass, viz. the foregoing, which, according to Mr. Ray, is the *Lolium rubrum*, or red darnel; and the *Lolium album*, which, according to the same author, is C. Bauhin's *Gramen loliaceum spica longiore*, darnel-grass with a longer spike, and the yvræ of the French, by us commonly called darnel only. But both of them are equally rye-grass. It is the last of these species, viz. the *lolium album*, which is chiefly cultivated in England, especially in strong cold land, upon which it will succeed better than any other species, and is an earlier seed in the spring: but it is very coarse; and unless it be cut quite early for hay, it becomes so hard and wirey in the stalks, that few cattle care to eat it: for this sort of grass has but few leaves, and runs all to stalks. When cattle have been turned in to feed upon it, the remaining stalks or bents, as they are sometimes called, should be mowed off in June; for otherwise they will dry upon the ground, give the pasture the disagreeable appearance of a stubble field during all the latter part of the summer, and be so very troublesome to the cattle which feed on it, by tickling their nostrils, that nothing but the want of better grazing will compel them to eat of the young grass which shoots up between these withered stems; for they will not eat them. Those who think that they do, when straitened for food, are greatly mistaken, according to Mr. Miller, who says, that he has closely attended to this many years, and has always found these bents

remaining, on the ground untouched, till the frosts, rain, and winds, have destroyed them in the winter. Besides this, by permitting them to stand, the after-growth of the grass is greatly retarded, and the beautiful verdure of the fields is lost for three or four months. It therefore is good husbandry to mow them close to the ground, before they become too dry: and if this cutting is then made into hay, it will serve to feed cart-horses in the winter, so as to repay the expence of mowing.

The red darnel is a considerably inferior species of rye-grass; for it has yet narrower leaves, and its stalks grow hard much sooner. It is very common in most pasture grounds, because it flowers early, and its seeds ripen and sow themselves before the hay is cut. They, therefore, who would keep their pastures as clear as possible from this grass, should always mow them before its seeds are ripe.

Rye-grass is usually sown with clover, upon such lands as are designed to be ploughed again in a few years; and a common method is to sow it with spring corn. But Mr. Miller, from many repeated trials, has always found, that when this grass has been sown in August, and a few showers have fallen shortly after, the crop has been by much the best: for then it has often been so high as to afford a good seed the same autumn; and a ton and a half of hay has been mowed early the next spring on each acre of land, though it has been a cold and sour soil. "I am, therefore, says he, convinced of that being the best season for sowing these grasses; though it will be very difficult to persuade these persons to alter their practice, who have been long wedded to old customs. The quantity of seeds which I allow to an acre is about two bushels, and eight pounds of the common clover, which, together, will make as good a covering upon the ground as can be desired. But this is not to be practised upon lands where the beauty of the verdure is principally regarded. It is fittest for those who have only profit in view." However, we must reckon as an abatement in this profit, that, as M. Duhamel rightly observes, the ground that has been under rye-grass, which is not so profitable a crop as either lucerne, saintfoin, or even clover, is not able to bear wheat the next year, as it is after those other plants, or after a crop of roots.

According to Mr. Lisle's information, the farmers in the Isle of Wight prefer rye-grass to hop clover, because, say they, the rye-grass will bear the winter, and keep to a good head, which the clover will not do. One of his tenants there had an acre and a half of rye-grass upon tolerably good ground, which he shut up from Michaelmas till within a month of Candlemas, and from thence to the middle of April it kept fifteen ewes and fifteen lambs.

Rye-grass seldom lasts more than three years, as it is commonly managed: but Mr. Lisle is strongly of opinion, that, considering the nature of its roots, and its manner of propagating itself, by sending forth fibres from its joints, it may be kept alive many years longer, by dunging it, or by refreshing it with soil, when it begins to decay, after the second or third year: besides which, this will make its roots tiller, and mat on the ground, to the utter suppression and destruction of all weeds, not excepting even the couch-grass.

An acquaintance of his near Upcurn, in Dorsetshire, told him, that he had as much rye-grass seed on eighteen acres of land, as was worth twenty pounds; and that, after the seed was threshed out, that hay was better than oat-straw fodder. Mr. Lisle himself saw a rick of this coarse stubbed hay, and a rick of oat-straw, both of which had been laid open to the cattle, in the same place; and they would not touch the straw, but had made such a hole in the rye-grass hay-rick, that it was ready to fall. The same person assured Mr. Lisle, that he found the rye-grass to be excellent food for his cattle, if it was mowed green, and not kept for the lucre of the seed. His usual allowance was three bushels of this seed to an acre of land, and he used to sell it for twenty-two pence, or two shillings a bushel.

Another farmer shewed Mr. Lisle some of his rye-grass, saying, that he looked upon it as his choicest fodder for sheep. He mowed it while in the flower; and Mr. Lisle declared, that he thought it very fine hay. Others again, and those men of experience, have affirmed, that the very stubble of the rye-grass, mowed the same year it was

sowed, is, when ploughed in, as good as dunging, and will pay for the seed.

Mr. Lisle agrees with all other experienced husbandmen, that, though rye-grass will maintain as many cattle on an acre as hop-clover will do; yet it does not, like it, improve the land for a subsequent crop of corn; the reason of which he takes to be, that the roots of the rye-grass, consisting of a multitude of matty fibres, which run on the surface of the ground, gird and hold the earth so strongly together, that they cannot easily be disentangled from it by ploughing.

"If I may judge of this grass, says Mr. Stillingfleet, by the venison I have eaten out of a paddock that was chiefly filled with this species, I would by no means recommend it for parks. I know it will be said, that venison is never good out of paddocks, that the deer must have room to range, trees to browse on, &c. I grant there is some reason for saying this, but I believe in general it is more owing to the want of proper food, viz. good grass, than merely to confinement: for paddocks are generally made out of a rich spot of ground near the house, that has constantly been manured, and of course is full of grass fitter for the dairy or the stable, than for deer; which hardly ever is the case in large parks. No man will, I suppose, pretend to make good pork from a hog fed with grains instead of pease, though he has the liberty of choosing as much ground as he pleases, and where he pleases."

In a subsequent edition of his Observations on Grasses, he adds, "I have since eaten venison out of a large park, where there was much of this grass, and it was no better than that out of the paddock. I should be apt to think from hence, that this grass would not be proper for sheep, as I have always observed that the same kind of ground which yields good venison, yields also good mutton. For what particular uses it is good, wants to be tried; whether for the dairy, for fattening cattle, or for horses. Many are tempted, by the facility of procuring the seed of this grass, to lay down with it grounds near their houses, where they want to have a fine turf: but unless the soil be very rich, a worse grass cannot be chosen for this purpose, as it will certainly die off entirely in a very few years."

The wall-barley, or way-bennet, as some people improperly term it, is evidently from the shape of its ear, and from every other characterising circumstance, a rye-grass, or wild rye, as Mr. Ray observes, though very different from the preceding. It is the *gramen secalinum et secale sylvestre*, called tall meadow rye-grass by Mr. Miller, who reckons it an excellent grass for sowing, because it is very leafy, its stalks do not become stiff and hard like many other species, and its roots are perennial. He seems not to doubt, but that it may be rendered very fine by proper care; and as its roots are perennial, rolling will make them mat so as to form a very close sward. There are three sorts of it, viz. the greater, the lesser, and the marsh rye-grass. Mr. Stillingfleet wishes, that this genus only were to be called rye-grass, and that the old name of darnel were continued to the *gramen loliaceum*, or rye-grass before spoken of.

The two best species of grass for pastures are, in Mr. Miller's opinion, C. Bauhin's *gramen pratense, paniculatum majus, angustiore folio*, meadow-grass, with large panicles, and a narrower leaf, which is the *poa panicula diffusa spiculis, quadrifloribus pubescentibus culmo erecto teretri*, Flor. Succ. 77. Poa with a diffused panicle, the smaller spikes having four hairy flowers, and a taper erect straw; and C. Bauhin's *gramen pratense, paniculatum majus, latiore folio*, meadow-grass, with a larger panicle, and broader leaf which is the *poa panicula diffusa, spiculis trifloribus glabris, culmo erecto teretri*, Flor. Succ. 76. Poa with a diffused panicle, small spikes with three flowers, and an upright straw.

These seem to be the great meadow-grasses Mr. Stillingfleet observes are common in our best meadow grounds. He has also met with them frequently on banks by the road side, and near ditches, even where they were not to be found in the adjoining meadows and pastures. But as he has not favoured us with a botanical description of them, we can only form conjectures.

If the seeds of these two sorts were carefully collected and sown separately, without any mixture of the seed of other grass, they would not only afford a greater quantity of fodder on the same space of land, but the grass would also

also be better, the hay sweeter, and the verdure more lasting, than that of any other species. Mr. Miller recommends this particularly to every gentleman who would improve the verdure near his habitation.

The annual meadow-grass makes the finest of turfs. It grows every where by way sides, and on rich found commons. It is called in some parts the Suffolk grass, as we mentioned before. Mr. Stillingfleet says, he has seen whole fields of it in High Suffolk, without any mixture of other grasses, and as some of the best salt butter we have in London comes from that country, it is most likely to be the best grass for the dairy. See ANNUAL MEADOW GRASS.

As the next best to meadow-grass, Mr. Miller recommends Ray's *gramen avenaceum pratense elatius, panicula flavescens, locustis parvis*, taller meadow oat-grass, with a yellowish panicle and small husks, which is the *avena panicula laxa, calycibus trifloris brevibus, flosculis omnibus aristatis*, Prod. Leyd. 66. Oat-grass with a loose panicle, three flowers in each impalement, which is short, and all the flowers having awns. Mr. Ray likewise recommends the smooth mountain oat-grass, which he calls *gramen avenaceum montanum spica simplici, aristis recurvis*, found by Mr. Dale upon Bartlow hills in Essex, on the edge of Cambridgeshire in the borders of the corn fields between Newmarket and Exning, and on the chalk hills between Northfleet and Gravesend; and the rough or hairy oat-grass, which he distinguishes by the appellation of *gramen avenaceum hirsutum, panicula purpureo argentea splendens*, and which abounds in the pastures about the earl of Cardigan's house at Twickenham, in Middlesex. He also includes under this genus, all the *festuca* kinds, of which Mr. Stillingfleet gives the following account, in his Observation on Grasses, subjoined to his translations of several ingenious tracts, selected from the Transactions of the Academy of Upsal.

Sheep's fescue, which he distinguishes by the name of *festuca ovina*, is the grass most esteemed for the food of sheep in Sweden, where they have not such downs as we have.

Gmelin says, that the Tartars choose to fix, during the summer, in those places where there is the greatest plenty of this grass, because it affords a most wholesome nourishment to all kinds of cattle, but chiefly sheep: and he observes, that the sepulchral monuments of the ancient Tartars are mostly found in places which abound with this grass, which shews, adds he, that it has long been valued among them.

This grass abounds in many parts of England and Wales, and particularly on all the finest sheep pastures in Herefordshire, Oxfordshire, Norfolk, &c. Mr. Stillingfleet observes, that it is a very early grass, and that, contrary to what Linnæus says, either sheep or some other animals do eat the flowering stems of this grass; for, when he searched for it upon Bansted downs, he could see no part of it but the radical leaves, except among bushes near the hedges, where it was guarded from the sheep.

Mr. Stillingfleet says, that he has always seen the purple fescue along with the fine bent and silver hair grass, which will be spoken of hereafter, particularly on Bansted downs, in great plenty, in a place inclosed in order to keep the sheep out. From thence he is inclined to think, that this is the chief grass all over the downs; but as the flowering stems in the other parts were entirely gone at the time of his viewing it, except along the hedges, he could not be certain in this respect.

After candidly declaring his want of knowledge of the qualities of the fescue fescue, which he calls *festuca fluitans*, Mr. Stillingfleet quotes a curious passage in the Transactions of the Academy of Upsal, where the author of a piece entitled *Plantæ Fescentæ* says, that the seeds of this grass are gathered yearly in Poland, and from thence carried into Germany, and sometimes into Sweden, and sold under the name of manna seeds, and that they are there much used at the tables of the great, on account of their nourishing quality and agreeable taste. Mr. Stillingfleet then adds, that one Mr. Dean, a very sensible farmer at Ruseomb, in Berkshire, assured him, "that a field of about four acres, which always lay under water, and was occupied by his father when he was a boy, was covered with a kind of grass that maintained five farm horses in good heart, from April to the end of harvest, without giving them any other kind of food, and that it yielded

more than they could eat." Some of it was carried to Mr. Stillingfleet, who found it to be the fescue fescue, with a mixture of the marsh bent: but whether this last contributes much towards furnishing so good pasture for horses, seems doubtful to him. They both threw out roots at the joints of the stalks, and are therefore likely to grow to a great length.

Linnæus says, that the bran of this grass will cure horses troubled with bots, if they are kept from drinking for some hours.

In the index of dubious plants, at the end of Ray's Synopsis, mention is made of a grass called *gramen caninum supinum longissimum*, longest supine dog's grass, which grows at Maddington in Wiltshire, and in some part of Wales, to the length of twenty-four feet, and is used for the fattening of hogs. Its stalks are of the creeping kind, and touch the ground at several of their knots; for they do not rise much in height. Mr. Stillingfleet thinks it the fescue fescue, and rightly advises farther enquiries concerning it. But he does not seem here to have consulted Mr. Worlidge, who says, speaking of this grass, that it is extraordinarily sweet, but not so easily propagated as hath been imagined, the length thereof being occasioned by the washing of a declining sheep down, from whence hasty rains bring with them much of the fatness of the dung of the sheep, which subsides upon the small meadows where this grass grows: so that in springs not subject to these showers, or on lands not enriched by that fertilising soil brought down to them, this grass does not thrive so well.

The vernal grass, which Mr. Stillingfleet calls *anthoxanthum odoratum*, and which is at least a species of Ray's *gramen vernum spica brevi laxa*, and of C. Bauhin's *gramen vernum pratense spica flavescens*, vernal grass, with a loose yellowish spike, is one of the earliest grasses, and grows very commonly in all our meadows, pastures, and other grounds. It is found in plenty upon those pastures which sheep are fond of, and from whence excellent mutton comes; and therefore it is most likely to be a good grass for sheep pastures. Mr. Stillingfleet says, he has found it on all kinds of grounds, from the most sandy and dry to the most stiff and moist, and even in bogs. It is very plentiful in the best meadows about London, viz. towards Hampstead and Hendon; and its seeds may be gathered very easily, as it sheds them upon the least rubbing. This grass gives a grateful odour to hay.

Mr. Lisle remarks, that the *gramen parvum repens purpurea spica*, small creeping grass, with a purple spike, is no indication of bad ground, though it be a very bad grass. Ray says, that it is very common in pastures. There seems to be a great sweetness in it. The same may be said of the *gramen cristatum*, or smooth crested grass, which also abounds every where in our meadows and pastures.

The meadow fox-tail grass (*gramen alopecuroides*) abounds in our best meadows about London, and makes very good hay; perhaps the best of any that is brought to market here. Mr. Stillingfleet observed in the spring of the year 1762, a meadow near Hampstead which consisted of this grass chiefly, with some of the vernal grass and the corn-broom grass: but it is scarce in many parts of England, particularly in Herefordshire, Berkshire, and Norfolk; though it might be gathered at almost any time of the year, even from hay-ricks, as it does not shed its seeds without rubbing, which is the case of but few grasses.

The water fox-tail (*alopeuroides paludosum*) is also found in such meadows about London as are found and lie under water in the winter. Mr. Stillingfleet thinks it may, perhaps, be a proper grass to sow on such grounds.

Mr. Stillingfleet has always found the fine bent-grass, which he names *agrostis capillaris*, in great plenty on the best sheep pastures, as on Malvern-hills, Bagshot-heath, and all the high grounds in Herefordshire, Berkshire, Oxfordshire, and Norfolk, and other places remarkable for good mutton.

The same may be said of the mountain hair-grass, which he calls *aira flexuosa*; and of the silver hair-grass, which is his *aira caryophylla*.

The quaking-grass, cow-quake, or lady's hair, as it is called in some places, is the *gramen tremulum maximum*, of C. Bauhin, and J. Ray, and the *briza spiculis cordatis, flosculis septendecim*, Hort. Cliff. 23. Briza with heart-shaped

shaped little spikes, and seventeen flowers in each. Though a very poor and slender grass, Mr. Lisle thinks it no indication of poor land where it grows: for, as Mr. Ray observes, it is the most common grass of any in all the pasture grounds throughout England.

Mr. Miller describes it as having an annual root, which sends up many broad hairy leaves, between which arise slender stiff stalks, from a foot to near two feet high, dividing upward into a large loose panicle, garnished with heart-shaped small spikes, each having about seventeen small floscules, or florets; and these, after the flowers are past, are succeeded by a single seed. The heads hang by slender long foot-stalks, which are moved by every wind, so that they generally appear shaking; from whence it had the name of quaking-grass. There is a smaller species of it, which is a native of England; but, I believe, of no greater value than the former. These grasses come to head in May: and this gave rise to the English proverb, May, come she early come she late, makes the cow quake.

Matweed (*gramen spartcum*) is of the broom kind, and delights in sandy places near the sea. Even clouds of sand blown over it do no hurt, but on the contrary promote its growth. It has been of excellent service in fixing loose sands, as, if I have been rightly informed, it once did very remarkably in Norfolk. Of ten species of this plant, which Mr. Ray distinguishes, the following are the chief. 1. *Spartium Plinii*, five *juncus Hispanicus*, the true matweed of Pliny, or Spanish broom; 2. *Gramen spartcum paniculâ brevi folliculo inclusâ*, hooded matweed; 3. *Gramen spartcum maritimum Anglicanum*, English sea matweed, or marram; 4. *Spartum maximum maritimum Hollandicum*, spica *secalinâ*, the greatest Holland matweed; with a rye spike; 5. *Gramen spartcum pennatum*, Feather-grass; and 6. the *Gramen spartcum juncifolium*, or *spartum parvum*, small matweed.

Mr. Stillingfleet says, that the best mutton he ever tasted, next to that which comes from hills, where the purple and sheep's fescue, the fine bent, and the silver hair grasses abound, was fed upon the crested dog-tail grass, which he and Mr. Hudson call *cynofurus crystallus*. He therefore rightly judges it proper for parks; and confirms this opinion, by adding, that he knows a park where this grass abounds, which is famous for excellent venison. It makes a very fine turf upon dry, sandy, or chalky soils: but unless it be swept over with the scythe, its flowering stems will look brown; as is the case of all grasses which are not fed by a variety of animals: for that some animals will eat the flowering stems, is evident from commons, where one scarcely sees any part of the grasses, except the radical leaves.

Mr. Miller thinks the cock's foot grass (Ray's *Gramen dactylon*, Hist. p. 1271) the capon's-tail grass (Ray's *Gramen murorum spicâ longissimâ*, Hist. p. 1286) and the millet grasses (*Gramina maliacea*) too coarse to deserve attention in England; though some of their species are very useful in the warm parts of America, where there is a great scarcity of finer grass, and even much better adapted for such climates, than any of our European grasses; because many of them lie flat on the ground, and emit roots from their joints, by which means they are well prepared for heat; of which their large and juicy stalks likewise enable them to bear an extraordinary degree.

The purple, or, as it is commonly called, red meadow trefoil, which is C. Bauhin's *Trifolium pratense purpureum*, has already been sufficiently distinguished from the common red clover, or red honey-suckle (Ray's *Trifolium purpureum majus*, *pratense simile*, Sym. 328) which, though Mr. Lisle thinks otherwise, is undoubtedly a native of England, as is manifest from its spontaneous and flourishing growth on the top of many mountains, particularly in even the most northern parts of Scotland, where no mortal surely ever dreamt of cultivating it. The species called yellow meadow trefoil, or hop-clover, is C. Bauhin's *Trifolium pratense luteum, capitulo lupuli, vel agrarium*; and the smaller kind of this, commonly called nonesuch, or black seed, is the *Trifolium luteum, lupulinum minimum*. M. Duhamel rightly prefers the first of these sorts for artificial pastures, and observes, that it is the only species now cultivated in France for that purpose.

Our meadows afford us the white meadow-trefoil, honeysuckle-grass, or white Dutch clover, which is the *tri-*

folium pratense album of C. Bauhin, and by far the best sort of clover for lasting pastures, because it is the sweetest and most abiding of all plants of this kind. See CLOVER.

I do not know that the narrow-leaved plantain, or ribwort (*Plantago angustifolia*) hath ever been cultivated purposely for the food of cattle. It grows, indeed, in almost all pastures: but, as it will thrive upon very dry spots, because it strikes a deep root, it may probably deserve farther trial.

The late Dr. Eliot recommends two sorts of grasses, natives of North America, of which he lately sent over a parcel of the seeds to the London Society for the Encouragement of Arts, &c. by whom they have been distributed here, so that we may hope soon to know their success in this country, and of which he has given an account in his Essays upon Field Husbandry in New England. See the articles BIRD-GRASS, and TIMOTHY-GRASS.

GRASS-*Lease*, grass-lands, or lands appropriated to grass for feeding of cattle.

GRATTEN, a term used in Cornwall, to imply the mowing of grass, the first year after the land has been manured with sea-sand; and this operation they call mowing in gratten.

GRAVELLING. A misfortune that happens to a horse by travelling, by little gravel stones getting between the hoof and the shoe, which settles at the quick, and there festers and frets.

The way to cure it, is to take off the shoe, and then to draw the place with a drawing iron till you come to the quick; pick out all the gravel, and squeeze out the matter and blood found therein, and afterwards wash it clean with copperas water, then pour upon it sheeps tallow and bay salt melted together, scalding hot, stop up the hole with hards, and set the shoe on again, and at two or three times dressing it will be whole; but do not travel or work him before he is quite well, or let his foot come to any wet.

GRAVELLY-Land, that which abounds with gravel and sand. See the article SANDY-LAND.

The best manure for this sort of land is marl, or any stiff clay that will dissolve with the frost, cow-dung, chalk, mud, and half rotten straw from the dunghill.

GRAZING. Mr. Marshall, in his Rural Economy of the Midland Counties, says that "the midland district viewed collectively, is a grazing country. South and East Leicestershire, and much of Northamptonshire fall entirely under this description. Warwickshire, inclines more to the dairy.

The species of grazing, which is here practised, is, in a manner solely, summer fattening on grass. Some may, every year, be finished with hay and kept pasture: and a few individuals practise stall-fattening, on hay and what is called "cutmeat;" namely, oats in straw, cut in a chaff machine; and some, but very few, on oilcake.

GRAZING in a wet season. I cannot with propriety omit mentioning, in this place, an incident of practice which has occurred to me, this autumn, 1789, a very wet year.

The general complaint is, that grazing stock, though they have this year rolled in grass, have not done well; Mr. Henton, of Hoby (in Leicestershire) being singular in saying, that his feeders have done tolerably. Indeed, his stock corroborate his assertion. He had a lot of cows at Loughborough, the 12th of August, the fattest in the show.

But his management is more remarkable than his success. He "foddered them with hay all the wet weather;" that is, he mowed the broken grass for them, beginning under the hedges, and continuing to mow the coarsest patches, throughout the piece.

The first day (the day it was mown) the cattle seldom touched it; but the second or third day, they fell to it freely; eating it "between whites," in preference to grass. "In the morning it was always the first thing they filled their bellies with."

The cattle having eaten up the more palatable parts of the herbage, the thistles and other offal were raked up, and carried off the ground: most excellent management!

His stock consisted of about sixty head. At first, one man, only, was employed in mowing, &c. But, before the rainy weather ceased, he set on another man.

What an admirable thought! that which other men suffered to stand waste in itself, an encumbrance to the ground

ground, and a nursery of weeds, was converted to a food, more nutritious, in a wet season, than the best of the standing herbage.

The fairs at Birmingham are among the worst in the country, for fat stock! the butchers giving the graziers no encouragement to drive their stock to them: preferring the toil of riding twenty, thirty, or perhaps forty miles from home, to pick up their "fat!" spending a principal part of their time, and their profits, in an employment, truly ridiculous.

How convenient it would be to the grazier, as well as to the butcher, to have a weekly market—a Smithfield, at or near Birmingham! to the grazier, in thereby having a constant and certain market, whenever he wanted either keep or money; and to the butcher, in saving time and travelling expences. Yet the few which are taken there, at present, are frequently drove out unfold!

But, at present, the day, Thursday, the ordinary market day, is improper: Monday or Tuesday would be a more suitable day: and Sutton, perhaps the most suitable place.

For further particulars, see the articles FATTENING CATTLE, FLAX-SEED, &c.

GREASE, a disease incident to horses and other cattle, consisting of swellings and gourdinens of the legs.

In order to treat this disorder with some propriety, without having recourse to the falling down of humours for its explanation, we shall consider it as arising from two different causes; a fault or relaxation in the vessels, or a bad disposition of the blood and juices. In order to this, it will be necessary to observe, that the blood and juices are carried to the extreme parts by the arteries, and returned by the veins; consequently the blood must rise perpendicularly in the latter, in order to return from the extremities to the heart. And hence swellings in the legs of horses may be easily accounted for, as a partial stagnation of the blood and juices may be naturally expected where the circulation is languid, especially when there is a want of due exercise, and a proper muscular compression on the vessels to push forward the returning blood, and propel the inert, and half-stagnating fluids through their vessels. In short, the blood, in such cases, cannot so easily ascend as descend, or a greater quantity will be brought by the arteries than can be returned by the veins.

The grease then, considered in this light, must be treated as a local complaint, where the parts affected are alone concerned, the blood and juices being yet untainted; and in good condition; or as a disorder where they are both complicated: but when it is an attendant on some other distemper, as the farcy, yellow dropsy, &c. such diseases must first be cured before the grease can be removed. In the former case, moderate exercise, proper dressing, cleanliness, and external applications, will answer the purpose; in the latter, internals must be called into our assistance, with proper evacuations.

When a horse's heels are first observed to swell in the stable, and subside, or go down, on exercise, let care be taken to wash them very clean every time he comes in, with soap-suds, chamberlye, or vinegar and water, which, with proper rubbing, will frequently prevent or remove this complaint: or let them be well bathed twice a day with old verjuice, or the following mixture, which will brace up the relaxed vessels; and if rags dipped in the same are rolled on, with a proper bandage, for a few days, it is most likely the swellings will soon be removed by this method only, as the bandage will support the vessels till they have recovered their tone. To answer this end also, a laced stocking, made of strong canvas, or coarse cloth, neatly fitted to the part, would be found extremely serviceable, and might easily be contrived by an ingenious mechanic.

Take rectified spirit of wine four ounces, dissolve in it half an ounce of camphor, to which add wine-vinegar, or old verjuice, six ounces; white vitriol, dissolved in a gill of water, one ounce; mix together, and shake the phial when used.

But if cracks or scratches are observed, which ooze and run, let the hair be clipped away, as well to prevent a lodgment (which becomes stinking and offensive by its stay) as to give room for washing out dirt or gravel, which, if suffered to remain there, would greatly aggravate the disorder.

When this is the case, or the heels are full of hard scabs it is necessary to begin the cure with poultices, made either of boiled turnips and lard, with a handful of linseed powdered, or oat-meal and rye-flour, with a little common turpentine, and hog's lard, boiled up with strong beer grounds, or red wine lees. The digestive ointment being applied to the sores for two or three days, with either of these poultices over it, will, by softening them, promote a discharge, unload the vessels, and take down the swelling, when they may be dried up with the following:

Take white vitriol and burnt alum, of each two ounces; Ægyptiacum one ounce; lime water a quart, or three pints: wash the sores with a sponge dipped in this, three times a day, and apply the common white ointment, spread on tow; to an ounce of which may be added two drams of sugar of lead.

Or the following wash and ointment may be used for that purpose:

Take half an ounce of Roman vitriol, dissolved in a pint of water; then decant off the clear into a quart bottle, add half a pint of camphorated spirits of wine, the same quantity of vinegar, and two ounces of Ægyptiacum.

Take honey four ounces, white or red lead, powdered, two ounces; verdigrise, in fine powder, one ounce: mix together.

Some, for this purpose, apply alum-curd; others a strong solution of alum in verjuice, with honey; and many of these forms may be easily contrived. But let it be remembered, that as soon as the swelling is abated, and the moisture lessened, it would be very proper to keep the legs and patterns rolled up with a firm bandage, or linen roller, two or three fingers wide, in order to brace up the relaxed vessels, till they have recovered their natural tone.

This method is generally very successful when the distemper is only local, and requires no internal medicines: but if the horse be full and gross, his legs greatly gorged, so that the hair stands up, and is what some term pen-feathered, and has a large stinking discharge from deep foul sores, you may expect to meet with great trouble, as these disorders are very obstinate to remove, being often occasioned by a poor dropical state of the blood, or a general bad disposition in the blood and juices.

The cure in this case, if the horse is full and fleshy, must be begun by bleeding, rowels, and repeated purging; after which, diuretic medicines are frequently given with success. Thus,

Take four ounces of yellow rosin, one of sal prunella; grind them together with an oiled pestle; add a dram of oil of amber, and give a quart of forge-water every morning, fasting two hours before and after taking, and ride moderately.

As this drink is found very disagreeable to some horses, I would recommend the nitre balls in its stead, giving to the quantity of two ounces a day, for a month or six weeks, mixed up with honey, or in his feeds: take the following also for that purpose.

Yellow rosin four ounces, salt of tartar, and sal prunella, of each two ounces Venice soap half a pound; oil of juniper half an ounce; make them into balls of two ounce weight, and give one every morning.

Or,

Take nitre two ounces; camphor one drachm; honey enough to make into a ball: give as the former.

The legs in this case should be bathed or fomented, in order to breathe out the stagnant juices, or to thin them, so that they may be able to circulate freely in the common current. For this purpose foment twice a day with a discutient fomentation, in which a handful or two of wood-ashes has been boiled; apply then the above poultice, or the following, till the swelling has subsided, when the sores may be dressed with the green ointment till they are properly digested, and

then dried up with the water and ointment above recommended.

Take honey one pound, turpentine six ounces, incorporate with a spoon; and add of the meal of fenu-greek and linseed, each four ounces; boil in three quarts of red wine lees, to the consistence a poultice; to which add, when taken from the fire, two ounces of camphor in powder; spread it on thick cloths, and apply warm to the legs, securing it on with a strong roller.

If the sores are very foul, dress them with two parts of the wound ointment, and one of *Ægyptiacum*; and apply the following, spread on thick cloths, and rolled on.

Take of black soap, one pound; honey, half a pound; burnt alum four ounces; verdigrise powdered, two ounces; wheat flour, a sufficient quantity.

If the diuretic balls should not succeed they must be changed for the antimonial and mercurial alteratives already mentioned; but turning a horse out in a field, where he has a hovel or shed to run to at pleasure, would greatly contribute to quicken the cure; and, indeed, would in general effect it alone: but if this cannot be complied with, let him be turned out in the day time.

If the horse is not turned out, a large and convenient stall is absolutely necessary, with good dressing, and care: this stall should be six feet wide, that a tall horse may shoot out his legs at length, so that the blood may circulate freely, without meeting with resistance, which it naturally must, when a horse lies all on a heap, or with his hind legs under him: nor should the stable be paved with too great a declivity, for if the horse stands too low with his hind legs, most of his weight will rest upon them; and give him the grease, especially if he be at all inclined to be gourd.

The last thing we shall recommend, is to make him lie down in the stable as often as possible. This is undoubtedly of the utmost consequence, as it will not a little contribute to the removal and cure of this disorder: for by only changing the position of his legs, a free circulation would be obtained, and the swelling taken down; whereas it is in general greatly aggravated by the obstinacy of the horse, which refuses to lie down at all, probably from the pain it gives him in bending his legs necessary for that purpose; by which means the stiffness and swelling increases, till the over-gorged and distended vessels are obliged to give way, and, by bursting, discharge the fluids that should circulate through them. *Barlet's Farriery*, p. 284.

GREASE melted. See the article *MOLTEN GREASE*.

GREEN-SCOURING, a disease to which sheep and bullocks are often subject.

The best remedy for this disease is verjuice; a wine-glass full is enough for a sheep, and a pint for a bullock. *Lisle's Husbandry*, vol. II. p. 211.

GREEN-BUGS, which destroy plants in gardens, may be destroyed by sprinkling the places where they lodge with the juice of henbane infused in vinegar. Or the plants on which they settle may be watered with the cold decoction of mustard and laurel-seed, mixed with water.

GRIP, or *Gripe*, a small ditch cut across a meadow or ploughed-field, in order to drain it. It is otherwise called a water-furrow.

GRIPES, a very acute disease to which horses are very often subject.

There seems to be no distemper so little understood by the common farrier, as the gripes or cholic in horses; one general remedy, or method, serving them in all cases; but as this disorder may be produced by very different causes, the cure must also vary, otherwise the intended remedy, injudiciously applied, will not only aggravate the complaint, but make it fatal. We shall divide this disorder into three different species: the flatulent or windy, the bilious or inflammatory; and the dry gripes; each of which we shall distinguish by their different symptoms, and then point out the proper remedies.

The flatulent, or windy cholic is thus known. The horse is often lying down, and as suddenly rising again with a spring; he strikes his belly with his hinder-feet, stamps with his fore-feet, and refuses his meat; when the gripes are violent, he will have convulsive twitches, his eyes be turned up, and his limbs stretched out as if dying, his ears and feet being alternately very hot and cold; he falls into pro-

fuse sweats, and then into cold damps; strives often to stale, and turns his head frequently to his flanks; he then falls down, rolls about, and often turns on his back; this last symptom proceeds from a stoppage of urine, that almost always attends this sort of cholic, which may be increased by a load of dung pressing on the neck of the bladder.

These are the general symptoms of cholic and gripes from wind, drinking cold water when hot, and when the perspirable matter is retained, or thrown on the bowels by catching cold; in all which cases they are violently distended. Cribbing horses are more particularly subject to this complaint, by reason they are constantly sucking in great quantities of air.

The first intention is to empty the strait gut with a small hand dipt in oil, which frequently makes way for the confined wind to discharge itself; and by easing the neck of the bladder, the suppression of urine is taken off, and the horse stales and gets ease.

Farriers generally strike a steam in the bars of a horse's mouth, which seems to be of little or no use; for where a quantity of blood is intended to be taken away, the vessels of this part are neither large or numerous enough to furnish it; so that it is more eligible to take it from the neck-vein, and is always proper in full, sanguine, plethoric, young horses.

The following ball and clyster seldom fail of giving relief in these cases:

Take Strasburgh or Venice turpentine, and juniper berries pounded, of each half an ounce; sal-prunella, or salt-petre, an ounce; oil of juniper, one dram; salt of tartar, two drams; make into a ball, with any syrup: it may be given whole, and washed down with a decoction of juniper-berries, or a horn or two of ale.

If the horse does not break wind, or stale plentifully, he will find no relief; therefore in an hour or two give him another ball, and add to it a dram of salt of amber; which may be repeated a third time, if found necessary. During the fit the horse may be walked and trotted gently, but should by no means be harrassed beyond his ability, or dragged about till he is jaded.

The following clyster may be given, between the balls, or alone, and repeated occasionally:

Take camomile flowers, two handfuls; anise, coriander, and fennel seeds, of each an ounce; long pepper, half an ounce: boil in three quarts of water to two; and add Daffy's elixir, or gin, half a pint; oil of amber, half an ounce; and oil of camomile, eight ounces.

The subsequent balls and drink are also very proper for this purpose, and to remove gripes occasioned by drinking cold water when hot, or catching cold after violent exercise:

Take powder of anise, cummin, and fennel-seeds, of each half an ounce; camphor, two drams; pellitory of Sapin, one dram; oil of juniper, fifty drops: make into a ball with any syrup, and wash it down with a horn or two of ale.

Or,

Take mithridate, or Venice treacle, two ounces; Matthew's pill, two drams; camphor, one dram, dissolved in a little spirit of wine; powder of fresh aniseed one ounce; or the same quantity of the cordial-ball; dissolve in a pint and half of ale.

Or,

Take philonium, one ounce, or an ounce and an half; tincture of senna, or Daffy's elixir, and sallad-oil, of each half a pint: give warm for a drink, and repeat it if necessary.

Either of these medicines are well calculated for this purpose; but as the ingredients may not always be ready at hand, or procurable, we shall put down a couple of drinks that have frequently, on trial, been found successful, and are easily prepared. It is to be observed, that the horse should be well rubbed, clothed, and littered with clean straw up to his belly.

Take

Take of Castile-soap or hard-soap, nitre or salt-petre, of each one ounce ; juniper-berries and ginger, each half an ounce ; Venice turpentine, or rosin, dissolved with the yolk of an egg, six drams : mix with a pint and a half of warm ale, or a decoction of juniper-berries, with a large onion boiled with them. This may be repeated twice or thrice.

Or,

Take a pint of brandy, rum, or Geneva, with as much sweet oil, and give for a drink. Should this not succeed, boil an ounce of pepper or ginger, in a quart of milk ; and add to it a handful of salt, and half a pint of oil : this given warm, will (according to Burdon) purge in two or three hours.

The signs of a horse's recovery, are his lying quiet, without starting, or tumbling, and his gathering up his legs, and ceasing to lash out ; and if he continues an hour in this quiet posture, you may conclude all danger over.

The next species of cholic we shall describe is the bilious or inflammatory, which, besides most of the preceding symptoms, is attended with a fever, great heat, panting, and dryness of the mouth ; the horse also generally throws out a little loose dung, with a hot scalding water, which when it appears blackish, or of a reddish colour, and fetid smell, denotes an approaching mortification.

In this case the horse should immediately be bled to the quantity of three quarts ; and it should be repeated if the symptoms do not abate in a few hours. The emollient clyster, with two ounces of nitre dissolved in it, should be thrown up twice a day, to cool the inflamed bowels ; plenty of gum arabic-water should be taken ; and a pint of the following drink given every two or three hours, till several loose stools are procured ; and then it should be given only night and morning, till the disorder is removed.

Take fenna, three ounces ; salt of tartar, half an ounce ; infuse in a quart of boiling water an hour or two ; then strain off, and add two ounces of lenitive electary, and four of Glauber salts.

If this disorder is not removed by these means, but the inflammation and fever increase, attended with a discharge of the flesh-coloured water above described, the event will most probably be fatal ; and the chief thing to be depended on now, must be a strong decoction of Jesuit's bark, given to the quantity of a pint every three hours, with a gill of red port-wine.

A quart of the same may be used for a clyster, with two ounces of Venice turpentine, dissolved with the yolks of two eggs, an ounce of diascordium, and a pint of red wine, and given twice a day : if the horse recovers, give two or three mild rhubarb purges.

To a horse of little value, give the following, which in these cases has been found successful.

Take diapente, one ounce ; diascordium, half an ounce ; myrrh, in powder, two drams : make it into a ball with two drams of oil of amber, to be given twice or thrice a day.

The last we shall describe is the dry gripes, or the cholic, which arises often from costiveness ; it is discovered by the horse's frequent and fruitless motion to dung, the blackness and hardness of the dung, the frequent and quick motion of his tail, the high colour of his urine, and his great restlessness and uneasiness.

In this case the strait gut should be examined and emptied, with a small hand, oiled properly for that purpose ; the emollient oily clyster, given under the article CLYSTER, should be thrown up twice a day ; and the above purging drink given, till the bowels are unloaded, and the symptoms removed.

The diet for a horse in the gripes should be scalded bran, warm water-gruel, or white water, made by dissolving four ounces of gum arabic in a quart of water, and mixing it with other water.

From this history and division of gripes and cholics, with their different treatment, it appears how absolutely necessary it is they should be well understood, in order to be managed skilfully : it is plain, too, that violent hot medicines should, in every species of this disorder, be guarded against, and given with great caution and discretion, even in the first kind of stultent cholic, where indeed they can only be wanted ; yet two often, when prepared by the farriers, with

oil of turpentine, Geneva, pepper, and brine, &c. they even increase that disorder, by stimulating the neck of the bladder too forcibly heating the blood, and inflaming the bowels, till a mortification is brought on them. These are in general the constant appearance of horses that die of this disorder, whose bowels, being examined for that purpose, have been found inflamed, full of red and livid spots, sometimes quite black, crisped with extreme heat and rotten.

GRIPS, the swaths, or small heaps of corn, lying in the field, as it is cut down with the scythe or sickle.

GROATS, oats, after the shells are taken off.

GROOM, a man who looks after horses, and should demean himself after so gentle and so kind a manner towards horses, as to engage them to love him ; for a horse is reckoned one of the most loving creatures to man of all other brutes, and in every respect the most obedient.

Therefore if he be dealt with mildly and gently his kindness will be reciprocal ; but if the groom or keeper be harsh and cholerick, he will put the horse out of patience, and make him become rebellious, and occasion his biting and striking.

Therefore the groom should frequently dally, toy, and play with the horses under his care, talking to them, and giving them good words, leading them out into the sunshine, there run and shew them all the diversions he can.

He must also duly curry-comb and dress him, wipe away the dust, pick and clean him, feed, pamper, and cherish him ; and constantly employ himself in doing something about him, as looking to his heels, taking up his feet, rubbing upon the soles, &c.

Nay, he ought to keep him so well dressed, that he may almost see his own face upon his coat ; he must likewise keep his feet stopped and anointed daily, his heels free from scratches, and other sores, ever having a watchful eye over him ; and overlooking all his actions, as well feeding as drinking ; that so no inward infirmity may seize upon him ; but that he may be able to discover it, and endeavour to cure. The qualifications necessary in a groom, are obedience, fidelity, patience, diligence, &c.

First, he ought to love his horse in the next degree to his master, and endeavour by fair usage to gain a reciprocal love from him, and an exact obedience ; which if he knows how to pay his master, he will the better be able to teach it his horse ; and both the one and the other are to be obtained by fair means, rather than by passion and outrage. For those who are so irrational themselves, as not to be able to command their own passions, are not fit to undertake the reclaiming of an horse, who is by nature an irrational creature.

He must then put in practice the patience, which he ought at all times to be master of, and by that, and fair means, he may attain his end : for no creature is more tractable than a horse, if he be used with kindness to win him.

The next thing requisite to a groom is neatness, as to keeping his stable clean swept, and in order ; saddles, housings-cloths, stirrups, leathers and girths clean, and above all his horse clean dressed and rubbed.

Lastly, diligence is requisite in a daily discharge of his duty, and observing any the smallest operation, whether casual or accidental, either in his countenance, as symptoms of sickness ; or in his limbs and gait, as lameness ; or in his appetite, as forsaking his meat ; and immediately upon any such discovery to seek out a remedy.

This is the substance of the duty of a groom in general.

We will suppose *Bartholemew-tide* to be now come, and the pride and strength of the grass to be now nipped by the severe frosts and cold dews which usually accompany this season, so that the nourishment thereof turns into raw crudities, and the coldness of the night (which is injurious to horses) abates as much flesh and lust as he getteth in the day, whereof he is now to be taken up from grass, whilst his coat lies smooth and sleek.

The horse designed for hunting, &c. being brought home, the groom must set him up for that night in some secure and spacious place where he may evacuate his body, and so be brought to warmer keeping by degrees ; and the next day set him up in the stable.

It is indeed held a general rule amongst grooms, not to clothe or dress their horses till two or three days after their stabling ; but there seems no other reason but custom for this practice.

Some also give the horse wheat-straw to take up his belly at his first housing ; but others utterly disapprove of it.

For

For the nature of a horse being hot and dry, if he feeds on straw which is so likewise, it would straiten his guts, and cause an inflammation in his liver, and by that means distemper his blood; and besides it would make his body so costive, that it would cause a retention of nature, and cause him to dung with great pain and difficulty, whereas full feeding would expel the excrements according to the true intention and inclination of nature. Therefore let moderate airing, warm clothing, good old hay, and corn, supply the place of wheat-straw.

The first business of a groom after he hath brought his horse into the stable, is, in the morning, to water him, and to rub his body over with a warm whisp, a little moistened, and afterwards with a woollen cloth; also to clean his sheath with his wet hand from all the dust it had contracted during his running, and to wash his yard either with white-wine or water.

He must then trim him after the manner that other horses are trimmed, except the inside of his ears, which ought not to be meddled with for fear of making him catch cold.

In the next place he must take him to the farrier's, and there get him shod with a set of shoes, answerable to the shape of his feet, and not to pare his feet to make them fit his shoes.

Let his feet be well opened between the quarters and the frush, to prevent his being hoof-bound, and let them be opened straight, not sideways; for by that means, in two or three shoeing, his heels (which are the strength of his feet) will be cut quite away. Pare his foot as hollow as you can, and then the shoe will not press upon it.

The shoe ought to come near the heel, but not to be set so close as to bruise it, nor yet so open as to catch in his shoes, if he happens to over reach at any time, and so hazard the pulling them off, the breaking of the hoof, or bruising of his heel.

The webs of his shoes ought to be neither too broad nor too narrow, but of a middling size, about the breadth of an inch, with stopped spunges, and even with his foot; for though it would be for the advantage of a travelling horse's heel, to have a shoe set a little wider than the hoof on both sides, that the shoe may bear his weight, and not his foot touch the ground, yet the hunter being often forced to gallop on rotten spongy earth; if he have them larger it would hazard his laming, and pulling off his shoes, as has been before observed.

There is an old proverb, *before behind and behind before*; that is, in the fore feet the veins lie behind, and in the hinder feet they lie before; therefore the farrier ought to take care that he does not prick him, but leave a space at the heel of the fore feet, and a space between the nails at the toe.

Having got his shoes set on as above directed, a great deal of his hoof will be left to be cut off at his toe.

That being cut off, and his feet smoothed with a file, he will stand so firm, and his feet will be so strong, that he will tread as boldly on stones as on carpet ground.

The horse being shod, and it being time to water him, let him stand in the water, which will (in the opinions of some) close up the holes, which the driving of the nails has made.

Afterwards have him gently home, tie him up to the rack, rub him all over, body and legs, with dry straw, then stop up his feet with cow-dung, give him a quartern of clean sifted old oats, and a quantity of hay, sufficient to serve him all night, and leave him till the next morning.

GROUND, a general name for land, be the soil what it will.

The Romans were very attentive to examine the nature of the ground before they broke it up, and distinguished it into three situations, champaign, hilly, and mountainous. They rightly approved most of a champaign country, declining gradually from the foot of a hill toward the south, or south-east; if a hill rising gently; and if a mountain neither lofty, nor rugged, but covered with plenty of wood and grass. Either of these situations is eligible, according to the purpose for which the ground is intended; some plants affecting hotter, others colder exposures; some delighting to dwell on hills, others in vallies; and some again being indifferent to either: but generally speaking, most vegetables choose the warm and kindly soil of low grounds, fertilised by what the rains bring down to them from the hills and more elevated parts.

The spontaneous produce of the earth is an infallible indication of the nature and quality of the ground. Wild thyme shews it to be good for feeding cattle; betony and

straw-berries direct to wood; camomile points out a mel-low soil fit for wheat; burnet indicates land fit for pasture; and mallows denote it proper for the uses of the kitchen-garden, as has been observed by lord Bacon, Mr. Evelyn, and others.

On the contrary, says the last mentioned of these writers, some ground is so cold, as naturally to bring forth nothing but gorse, broom, holly, yew, juniper, ivy, box, &c. which may perhaps direct us to the planting pines, firs, and other perennial verdures in such places.

Moss, rushes, wild tanfy, sedge, flags, fern, yarrow, and withered, blasted, shrubby, and curled plants, are natural indications of a very bad soil.

The nature of the ground may also be pretty well guessed at, by the quality of the water which runs, or is strained through it.

By the smells, which, upon the falling of the first rains after a long drought, is very pleasing, and even fragrant, from good and natural mould; but disagreeable and noxious, if the ground contains any mineral, or other ill quality, as is remarkable in marshes and fenny places.

By the taste, all earths, as well as plants, abounding more or less in their peculiar salts; some sweet and grateful; others bitter, hot, or astringent; and others flat and insipid; easily discovered by the method which Columella directs, of digging up some of the under mould, out of that part of the land which is deemed the worst, and mixing it thoroughly in an earthen vessel, with sweet water, which, when poured off after the grosser parts have subsided, will retain the taste of the earth soaked in it.

The touch will immediately shew whether it be soft, pliant, fat, and slippery; whether it sticks to the fingers, or melts and dissolves on the tongue; in which case the soil may be deemed rich. If it be gritty, light, and porous, it is bad.

Mould fit for the production of plants is of an uniform substance, unmixed with the contrarieties of soft and hard, churlish and mild, moist and dry: neither is it too unctuous or too lean; but light, and crumbles easily; yet is consistent enough to be wrought and kneaded. It is of such due tenacity as to retain a just degree of moisture, and neither soils the fingers, nor cleaves much to the spade, which easily enters it. Of this kind is the soil usually found under the turf of pasture-grounds, upon which cattle have been long fed and foddered. In short, that is the best mould which is blackest, cuts like butter, sticks not obstinately, breaks into small bits, smells sweet, is tempered without crusting or chopping in dry weather, or becoming poachy in wet, which shines after the plough, where flocks of crows follow the ploughman, and, as Pliny expresses it, peck at his very heels.

As to colour, next to the blackish, the pre-eminence is generally given to the darker grey, and after that to the russet: the clear tawny is reputed worse: the light and darsh ash-colour (light of weight and resembling ashes) good for very little: and the yellowish red, the worst of all.

The common opinion, that all grounds are red or brown; cold and dry, blackish; cold and moist, whitish; hot and moist, ruddy; is, notwithstanding the specious arguments alledged in favour of it, from the exhalation of minerals, the heat of the sun, and other accidents, exploded by Columella, who proposes, as a much surer way to judge of the goodness of land, digging a trench, and afterwards throwing back the same earth that was dug out, treading it down well when it is returned. If, says he, through a kind of ferment as it were, there be more than enough to fill the trench, it is a certain sign that the soil is fat: if there be not enough, we may be sure that it is poor and lean; and if the quantity be just sufficient to fill the whole from whence it was taken, it is of a middling quality.

Mr. Evelyn, after examining the component parts of several sorts of soils, concludes, that the very finest earths and best moulds, however to appearance mixed with divers imperfect bodies, may, for aught we know, consist more of sandy particles than of any other whatever. Hence he infers, that earth, stript of all heterogeneous particles, retains only weight, and an insipid siccity; and doubts whether it affords any thing more than embracement to the first rudiment of plants, protection to the roots, and stability to the stem; being "unprolific till married to something of a more masculine virtue, which irradiates her womb: but otherwise, nourishing only from what is added, with-

without any action or material contribution : for, says he, what gives the divers tempers to moulds, seems rather to be caused by the perpetual and successive rotting of vegetable and animal substances, than by any peculiar and separate principle ; the clamminess of the earth seeming rather something extrinsecal and accidental to it, than natural and originally constitutive. We know indeed, that the earth is, without any artificial auxiliaries, indued with a wonderful prolific virtue : but as this is liable to be lost, or to decay, and never can be expected from some grounds, without helps, it may be worth our while to consider by what expedients the desired effects of perpetuating its vigour may best be accomplished.

The means of giving and perpetuating this vigour now becomes properly the subject of our farther enquiry, consistent with what was observed before, that in order to the earth's having this vigour, it should be constantly kept in an alkaline or calcareous state. Mr. Evelyn is clearly of this opinion, when he says, " I firmly believe that were salt-petre to be obtained in plenty, we should need but little other compost to meliorate our ground." In other words, could the earth be always kept in a state fit for collecting nitre, it would consequently be always in a state fit for the production of plants. They who are acquainted with chemical researches, know, that nitre is obtained from substances of a mixed nature. Its basis is a calcareous earth, to which must be added putrid or alkaline substances, especially of the vegetable kind.

Mr. Evelyn and some later writers have spoken so much of the effects of nitre, and nitrous earths, in vegetation, that many have imagined nitre to be essentially necessary in the growth of plants : though Dr. Woodward assures us, that, by all the trials he has been able to make, the very contrary seems to be the case ; for that nitre, when contiguous to a plant, rather destroys than nourishes it. When, therefore, they mention nitre, and nitrous earths, it is more than probable that they mean earth in a state fit for collecting nitre : but when the alkaline substances are once saturated by the acid in the air, or when the alkali is brought to a neutral salt, as nitre is, its fertile state then ceases, and it becomes a hard compact body, much more impervious to the roots of plants than it was before.

The nature of calcareous substances, and that of the two kinds of alkali, viz. the fixed alkaline salt of plants, and the volatile alkali arising from animal and putrid vegetable substances, has already been explained.

Farmers commonly say, that lime (to which might be added all other calcareous substances) does not fatten, but only mellows the earth ; meaning, according to Dr. Woodward, that it does not contain in itself any thing of the same nature with the vegetable mould, or, in other words, afford any matter fit for the formation of plants ; but that it only softens and relaxes the earth ; by that means rendering it more capable of entering into, and of nourishing the seeds and vegetables set in it, than would otherwise be. It is well known how apt lime is to be put into a ferment and commotion by water. Now this commotion can never happen when the lime is mixed with earth (and it retains its qualities of lime) however hard and clodded the ground may be, without opening and loosening it. What Dr. Woodward says of salt in general, may more properly be applied to the fixed alkaline salt of plants. Every one, says he, must have observed, how apt all sorts of salts are to be wrought upon by moisture, and how easily they melt and run with it. When this happens to those that are in the earth, the clods which they are mixed with, moulder and fall asunder. The same gentleman farther observes, that if we would render the earth truly fruitful, it must be by the addition of such substances as former crops have robbed it of, or such as contains in itself vegetable matter.

The several manures which are found best to promote this end, are chiefly, either parts of vegetables, or of animals ; of animals, says the doctor, which either derive their own nourishment immediately from vegetables, or from other animals that do so, and which, being returned to the earth, serve for the formation of other similar bodies. These vegetable and animal substances, are the matter from whence Mr. Evelyn thinks the earth derives that clamminess which he takes to be a sure indication of a rich soil.

If the effects of the putrefaction of vegetable or animal substances, when mixed with, and separated in the earth, be duly attended to, we shall find this a very probable

opinion. Vegetables, or animals, if exposed to the air, soon putrify and fly off into the air : but when they are divided into small portions, and mixed with the earth, the earth renders the progress of their putrefaction slower, and intangles the volatile alkaline particles, which would otherwise fly off into the air. These are not only strongly attractive of moisture, but, like the fixed alkali, attract the acid in the air, and effervesce with it ; whence the double advantage of a moist and loose soil.

If we attend to the infinite number of animals and vegetables which are rendered volatile by putrefaction, and fly off into the air ; and to the quantity of perspirable matter from animals and vegetables sent into the air ; and also to the effects of the acid found every where in the air on such substances mixed with the earth ; we need no longer wonder at the efficacy which writers, in all ages, have ascribed to the air, with regard to its quality of enriching the earth.

That the peculiar richness of soils is owing to the putrid or rotten particles mixed with them, is an opinion of long standing. This is Virgil's *putre solem*, rotten, crumbling, or loose earth ; and that which Columella distinguishes by the appellation of *pinguis et putris*, fat and rotten, or fat, loose, and crumbling, as the soil which yields the greatest profit with the least labour and expence, because it is naturally nearest that state which cultivation is intended to effect ; " for to cultivate is no other thing but to open, loosen, and ferment the earth."

From these principles it is that we account for the appearances before-mentioned of good soils, such as, their blackish or dark colour (which is that of all soils in a putrid state) their ready crumbling, easy mouldering, fragrance of smell, &c.

Mr. Evelyn constantly imputes the fruitfulness of the earth to a nitrous salt : but if these rich putrid substances are substituted instead of that salt (and it seems highly probable that he means them) we shall find that his reasoning will appear full as strong, more intelligible, and indeed more rational. The substance of p. 312, and 313, of his Philosophical Discourse of Earth, so far as relates to this matter, will run thus :

" It is this putrid quality which entices roots to affect the surface of the earth, upon which the fertilising rains and dews descend ; which makes all covered and long shaded earth, abound in fertility ; which resuscitates the dead and mortified earth, when languishing and spent by our indulgence to her verdant offspring ; her vigour being quite exhausted, till the rains and showers gently melt into her bosom what we administer to supply that which has been consumed. It is this which fertilises and renders Egypt so luxuriantly fruitful after the inundations of the Nile, &c."

GROUND-IVY, the name of a trailing plant, which strikes out roots from the joints of its stalks : but as it generally grows under hedges, and upon the sides of banks, it cannot be of any great disadvantage to the soil.

GRUB, the name of a large maggot, produced from the eggs of a certain species of butterfly. It is of a large size, and often does great injury to the corn by undermining it, and preying on its roots. It produces the beetle, and is by some called the rook-worm, because rooks are particularly fond of it. The best way of destroying the grub, is good and frequent ploughings, which will clear the ground however infested with this insect, for some years at least. See POTATOES.

GRUBBING, the clearing of lands from the roots and stumps of trees, bushes, &c.

Mr. Worlidge rightly observes, that the best and cheapest method of grubbing up thorny shrubs, broom, grass, &c. is ingeniously delivered by Gabriel Platt. The instrument he has recommended for this purpose resembles a three-grained dung-fork, but much larger and stronger, according to the bigness of the shrub, &c. the stake thereof resembling a large and strong lever. This instrument being placed about half a foot, or any other reasonable distance from the root of the shrubs, &c. and driven to a good depth, with a strong hedging beetle, then raised by laying under it a stone or log of wood, is pulled down by means of a rope fastened to the upper end of the stake, and the whole bush wrenched up by the roots.

GUTTERING-Plough, a small and simple instrument used in some counties for draining wet lands.

It is small, and worked by a single man. A trench four or five inches broad, and six or eight deep, may be easily made with it ; and on that account it is much used for making

ing drains in bleaching grounds, and may do very well for wet clay meadow-land, where the soil is shallow, and apt to produce a large quantity of rushes.

It consists of a piece of iron about five inches broad, and pointed at the end. Upon this piece two other pieces are fixed perpendicular to the former, one on each side, the fore-edges inclining backward; so that the three edges of the instrument form a capital A. To the bottom plate is fixed a socket, for receiving the stale, which is set higher

or lower by means of a wedge on the under-side. At the end of the stale is a cross piece, three feet long, against which the man's breast is placed when he shoves the instrument before him, in order to cut the drain. A rib, twenty-four inches long, is fixed on the socket, and at the end of it a peg, about a foot long and two inches diameter, is fastened to the side of the stale with screws. This peg resteth on the land, when the clod is turned out of the mouth of the instrument.

H.

HACK, a pick-axe, or mattock, having only one end and, that a broad one.

HAIR-STARING (or planted coat), is said of a horse whose hair bristles up, or rises upright; which disorder is owing to being ill curried, not well covered, or too coldly housed.

In order to make the hair of an horse smooth, sleek, and soft, he must be kept warm at heart, for the least inward cold will cause the hair to stare; also sweat him often, for that will loosen and raise the dust and filth that renders his coat foul; and when he is in the height of a sweat, scrape off all the white foam, sweat, and filth, that is raised up, with an old sword-blade, and that will lay his coat even and smooth; and also when he is bled, if you rub him all over with his own blood, and so continue two or three days, and curry and dress him well, it will make his coat shine.

Hair falling, or shedding, from the mane or tail of a horse, is caused either by some heat taken, that has engendered a dry mange there; or it proceeds from some surfeit, which causes the evil humours to resort to those parts.

To cure this, anoint the horse's mane and crest with black soap; make a strong lye of ash-ashes, and wash it all over with it.

But if a canker should grow on a horse's tail, which will eat away both flesh and bone; then put some oil of vitriol to it, and it will consume it: and if you find the vitriol corrodes too much, you need only to wet it with cold water, and it will put a stop to it.

If you have a mind to take away hair from any part of a horse's body, rub it with the gum that grows on the body of ivy, or the juice of fumitory that grows among barley, or boil half a pound of lime in a quart of water, till a fourth part is consumed: to which add an ounce of orpiment, and lay a plaister on any part of the horse, and it will do the business in a few hours.

HALTER-CAST, is an excoriation of the pastern, occasioned by the halter being entangled about the foot upon the horse's endeavouring to rub his neck with his hinder foot.

If your horse is apt to unhalter himself, you must get him a halter with a throat band.

Halter cast is thus: when a horse endeavours to scrub the itching part of his body, near the head or neck, one of his hinder feet entangles in the halter, which by the violent struggling of the horse to disengage himself, he sometimes receives very dangerous hurts in the hollow of his pastern.

For the cure of this, take linseed oil and brandy, of each an equal quantity; shake them together in a bottle till they are well mixt, and anoint the sorance, morning and evening, first having clipped away the hair; but take care to keep the foot very clean.

Another easy remedy is, take oil and wine, of each an equal quantity; boil them together, till the wine is evaporated; and apply the remainder of the oil once a day to the part, which will be quickly healed.

HALTING. A limping, or going lame, an irregularity in the motion of an horse arising from a lameness in the shoulder, leg, or foot, which makes him favour the part, or use it timorously. Halting happens sometimes before, and sometimes behind; if it be before, the hurt must of necessity be in the shoulder, knee, flank, pastern, or foot.

If it be in the shoulder, it must be towards the withers, or in the pitch of the shoulder, and may be known in that he will a little draw his leg after him, and not use it so nimbly as the other.

If he cast it more outward than the other, it is a sign of lameness, and that the grief lies in the shoulder: then take him in your hand and turn him short, on either hand, and you will find him to complain of that shoulder he is lame of, and he will either favour that leg or trip in the turning: also lameness may be seen by him while standing in the stable; where he will hold the lame leg out more than the other; and if when you are upon his back, he complains more than otherwise he does, the grief certainly lies in the withers; so that griping him hard you will perceive him to shrink, and perhaps offer to bite.

If he treads thick and short before, then the grief is upon the pitch of the shoulder, close to the breast, which may be discovered by setting the thumb, and pressing it hard against the place, and thrusting him with it (if you would have him go back), upon which he will shrink, and put back his leg, foot, and body: if the grief be in the elbow, it may be known by pinching him, with the fore-fingers and thumb, and then he will hold up his leg and offer to bite.

But if the grief be in the knee, it may be discovered by the horse's stiff going; for he will not bend it so nimbly as he does the other.

If it be in the flank, or shin-bone, the same may be seen or felt, it being a back sinew, splinter, strain, or the like.

If it be in the bending of the knee, it is a malander, which is also easily discovered.

Farther, when the pastern, or joint, is affected, it may be known by his not bending it so well as the other: and if you put your hand upon the place, you will find it very hot.

If it be in the foot, it must be either in the coronet or sole; if in the coronet, probably it comes by some strain or wrench.

If in the hoof by some over reach, or distemper in or about the frush.

If in sole from some prick, acclay, nail, &c.

HAND, is a measure of a fist clinched, by which we compute the height of a horse.

HAND-WEEDING. See WEEDING.

HANGING-GATES. Mr. Marshall, in his Rural Economy of the Midland Counties, makes the following observation:

"1785, March 27. In Yorkshire, I paid considerable attention to the hanging of gates; not with pivots only, but with hinges; and gained an adequate idea of the leading principle; which, however, I did not commit to writing.

"Here, I have had occasion to apply the principle to practice.

practice. But the true principle had escaped my memory ; a false one having supplied its place : namely, that the only thing needful was to throw the gate out of its upright, so as to learn toward the post ; no matter whether this inclination of the gate were obtained, by the hooks, or the thimbles.

"Led by this false idea, I had conceived that the simplest, and of course the best, way to hang a gate, would be to put the hooks in, exactly perpendicularly to each other, and to give the fall by the thimbles alone.

"In consequence, I prepared a bottom thimble, with a clasp to take the hartree, and with an eye at each corner ; in order that the gate might be occasionally hung, on one or other side of the fence, as the occupation of the inclosure might require, and with this thimble hung a gate.

"The centers of the pins of the hooks being placed exactly perpendicularly to each other, by a plumb line, the gate was hung on. But, instead of falling this way or that, it stood stationarily, wherever it was set !

"Thus finding myself at a stand, without inclination to remain long in so disgraceful a predicament, I set the workmen to other work, and myself to investigate the principles of gate-hanging.

"After musing some time, with the gate in my hand, and sketching my ideas afterward on paper, I saw clearly, and to demonstration, that the fall depends entirely upon the hooks : the axis or motion is given by the situation of the hooks, with respect to each other ; and, which ever way the axis of motion inclines, that way the gate will fall.

"The theory of this principle is easily demonstrable ; but as it requires diagrams to explain it, and is merely elementary, it may appear with greater propriety in another place :—I therefore give, in this, the practical part of the Minute, only.

"A gate should have what is called two falls : one at the post, to make it catch ; and another at right-angle to the gateway, to prevent its standing open.

"The quantity of fall varies with the uses and length of the gate, and the judgment or fancy of the hanger. If a gate has too much fall at the post, it is liable to beat itself to pieces ; if too little, it does not catch with sufficient certainty, and is liable to be blown open by the wind, and thus becomes a deception, rather than a safeguard.

"On sufficient trial, I have found that, for field gates, one inch and a half at the post, and an inch at right-angle, give what appears to me a proper fall.

"With respect to thimbles, the only use of their being made in this or that form, is to counteract the obliquity or crosswinding of the hooks : so that the gate, when shut, shall hang plumb and level ; or every way in a perfectly upright position.

"The way to ascertain the true position of the hooks is that of taking a plumbing line (or any string with a stone tied in it), and, looking along the line of the fence or gateway, drive the hooks, or move the post, until the center of the pin of the upper hook appears, by the line hanging perpendicularly before the eye, an inch and a half nearer the middle of the fence than that of the under one : and then looking along the line of the road (or perpendicularly to the gateway) see that the center of the pin of the upper hook stands one inch nearer the middle of the road than that of the under hook ; observing, likewise, that the pins of the hooks stand, not exactly upright, but in a line with each other, forming one direct axis of motion.

"Gates being liable to sag, or droop, by hanging, they should be hung rather above than below the level.

"The top thimble being usually put into the middle of the hartree, with the eye as near to it as the shoulder of the hook will admit ; the counteraction, of course, depends on the bottom thimble.

"If the bottom thimble be made with two strong straps, to clasp the lower part of the hartree (as it always ought), with an eye on one side, or with two eyes, one on each side, and their centers three inches apart, and with necks projecting, when fixed, one inch farther from the hartree than that of the upper thimble (or, more accurately speaking, with the center of the eye or eyes of the lower thimble standing an inch farther behind the hartree than the center of the eye of the upper one), the gate acquires, on a certainty, the required fall, yet hangs level and upright when shut."

HARNESS-GALLS ; sometimes the breasts of horses are galled by the harness, or rise in hard bunches, especially in rainy weather.

To cure this, first shave off the hair about the sore very close, and rub the whole breast with a lather of water and black soap ; then wash that part of the breast which is usually covered with the petrel, with salt and water, suffering it to dry off itself.

If the hardness of any part of the harness occasions the galling, take it away, or cover it with little bolsters.

HARE, a mist.

HARROW, an instrument for breaking the clods of earth, and covering the corn when sown. It is a sort of wooden drag, made in the form of a square, with large iron-teeth or tines. The reader will find different sorts of harrows described under the articles **BEANS**, **LUCERNE**, &c.

Mr. Marshall observes, that harrowing of wheat in the spring is allowed to bring ketlock and poppies ; he therefore disapproves of harrowing winter crops in spring, unless they are hide-bound, or to remove some particular obstruction. See **FALLOW**.

HART-CLOVER, melilot.

HARVEST, the season when the corn is ripe, cut down, and carried into barns, &c.

Wheat which is full of weeds ought to be cut three or four days sooner than ordinary, that the weeds may have time to wither before the corn become too ripe : for if it be not cut till the grains are full ripe, it will be liable to considerable damage by shedding, loss of colour, and injuries from rain, whilst it remains exposed for the weeds to dry. A single shower, indeed, or even a day's gentle rain, whilst it lies in swarth, is thought to be rather beneficial to the grain, by making it feel dry and slippery, and thresh the better : but all possible care should be taken to guard against its being wetted too much. When, through any unavoidable accident, it is laid up not thoroughly dry, though it will not take much harm in the mow, it will sweat and cling together when laid in a heap after being threshed, and look as white, with mouldiness, as if it had been strewed with flour. Such corn will not keep, and therefore should be sent to market, and sold, as soon as it is threshed.

In Oxfordshire, and several other countries, they bind up their wheat in sheaves, though it be full of weeds, and set three sheaves somewhat sloping against three others, after which they cover their tops with two sheaves opened at their ear-ends, which are extended and placed downward. In this situation they let their wheat stand three weeks or a month in the field, before they carry it in : for no wet can hurt it, nor is it apt to grow in the ear, when thus sheltered.

In their wheat-pooks, as they call them in Wiltshire, the sheaves are set in a circle, with their ears uppermost, another circle of sheaves is placed upon that, and so on, contracting each round, till the pile ends in a point, upon which a sheaf opened, and turned with the ears downward, is placed, like the hackle of a hive ; for an ear turned downward will not grow, though ever so much wet fall upon it, and the bottom of a sheaf being broader than its top, every upper one shelves over the under, like the eaves of a house. A load, or two loads, may be thus put into a pook, which is a very good way to secure corn against rain, and to give the weeds among it time to dry. But, as Mr. Lisle rightly judges, this method is not altogether proper when the wheat is intended to be laid up in a rick ; because, if the weather prove wet, mice will run to it for shelter, and will be carried in with the pooks. It is the general way of making wheat-ricks in the Isle of Wight, without thatching.

Though most corn is bettered by lying awhile in swarth, or grips, to take the dews, which contribute to render its grain plump and of a good colour ; yet its straw becomes thereby the worse for fodder, unless it was cut before it had attained full maturity, and lies out no longer than till it be sufficiently ripened.

In hot dry summers, when the corn ripens fully, and its own vigour gives it a proper colour, and plumps up the grain so that the husks readily yield their contents when threshed, wheat need not lie out in grip, before it is sheaved, or in sheaf ; unless it be very full of grass and weeds : but in cold summers, the wheat is horny and pale, the grains are thin and require being plumped, and their husks cling so close, that they must be mellowed, in order to make them thresh well. The full grain which swells the chaff, even till it opens, in good and fruitful years, lies almost bare to every moisture ; and the heavy ears then spread and hang

hang over the sheaf, which of course opens wider, and lets the rain into the bands sooner than in less kindly seasons, when, the wheat being light, the ears in the shock stand more upright and closer together.

In proportion to the heat of the weather, greater expedition is necessary in reaping: for corn, when hastily ripened, scorched up by the sun, and full in grain, soon takes a stain, is damaged by wet, and easily sheds at every blast of wind. The prudent husbandman should, therefore, in such cases, employ the greater number of reapers; for he cannot desire more than that his corn be perfectly ripe, and of a good colour; for which reason, the less it then lies abroad in grip or sheaf, the better it will be. Cutting it high up, so as to avoid the intermixed grass as much as possible, by which means it is the sooner fit for carting, has been found very serviceable on these occasions; and Mr. Lisle is of opinion that, especially in hilly countries, corn can never be better housed, if thorough ripe, hard, and not weedy, than by gripping and carting as fast as it is cut down; because the dampness which it takes by lying on the ground all night, is not easily removed.

It is always most advisable to turn the grips of wheat which is left out, very early after their being cut down, in order to get them dry as soon as possible. By this means they are kept the longer from sprouting in the ear, in case of rain: for if dripping weather or driving mist should ensue, and continue for any time, after they have been already loaded with wet, all the art of man cannot prevent their growing: nay, even independent of other accidents, the bare weight of the ears will sink the grips of wheat to the ground, though they have been laid ever so light and hollow; and they will certainly be injured thereby, if suffered to lie long out in wet weather. The best method of guarding against this, is by laying them in triangles, as directed by M. de Lisle.

A principle somewhat similar to this seems to be the reason why the farmers in Leicestershire, and Northamptonshire, in particular, where the land is rich, deep, lies flat, and is much inclosed, leave a very high wheat stubble, upon which the grips are supported, lie the hollower from the ground, and consequently are the easier dried by the sun and wind; for it is to be observed, that the fatter and richer the soil is, the sooner the grips will grow after they have taken wet, if they lie upon the naked ground; much sooner than they would, in the same case, in a hilly country where the land is poor. Husbandmen there besides esteeming it an advantage that they can stow a greater number of short-cut sheaves in their barns, think the loss of the straw compensated by the excellent thatch which they make of the stubble. In some places they mow it for drying malt.

The forwarder the harvest is, and the warmer the season, the longer the corn may safely lay in the field, either in grips, or sheaves: for this exposure to the air, after it is cut down, mellows it, and makes it thresh better and look finer. Thus, when the wheat-harvest takes place by the middle, or at least before the latter end of July, of which we have had instances, there can be little danger in letting the wheat lie abroad four or five days or a week, if it be not over ripe when cut, even though a rainy day or two should come: for at that time of the year the sun is so hot, the days are so long, the grass so short, and the dews generally so little, that the corn soon dries; even after a hard shower; whereas in the middle, and still more towards the latter end of August, the rainy season frequently begins, the dewy nights grow so long, the grass is so rough, and the sun's drying power so much abated, that, if wet weather comes on then, the corn will be much more apt to grow.

A caution which Mr. Lisle recommends as singularly important in hilly countries, is not to bind the grips of wheat up into sheaves too early in the day; because, in such a situation, the grips take so great a damp by having lain on the ground, that, though the straw, and chaffy ears may seem to be dry when the dew is first gone off, and after the sun may have shone an hour or two upon them, yet there will remain an inward dampness in the corn, and within the straw, which, if laid up in that condition, will come damp from the rick or barn at threshing time. The afternoon is therefore certainly best for gripping and binding into sheaves in such countries, but so that this work may be finished before the day is over. The bands should, however, be laid in the morning, that they may not crack;

for the straw will not twist after the sun is up, but will be brittle, and break off below the ears. The turning of three or four of the stubble or bottom ends of the straw to the ears of the band, helps greatly to add to its strength and toughness.

The bands for binding up the sheaves should not be spread but in fair weather, because, being pressed down by the grip or two which it is necessary to lay upon them to keep them in their places and prevent their being untwisted by the sun, they will grow sooner than any other corn, if rain should come; for they cannot dry, on account of their lying undermost. But though the bands must always be made while the morning dew is upon them, the sheaves ought not by any means to be bound up wet, if they are, they will certainly grow mouldy.

Farmers do not always attend sufficiently to the binding up of their sheaves, but suffer the reapers, for dispatch, to tie the bands just underneath the ears instead of binding them at the other end; the consequence of which is, that they will hardly hold together to be flung into the cart at harvest, and will certainly be in great danger of falling to pieces before they are threshed.

If a little rain is foreseen in harvest-time, it is best to bind the grips up into sheaves as fast as they are made; because small showers will wet the single grips so much that they cannot be bound up, and those showers may be the fore-runners of greater rains. The sheaves, being bound, will soon dry after such wet. But if a hard rain is foreseen, the best way is not to bind up into sheaves, because they will then be wet to the bands, and must all be opened again. One of Mr. Lisle's neighbours, to whom this happened, unsheaved some of his wheat to dry it, opened it, and turned it so often, that the ears broke off, by which he lost half his corn. Caution ought therefore to be used in this case, lest by curing one evil we create a worse.

All farmers agree that rain which comes with a driving wind, is the worst of any weather for sheaves of wheat out in the fields; and that it is worse than a downright soaking rain for such sheaves as are wet to the bands.

In a wet harvest, small sheaves are best, because, thin at top, and falling close, the rain does not sink down into the middle of them, and so go through into the bands, as it is apt to do in great sheaves, which lie broader, and take a larger compass. Small sheaves are also best when many weeds are intermixed with the corn, because the air, wind, and sun, have then a greater power to dry them, than they could have if the sheaves were large.

It has been the opinion of some good farmers, that if the weather be likely to continue fair, it is best to lay the sheaves, the night after the wheat is cut, one by one, flat on the ground, in order to make the straw lie the closer together, and their ears stand the stiffer, and more upright, by which means they will be less apt to open at the top, and rain will have the less power to penetrate them when laid in shocks.

Mr. Marshall, in his Minutes of Agriculture, recommends the tying of sheaves but loosely and not too large; but the extreme must be guarded against; for if they be tied too loosely there is danger of their slipping wholly out of their bands; besides their being difficult to load, and worse to stack. He recommends also that they be set up in such a manner, as but just to touch each other at the butts and ears; leaving a space of a foot and a half between each sheaf at the band place, and that the ears of the bands be turned inward. He observes in general, that the small, loose-tied sheaves will dry soon, while the large tight-tied ones, of the same shock, will grow; and that the ears of the bands are the first that will grow; and that those shocks which stand free and open, far better than those of which the sheaves stand huddled together in a close lump, through which, neither air or sun can penetrate. Instead of tying the band at the foot of the butts, he recommends the tying them loosely about the same distance from the tips, and spreading the butts, setting the sheaves up singly in resemblance of sugar loaves, leaving the insides totally hollow; this will enable them to dry very soon; and then shifting the bands the next day back again to the common banding places, and opening the ears, they will soon be perfectly dry." In his Rural Economy of Yorkshire, Mr. Marshall observes that, "nine-tenths of the corn that is cut with the sickle in this kingdom is cut by men. In Surry and Kent a woman may sometimes be seen with a sickle in her

her hand. In Norfolk it is a sight which is seldom or ever seen. Here, it is almost equally rare to see a sickle in the hand of a man; reaping (provincially, "shearing") being almost entirely done by women.

Three women and one man make a sett; who, of a middling crop, do an acre a day. If corn be thin, a man will bind after four women; if very thick upon the ground, he requires a boy to make bands for him.

Sometimes the bands are laid for the women to throw their handfuls into; but in general they lay the corn in "reaps," of about half a sheaf each; the binder gathering it up carefully against his legs in the manner wheat straw is usually gathered on the threshing-floor. This is much the best way (though somewhat more troublesome); the corn being by this means bound up tight and even, and the sheaves made of an equal size.

The day-wages of a woman in harvest is 10d. of a man 2s. Thus wheat, which in Surry would cost 10s. to 12s. and which, in any country I have observed in, would cost 7s. or 8s. is here cut for 4s. 6d. an acre."

Reapers should take care in placing their grips; to lay the straw end in the furrow, and the ears out; because these will then stand sloping up, and lie tolerably dry, even though rain should come; but in the other way they would soon grow.

Mr. Lisle remarks, in his *Observations* (which might have been thrown into a more regular, as well as more laconic form, before they were published; for that gentleman certainly never intended, that his unconnected notes and memorandums should appear in the manner in which he penned them merely for his own use) that "one of his reapers, when he had made up some wheat into sheaves, the wheat being long-eared and top-heavy, said, rain had not need meet with those sheaves before they were carried home." Mr. Lisle asked him, "Why so?" To which the other replied, "because the ears being long and heavy, were busled-headed, that is, did hang their heads downward into the sheaf, so that (in case rain should run down to the bands) neither sun nor wind could enter in to dry them; whereas, said he, when the ears are short, and not heavy, they stand upright and hollow, so that the sun and air may easily dry them."

The straw of blighted wheat, being hollow and spongy, is very apt to imbibe moisture; for which reason the best way is to house such corn as soon as it is tolerably dry, especially if there be the least prospect of rain; for if straw of that loose texture should once soak in wet, and showery weather should afterward come on, it would require much more time than other corn to dry and fit it for threshing.

Experience has shewn, that wheat keeps better when stacked in the ear unthreshed, than its grain does alone, when threshed out and laid up in granaries: besides which, a farther advantage which attends the stacking of this corn is, that the husbandman need not thresh it, but as his markets or other occasions require; whereas, if it were to remain long in the barn, he would not be able to preserve it from rats, mice, and other vermin, which harbour in the walls, roofs, &c. of such buildings.

To guard against these enemies, as well as against the dampness of the ground, which would otherwise occasion great loss (for there have been instances of its rotting piles of corn to the thickness of a yard, or more) four, six, or more strong posts, according to the intended size of the stack, are driven into the ground, beams of a proper strength are laid across them, and upon these is made a floor to support the stack. Some farmers build these platforms for their stacks so high from the ground, that there is room to shelter their carts and other implements of husbandry under them: and some again, as an additional security against rain and birds, erect sides and a roof, by which means they form a kind of barn: but this is needless, if the corn be stacked, as it ought to be, in sheaves, with the ears turned inward, and the straw ends outward, and the top well thatched with good wheat straw, which is the best of any sort for thatching. They likewise cover the supporting posts with tin, for about a foot in breadth from the top, to prevent the mice and rats getting up: but this method soon proves ineffectual, because tin is very apt to rust, and consequently loses its smoothness. A better way, as Mr. Mortimer advises, is to cover those posts with Dutch tiles, such as chimnies are commonly set with, because they will always keep smooth. Others make their supporters of two hewn stones, one of which, being about three feet high, and sloped from the bottom, where it is two feet wide, to

the top, where it is but a foot thick, stands upright, and is covered with a large flat stone, about a yard square, or which is better, of a round form. This not only prevents rats and mice from climbing up, but is also a security against the dampness of the ground. Others again, whose method is the best of all, lay a foundation of brick as wide as the stack is intended to be, and build round it a brick wall, about two feet high, capped with hewn stones, which project sufficiently outward, to hinder the ascent of any sort of vermin. If either rats or mice should, by the help of any thing accidentally rested against the stack, chance to climb up, and get into the corn, they will not be able to remain there long, because, as they cannot live without water, necessity will force them down, and their former means of climbing being removed, they cannot get up again. If any of them chance then to be left in the stack, they will soon die there for want of drink.

Particular care should be taken in the stacking of wheat, always to lay the ear ends of the sheaves inward, and upon a rise, so as to keep the middle of the stack full while it is worked up: for in this case, when it settles, the sinking will be chiefly on the outside, which will thereby be made to lie the closer, and the straw ends being outward, and inclining downward, birds cannot get at the grain, nor can rain be driven up to the ears. The shortest and thinnest sheaves should be used in the topping of the stack, because it cannot be so conveniently drawn in and narrowed with great long sheaves. They should be taken from off the same ground, if the husbandman wants to keep any particular sort or growth of corn pure and unmixed. Where less nicety is observed; oats, or some other kind of coarse grain, are frequently laid on the top of the stack of wheat under the thatch, the better to preserve it from being wet. Wheat, properly stacked, will keep in perfect order for many years.

Mr. Lisle, who does not approve of stacking any corn but wheat, when room can be found for it in the barn, thatched a long rick of vetches, brought up sharp, with barley straw, to the thickness of three feet, and yet found, upon cutting it, that the rain had penetrated through this thick covering, and done considerable damage to the vetches. He imputes this, first, to barley-straw's being more woolly and spongy than wheat straw, which is close and hard; and, secondly, to the stack's having sweated and heated pretty much, in which case the covering of straw is always hollowed and softened, and consequently rendered the more apt to admit and retain wet.

The stalks of oats are naturally so smooth and slippery, that they are apt to slide in the stack, which then frequently tumbles down, especially if this corn was very dry when carried in. An oat rick must therefore not be widened by any means beyond its foundation, which generally is of faggots, nor should its sides ever bulge out, but, on the contrary, they should be gradually contracted. Barley, having a rough stem, may be piled more upright.

When sparrows roost at night in holes, under the eaves of a stack of corn, it is reckoned a sure sign that there are neither rats nor mice in the rick; for their squeaking and running about in the night, would disturb the birds, so that they would not stay there.

Mr. Marshall, in his *Rural Economy of the Midland Counties*, on the subject of *Harvesting*, says as follows:

"The corn harvest of this district, though it cannot be called, emphatically, a corn country, is not got in without some foreign assistance, from whom are termed 'peakrills' and 'low country men'—namely, men, and some women, from the Peak of Derbyshire, and the Morelands of Staffordshire. The wheat is much of it cut by these itinerants.

"The harvest labourers of the district are not hired for the harvest month, as in Surry, &c. nor for the harvest, be it short or long, as in Norfolk; but work by the day, as at other seasons of the year; and for the same wages, a shilling a day; but with the addition of full board, so long as the harvest lasts: and, in addition to this, each labourer who has been constantly employed through the summer, has a right, by custom, to the carriage of a load of coals, in autumn. It is also a pretty common custom for farmers to let their constant labourers have their bread corn somewhat below the market price; more especially when corn is dear.

"The hours of work, too, like the wages, are the same in harvest as in less busy seasons; and the same slow pace is too generally observed. No coming at four in the morn-

ing; no trotting with empty waggons; nor any personal exertion, whatever, betokening harvest; saving such as are stimulated with ale as strong as brandy!

"The method of harvesting sheaf corn, whether wheat or oats, is, in this district, above par. In part it is new to me: reaping being generally done by the "threave:"—feldom by the acre.

"A threave is twenty-four sheaves; each sheaf measuring a yard round, in the banding place; the string crossing the band in measuring. A better sized sheaf, for seasons and crops in general, could not, perhaps, well be fixed upon. See WHEAT.

"The great difficulty, in reaping by the threave, lies in not being able to get the sheaves made up to the standard. The deviation, however, is on the right side: whereas, in reaping by the acre, it will always be on the wrong. For, in that case, it is the interest of the reapers to make large sheaves; having thereby fewer bands and less binding. On the contrary, in reaping by the threave, it is their interest to make small sheaves.

"Another conveniency arises from reaping by the threave: any number of hands may be scattered over a piece of corn, as circumstances may require, without the extraordinary trouble of measuring the land in this case. Each man sticks to his "threo," whether it consists of one or more lands, and sets up his own sheaves in one row of shucks, of twelve sheaves each: so that the trouble of ascertaining the number of threaves is inconsiderable.

"The price, for wheat, is fourpence a threave, with beer; provided the crop be tolerably good: if very thin, five-pence or six-pence is sometimes given: or such thin wheat is sometimes reaped by the acre; at about six or seven shillings an acre. For oats, three-pence is the common price.

"In carrying sheaf corn, there is usually a loader to each pitcher. The butts are laid outward all round, as in Surry and Norfolk; forming the load, not into a long square, but into a figure between that and an oval; binding it across and across, in three or four places.

"The method of harvesting loose corn, whether oats or barley, is reduced, here, to the lowest degree of simplicity.

"In Yorkshire, barley and oats are mown inward, against the standing corn, and harvested in sheaf.

"In Kent and Surry, they are mown outward, with a cradle, laying them so straight and neatly, they might be bound after the scythe; but are harvested loose. In cocking them, the Kentish farmers make use of corn forks; laying the ears all one way; preserving the same neatness and regularity, even to the stack: the outside course of which is laid with unbroken pitches, with the butts outward, having thereby a security nearly equal to that of sheaf corn.

"In Norfolk, they are mown outward, with bows, fixed to the heels of the scythes; which, however, do not lay them so neatly as cradles; but still the heads, if the crop stand any way fair, lie one way, and the tails the other. There, too, the corn-fork is used.

"Here, they are mown outward with naked scythes; and cocked, or rather rolled into rough bundles, with common hay forks; and this, generally, two or three days before they are carried: a crop of clover, a crop of barley, a crop of peas, a crop of oats, and a crop of beans and vetches, being harvested very much in the same manner.

"Mowing barley and oats with naked scythes, and pulling them about with hay forks, have, to strangers, a slovenly and wasteful appearance. But with respect to cocking loose corn before the day of carrying, something, perhaps may be offered in its favour."

"It is true, that, in other districts, it is considered as very bad management to leave even a few cocks remaining only one night; under an idea that, if loose corn once get wet in cock, it is difficult to get it dry again, without a great waste of labour and corn. Nevertheless, experience shows that even a very heavy shower has not that evil effect in the practice of this country.

"An incident in my own experience convinced me of the fact: I had, through neglect, a few oats in cock left out all night. Next day, much rain fell; but the succeeding day proving fine, they were got into very good order again, in this manner. The tops were first dried, by raising them up, light and porous, with the tines of a fork; so as to let the sun and air into them; and, when the tops were dry, the bundles were turned over to air the bottoms.

"In this manner, and without greater trouble, corn cocks generally dried; though sometimes it will happen that

they require to be pulled to pieces: in which case, there is, of course, considerable waste.

"The Midland farmers have one very good plea for harvesting oats in this manner. For, by cocking them a few days before carrying, the labour and waste of turning is saved: besides, by being cocked while a portion of the sap remains in them, they are not so liable to be shed in cocking, as when they are disturbed in a dry parched state.

"This practice, probably, took its rise in open common fields. Formerly, much of the district lay in that state; the soil being raised into high roof-like ridges. The furrows and skirts of the lands lay, of course, proportionably low; and the corn being thereby frequently deprived of the benefit of the sun and wind, it was found, by experience, most eligible to gather the corn into heaps, and place them upon the top of the ridges. And this is the present practice of "field farmers." In a few days after cutting, the whole crop may be seen standing in pitchcocks, placed in close order, like strings of beads stretched along the ridges.

"But notwithstanding this practice may be eligible where corn is mown with the naked scythe, and rolled up into rough porous bundles, it does not follow that it should be universally adopted. Were a Kentishman to leave his unruffled close piles exposed even to one heavy shower, he would find some difficulty to get them thoroughly dry again, without spreading them abroad.

"An evil attendant of the Midland method of harvesting loose corn is, the increase of bulk which corn harvested in this way acquires, comparatively with the same quantity of corn harvested in the Kentish manner. More barn-room is of course wanted, and a greater number of loads are to be carried. Four loads an acre is no uncommon crop; five loads are talked of, and are sometimes carried. But the method of loading, and that of barning, both of them tend to increase this evil.

"The method of carrying loose corn here, differs from that of other districts, in having only one loader to two pitchers; and in loading, not with the arms, but with a fork; the loader standing in the centre of the load, and piling the corn loose and light around him. Thus the entire process tends to increase the number of loads.

"And the method of housing is not calculated to do away the inconveniency. I never met with an instance, in this district, of a horse, or any other animal, being used on a mow.

"Ricking, however, remedies the evil; and in this district, where barn-room is more contracted than in some others, loose corn is pretty generally put into ricks.

"In the method of ricking loose corn, nothing is noticeable; excepting the last finish. To endeavour to secure the stems from the pillaging of sparrows, and other small birds, they are, generally, either "tucked" or "pared:" that is, either the loose ears, exposed on the outside, as many unavoidably are, in the method of harvesting above described, are doubled back, and thrust into the stem; or the entire stem is shaved with a scythe laid longway in the handle, or some other similar instrument: in some few instances, I have seen the stems thatched, as the roofs.

"On ricking sheaf corn, a few particulars may be mentioned. Though built on a square frame, the stem—provincially the "wall," is not carried up square, as in Surry and Norfolk; nor round, as in Gloucestershire; but in a form between the two; the corners of ricks being rounded off, as those of loads.

"Large ricks being fashionable, and it being customary, in carrying up the stems, to bind with the ears, instead of the butts of the sheaves, they are of course liable to slip. This has taught the Midland rickers an admirable expedient, when any symptom of slipping, in carrying up the stem, is perceived, to prevent the mischief; namely, that of laying long green boughs across the part affected: an excellent thought.

"In setting on the roof of a sheaf corn rick, the Midland rickers are above par: laying the last course of the stem so as to project a few inches, and form a kind of cornice for the eaves of the thatch to rest upon, and to carry the drip clear to the stem. The middle is then filled in full and round; so that the butts of the outside sheaves hang downward.

"This, though not peculiar to the district, is a rule which ought always to be observed, in forming a roof; for, in this case, if rain should happen to penetrate through the thatch, there is little fear of its doing, even the roof of the rick much injury; every straw becoming a conductor to lead it to the surface.

"Another

"Another commendable practice, in forming the roof of a sheaf corn rick, and which is new to me, is that of carrying it up without a pitching hole. A man sticks his heels into the roof, and stands with great ease and safety. This might well be copied by other districts: holes are dangerous; unless great care be used in making them up, and in thatching them securely. For if water enter, in this part, it finds its way directly into the heart of the rick.

"The method of securing corn ricks, in a catching season, previous to their being thatched, is likewise entitled to notice. It is effected with "battins"—small trusses of straw—which are afterward used as thatch. A row being laid close and pegged securely along the eaves with their butts downward; others are laid (firmly, but without pegs), as tiles or slates are laid on a roof, with their heads downward; spreading the ears (without untying the bands) so as to prevent the rain water from getting through between those which lie below: continuing, thus, till the ridge be reached.

"Having plenty of these battins, in corn harvest, ready at hand, to cover a rick with, in catching weather, is a very great convenience. A rick of 200 threave, eighteen or twenty loads, may be secured in a few hours: or, with plenty of hands, in half an hour.

"The method of thatching ricks is also peculiar in this district, and requires to be mentioned. Instead of thrusting the ears of the straw into the roof, and spreading the butts outwardly as a security; the straw, in thatching, is laid on as the battins, with the ears downward, and of course outward (excepting the first course at the eaves), and is secured in its place, by pegs and hay ropes; passing horizontally from end to end of the roof; at the distance of twelve or fourteen inches from each other.

"Sometimes thatch is bound with ozier twigs, which are much more lasting than hay bands (that are only annuals), in a simple ingenious manner. The small end is formed into an eye, like that of a with, and the thick end run into the roof as a peg, through the eye of the succeeding twig.

"An inconveniency attends this method of thatching. A rick cannot be thatched with propriety, until the roof has done settling. For if it settled after it is thatched, the straw is raised into puckers between the bands, and the water of course, let in."

In his Rural Economy of the Vale of Gloucester he says, "the work of harvest was, formerly, done chiefly by harvest-men; but now, in part, by the acre.

"The wages of harvest-men are thirty shillings for the harvest; or a shilling a-day; with full-board.

"The method of victualling harvest-men, in this district, is singularly judicious. They have no regular dinner. Their breakfast is cold meat. Their refreshment in the field, bread and cheese, with six or eight quarts of beverage. At night, when they return home, a hot supper; and, after it, each man a quart of strong beer, in order to alleviate the fatigues of the day which is past; and, by sending him to bed in spirits and good humour, to prepare him for the morrow's toil.

"There is more than one advantage arises from this custom. All work within-doors, in the middle of the day, is got rid of: and the advantage of continuing the work of the field, without a break through the prime part of the day, is obvious; and is highly estimated by those who know the value of it from experience.

"The hours of work are long;—from dawn to dusk;—especially when dispatch is more particularly requisite. The quantity of work done is above par: namely twenty or thirty loads of corn; with one set of men."

HASK, a husky cough.

HATTOCK, a flock of corn, consisting of twelve sheaves.

In some counties it implies only three sheaves laid together.

HAVER, a name given to oats in some parts of England.

HAUNCH or HANCH; the hip part of the body of a living creature.

The haunches of a horse are too long, if, when standing in the stable, he limps with his hind legs farther back than he ought, and that the top or onset of his tail does not answer in a perpendicular line to the tip of his hocks; as it always does in horses whose haunches are of a just length.

There are some horses, which though they have too long haunches, yet commonly walk well; such are good to climb hills; but to balance that, they are not fit to go down a

descent; for they cannot ply their hams, and they never gallop slowly, but almost at full speed.

HAW, a close, or small field.

HAW, is also the common name for the fruit of the white thorn.

HAW likewise signifies the swelling of a spongy texture, growing in the inner corner of the eye of a horse, and sometimes so large, as to cover a part of the eye.

HAY, a general name for any kind of grass, cut and dried for the food of cattle.

When grass is to be made into hay, the farmer will be directed in the season for mowing it, by the quality of the grass. When the crop is very great, it should be cut as soon as the bottom of the grass grows yellow: for if it stands longer, more will be lost by the quantity of leaves rotted at the bottom, and the ill flavour which these will give to the rest, than will be gained by its growth. When other circumstances permit the choice of time, it should be when the grass is in full bloom before the stalks begin to harden, and rather early than late, because the same sap remains in the roots, the sooner the next crop will spring up. There is not, however, any general rule for this; because, in some cases, the ripe seeds add a great value to the hay, as in saintfoin and burnet: and in others, the growth of the grass itself brings a recompence, as in the fowl-meadow grass.

A dewy or dusky morning should be chosen for cutting the grass because being then fullest of sap, it stands best to the scythe. When the high noon-tide sun has dried the grass, and made it recline its head, the mower will employ his time more usefully in making the hay already cut, than in continuing to mow, with great additional labour, grass, which no longer makes the due resistance.

Our farmers in general are very inattentive to the management of their hay whilst in the cock, to which is in a great measure owing the loss which they (or rather the nation) sustain every year, by the damage which the hay receives from rain.

To guard as much as possible against this accident, let the hay-makers follow the mowers, and if the weather be quite fine, spread out the grass as fast as it is cut down, especially if it lie so thick in the swarth, that neither the air nor sun can pass freely through it: but if wet be feared, let it remain in the swarth. At night, make it into grass cocks, and the next day, as soon as the dew is off the ground, spread it again, and turn it, that it may wither on the other side; then handle it, and if you find it dry, make it up into large cocks. If the weather continue favourable during the second day, the grass will, by that time, be so dry as to bear being kept in these cocks till the day on which it is to be carted, when it should be spread out again in the morning, to receive a farther drying, if wanted. If these cocks are made as tall and as taper as can be, consisting with their standing safely, the winds, by passing through them, will dry them gently and equally; and though rain should fall upon them, it will not do much hurt, because the greatest part of it will run off directly, and the sun and wind will soon dry that which may have penetrated into the cocks. These cocks have therefore a great advantage over the common small and low ones: for if a rainy season comes on, these last will be so thoroughly wetted, that the wind will not be able to pierce sufficiently to dry them. More hay is, perhaps, lost for want of making the cocks properly, than by all the rains which happen in the hay-making season.

Where the colour of hay is principally regarded, as in London, the best way of making it, provided the weather be fair, is to open it perfectly and spread it thin, immediately after it is cut, and to have hands sufficient to turn and shake it, till the evening, when it is made up in grass cocks; and thus proceed every day till it is sufficiently made. In this way the hay retains a fine green colour, and gives it a value with the buyers of hay for horses; and for this reason the hay made about Hendon, in Middlesex, and which is made in this manner, gives it a value in London, though in other respects not superior to the hay from some other places.

Such hay, however, is not more nourishing to cattle, than other hay of equal quality, made in a different manner. Some are apt to blame the farmers, for negligence or ignorance in the management of their hay; but it is a matter of greater difficulty than they seem to be aware of. In catching seasons, it requires much attention and industry to save hay, and after all is liable to be spoiled, or greatly damaged

to the owners great loss, notwithstanding his utmost care and anxious attendance upon it; and in fine weather, by a sudden change, he may suffer as great loss, as in a catching season. I had once a large field of hay, in fine order, and set up in hay cocks; the weather then altered to rain, attended with such a high wind, that the hay cocks were blown down, and some of them carried above twenty yards from the places where they stood; so that the field was covered with the hay, and the weather continuing showery, the hay could neither be dried nor put up again as before. It was therefore raked together, and made into very small cocks, which could be readily turned with prongs; this was done several times when the rain abated, and was sometimes necessary to be done even in the rain to prevent its fermenting: this hay was at last saved at a great expence in tolerable order, though much damaged; and is mentioned here as a good method of saving hay in general, to put it into these very small cocks soon after it is mowed, not to be spread at all, if the weather is the least suspicious; and by opening the cocks sometimes when the weather is fair, and frequently turning them, the hay may be well made: though it is well known to all experienced husbandmen, that saving hay in good order, is often a business of much difficulty, and attended with no small expence and trouble.

The method here recommended is confirmed by the experience of a New England husbandman, whose account of it to the reverend Dr. Elliot ran thus:

"I shall relate to you my own practice in making of hay, though it may seem small and trifling at the first mentioning: but finding that it saves me near two fifths of the time and labour I used to be at in this article, and that my hay is, I think, better than when I used to pursue the usual method, I esteem myself justified in communicating it to the public. My method is this: I mow my grass, and let it lie in the swarth till the dew is off the next morning: then I turn and spread my hay, and let it lie in the sun till the after part of the day, when I take it up and cock it well, and never meddle more with it, till I cart it into my barn, or stack it. If the weather be good, it will do well to cart after it has stood two days in cock. This, I have found by five or six years constant experience, answers for any sort of hay, except salt-hay and red clover, of which last I have not had so long trial; but with respect to clover hay, I managed it last summer after this manner, viz. I followed my mowers as they cut the grass, I spread it as thin as I could, and before night I put it in cock. The next day, after the dew was off, I spread it again; in the afternoon, I cocked it a second time, and meddled no more with till it I carried it. The appearance of the hay since, makes me judge that no man has better of the sort. My first coming into this practice was purely accidental. After cutting my grass, five or six years ago, I put it in cock the next day: but my avocations then were such, that I had no time in which I could possibly take any farther care of my hay for many days. When I had dispatched my other affairs, I returned to it, and found it in as good order (that is to say the bulk of it) as ever I had hay in my life. Reflecting then, how much labour may be saved by this method, I have followed the same practice ever since, and find it answer very well. The reason why I think my hay really better is, because I take it for granted, that the more juice or natural moisture we can retain in it, without corrupting and rotting the stalk, the richer and more nourishing it is. The too often turning and spreading of hay in the sun extracts too much of the richness thereof; and one day's thus lying will take away such a quantity of the most watery particles, as that the remainder is only sufficient to raise a proper fermentation thereof when in the cock, while the smallness of the body there keeps that fermentation from rising to such a height as to corrupt it. After twenty-four hours, the fermentation will gradually abate: and the pitching of the hay into the cart, and afterwards into the mow, or stack, so checks it, that it will not again rise to such a height as to be detrimental. Cattle are fonder of this hay than of that which is made in the common way, and less of it will support them."

It would be almost needless to observe, that no narrow wheels should ever be brought upon pastures, not even in the driest season of the year, as that of hay-making generally is. The advantages of broad wheels, which help to roll and level the ground, and render the draught much easier, whether on grass, or any other soil in which narrow wheels will sink, have been confirmed by experience; and are as self-evident as it is that the latter crush and

bury, and thereby destroy great numbers of the plants of grass, wherever they are dragged.

If the hay has sweated a little in the cock, there will be the less need for its sweating afterwards in the rick, where it will then lie so much the closer, and consequently keep the better.

Mr. Marshall, in his Minutes of Agriculture, says, that having a field of hay that had been cut almost a fortnight and was in tolerable order; the sap being nearly exhausted; yet the weather was very unfavourable, but he was unwilling to expose it any longer in this critical state; he therefore put it upon the waggons to keep it out of harm's way; but did not unload it immediately, letting it remain until the next day, when he unloaded one of the waggons on to the stack very gently, and left it untrodden. On to the emptied waggon reloaded another which stood in the field. The wind was high, and the sun hot: two men reloaded it as deliberately as possible; breaking every lump and loading it lightly with a fork: they were three or four hours in doing it. It was unloaded the following day in good order. In this manner, he proceeded with the remainder, and with the same success. By thus exposing it to the sun and wind, and by leaving it on the stack for twenty-four hours untrodden, it was got from tolerable to very good order. Because hay, which had been long cut, and whose juices are exhausted, is loaded on the waggons to prevent it being totally spoiled; it surely does not follow that it should be hurried into stock wet or dry. Perhaps hay not half made, might, by repeated reloading, during fair blasts, be well got, even in very bad hay weather, as frequently happens.

Suppose one load takes two men three hours and a half; two men would reload three loads a day: about $13\frac{1}{2}d.$ per load. Ten times $13\frac{1}{2}d.$ is not equivalent to the difference between good and bad hay. Re-making in large cocks, may help hay which is under-made; but a cock cannot be drawn into a barn, or under a shed as a cart or a waggon. See *Tare HAY*.

He says also that, perhaps, meadow hay is generally cut too early, and the first crop of clover too late; that is, such grass as is intended to stand for a second crop, should be cut early that the second crop might not be caught in the autumnal rains; and that which is cut but once should stand until it be fully matured, that it may not shrink in making, that the hay may be heartier, and that it may be made with less labour and less risk. He recommends to cut clover the first and second weeks in June, and meadow hay the second and third weeks in July, for although grass seems to shrink on the ground before cutting, the quantity of hay is not the less when it comes to be carried into the stack, nor the weight less when it is cut out.

Mr. Marshall, in his Rural Economy of the Vale of Gloucester, says, that "The age, at which a crop of grass ought to be cut, is a subject of no small importance. In the ordinary practice of this district, as in that of every other, which I have observed in, grass is suffered to stand much too long before it be mown for hay.

"This evil practice may have originated in common meadows, whose after-grass is unstinted, (or frequently belongs to a separate owner): a species of mowing ground, which, formerly was common to this and most other countries.

"There are, however, in this district, men who are well aware of the advantages of early cutting; who know, from experience in *grazing*, the value of the after-grass of early mown grounds; as well as the fattening quality of hay, which has been mown in the fullness of sap. Hence we find in this country, more advocates for early cutting, than in most others, where the fattening of cattle on hay is not a practice. There is, in an ordinary season, much grass cut, in different parts of the district, at *six or seven weeks old*.

"In *mowing*, it is observable, the Gloucestershire labourers cut remarkably level. In some cases not a stroke, or scarcely a swath-balk, is discoverable. This is chiefly owing to the narrowness of the swath-width, and the shortness of the scythe in use in this country. The mowers of Gloucestershire and those of Yorkshire work in opposite extremes of the art. The Yorkshireman drives a width of nine or ten feet before him, the Gloucestershireman of six or seven feet only. I have measured across a series of swaths which one with another, have not measured six feet wide. The one makes the operation unnecessarily laborious, and causes, almost unavoidably, a waste of herbage,—the other renders it unnecessarily tedious. A good workman may take

take *half a rod* (eight feet and a quarter) with sufficient ease to himself, and at the same time leave his work sufficiently level. It is prudent, however, on the part of his employer to see that he keeps within due bounds; and, generally, that he does not exceed the *medium width*.

"The *making* of hay is an inexhaustible subject. Every district, if we descend to minutiae, has its shades of difference. The practice of this district resembles very much the practices of Yorkshire; not only in the first stages, but in the remarkable expedient of forming the hay into *stacklets* (here called "*windcocks*") previous to its being put into *stack*. But the practice is here carried a stage farther; the hay being sometimes made into small *stacks*, of several loads each in the *stack yard*; and, while yet perhaps in a degree of heat almost suffocating to work among, is made over again into one large *stack*.

"The same reasons are given for this practice, here, as in Yorkshire: namely that of being able to make it fuller of sap in this way than it can be by the ordinary method. There seems however, to be an additional motive to it in this country: namely that of being enabled, by this means, to make it into *very large stacks*, of fifty or perhaps a hundred loads each. Such *stacks* are fashionable. They are spoken of with pride: and it seems probable that the *pride of great ricks* has some share, at least, in the practice of giving hay a double heat.

"Be this as it may, however, it is a fact, well ascertained, that the hay of these Vales is of a superior quality. It is found to bring on fattening cattle nearly as fast as the green herbage from which it is made, passing through them with the same appearances. And the produce of butter from hay in this district, is extraordinary. But whether this superior quality be owing, in part, to the method of making it, or wholly to the soil and the herbage from which it is made, is by no means well ascertained. That there is a something in the soils of these Vales which gives a peculiar richness to whatever they produce, is to me evident; and to endeavour to preserve in hay as much as possible of this richness is, indisputably, good management.

"The degree of heat, which hay ought to be subjected to, is an interesting subject, which is seldom agitated, and little understood; even in this country where some little attention is paid to it. Something may depend on the species of stock it is intended for. The prevailing opinion, here, seems to be that, for fattening cattle, it ought to be moderately or somewhat considerably heated. For cows, however, there are dairymen, who say it should have little or no heat; giving for a reason, that "heated hay dries up their milk."—These, however, I mention merely as opinions. They may be well grounded. If not, they may excite a spirit of enquiry into a subject of some importance in a grassland country."

Mr. Marshall, in his *Rural Economy of Yorkshire*, says that "In Surrey, and round the metropolis, grounds intended to be mown are scrupulously freed from stock early in the spring; not a spring shoot is cropped. This is the opposite extreme; and, if the land will bear stock, is also improper. Some valuable spring-seed is lost; the frosts destroying that which would be of service to stock.

"Land may in general be eaten until old Lady-day or the middle of April, without injuring the crop of hay. Early weeds, and the ranker grasses, are choked, by which means the better bottom grasses are suffered to rise, and to ripen with them.

"To give a minute account of the department of the grass-land management, it will be requisite to consider separately the following divisions:

1. Mowing:
2. Making:
3. Laying up.

"1. Mowing. This is done chiefly by the "*day's mowing*," which is an inaccurate acre; sometimes more, but generally less than a statute acre; old inclosed meadows having been reckoned from time immemorial, so many "*day mowings*;" and whether they are in reality a greater or less number of acres, they are considered as so many days' works.

"The wages for mowing, one shilling to eighteen-pence a day and board. Little or no mowing is done by the acre. A man seldom mows more than his day-mowing: which, if he be a good hand, he performs in a few hours, in the morning and evening; generally lying by in the middle of the day.

"The Yorkshire mowers labour hard during the short hours they work: their *sithes* are of uncommon length, and they take their *swath* of unusual width; seldom less than three yards; some of them ten or eleven feet wide; and, what is I believe peculiar to them, they invariably "*keep stroke*;" that is, all strike together as one man: a practice which is at least pleasing to look at.

"2. Making. All countries, I find, abound in bad hay-makers; and some are destitute of good ones. The country under survey may be said to be above par; and that is as much as can be said of it. Quantities of hay are annually wasted, and still greater quantities unnecessarily injured, through bad management. It is seldom tedded sufficiently; is frequently exposed all night abroad in catching weather; and in such weather is too often carried before it be dry.

A singular expedient is here practised to get it (as it is intended) out of harm's way. This is to put it into "*pikes*," or *stacklets* of about a load each, before it be fit to be put into *stack*; and, too frequently, before it be fit to be put into large *cocks*. This is considered as a middle stage; in which it is to take a partial heat, and become prepared for the *stack*.

If hay be free from water-wet, but yet too full of sap to be trusted in *stack*, "*piking*" it may have its use. But it is more generally made use of as a slovenly expedient for getting hay out of hand in a tedious season. In this case, however, it is mostly mischievous. I have seen these *pikes*, when opened out to be carried to the *stack*, white with mould, black with rottenness, and of every intermediate colour, excepting that which alone is desirable. But this good old way seems to be declining.

In the best practice of the district, the grass, in fine weather, is tedded after the mowers; or, in showery weather, as soon as a fair opportunity offers. In the evening, unless due confidence can be placed in the weather, it is put up into *cocklets*, provincially "*hipples*;" made in different ways; some being set up hollow with the foot and the head of the rake; others in the common way with forks. As the hay has advanced in dryness, the *hipples* are increased in size.

"When a fair opportunity offers, and the grass is perfectly dry, the *hipples* are "*fundered*;" that is, broken out into beds in the usual manner; turned; and again got up into *cocklets*, of such size as the state of dryness requires. When sufficiently dry, the hay is made into well-sized *cocks*; namely, about eight or ten to the load.

When the crop is intended to be stacked on the piece it grew on, the first-made part generally stands in these *cocks* until the whole, or the principal part of the remainder, be ready for the *stack*; which, by this means, is never exposed abroad in its first stages: a circumstance, however, which is too commonly suffered by less judicious hay-farmers.

"3. Laying up hay. The most prevalent practice is to *stack* it in the field, either for the purpose of foddering it on the ground, or to be fetched home in frosty weather, or when wanted. Much, however, is carried to the home-stall at hay-time; some to be stacked; others to be housed; a practice which, when room can conveniently be had, seems to be in good estimation. It is at once got out of the way of the weather, and probably into the place in which it will be wanted: the mustiness of housed hay, which is talked of in some places, is not perceived in this.

"The practice of stacking hay in the field adds much to the ease and dispatch of hay-time. If the *stack* be placed in the center of the ground, a considerable part of the hay may be collected, without the trouble of loading it on to a carriage.

"If it be in large *cocks*, it is sometimes drawn to the *stack* with one horse, and a cart-rope put under the skirts of the *cock* on the sides, and above the skirts on the back part; giving the bend of the rope sufficient hold of the hay, to prevent its being drawn from under the *cock*. The two ends of the rope pass to a pair of hames; being made fast on one side, and kept in its place with a peg on the other; the *cock* arrived at the *stack*, and the peg drawn, the rope is disengaged.

"If the hay be abroad it is rowed in the usual way, and is sometimes drawn together with a long pole (six or eight feet long), with a rope passing from each end of it to the hames; a man standing or pressing upon the pole, to keep it down to its work, and make it clear the ground as it goes. This however, though simple, is a difficult business.

More complex implements of various constructions have therefore been contrived for this purpose.

"These implements are also used in cocking; and, when the quantity of dry hay is great, and hands scarce, it eases and expedites the business very considerably. For, in this case, the main burden of the hay is drawn together by the team, the rakers having only the bared ground to rake over; following the implement, and drawing the rakings to the part to be cleared by the next sweep of the implement; beginning on one side of the piece, and proceeding in this regular and expeditious manner to the other; leaving the hay in large rows, easily to be cocked; dragged to the stack; or loaded; as occasion may require. This expedient, however, is far from being in general practice.

"When the ground near the stack is cleared, and the stack has risen too high to be conveniently forked on to from the ground, the outskirts of the field are drawn together in carriages.

"In the best practice of the district, the stack, if not very large (which field-stacks seldom are), is never begun upon until a sufficiency of hay be dry to get it above the eaves the first day. If the whole be ready, the middle of the stack is rounded up, and the remainder set in tall "pikes" by the side of it, ready to be laid on the first fine day after the stem be sufficiently settled. This appears to me to be bringing the business of laying up hay as near perfection as the nature of it will admit.

"Field-stacks are, I believe, invariably, made round. The favourite form at present seems to be that of an egg; a form, perhaps, of all others the most beautiful, but by no means the most convenient.

"When the hay has done heating, the stack is finally topt up, its roof adjusted and raked, and its top cap with thatch; the principal part of the roof being left naked."

"In a country where thatching the entire roof is the established custom, this would appear negligent management. In this country, to bestow thatch and thatching upon the whole would be deemed a wasteful extravagant custom. It would be difficult to say with certainty which is the better practice. Either of them is good, if properly executed.

"Field stacks are fenced with large hurdles, provincially, "stack-bars," resembling the gate-hurdles of some districts, and the cattle-hurdles of others. Being placed in a ring, and united together with pins passing through the heads, they form an arch, and become a simple and sufficient fence against every kind of stock."

Mr. Marshall, in his Minutes of Agriculture, says "he adapted the following method of making mix-grass and clover-hay: let it lie awhile to wither in swath; but while it is tough, before it be crisp, make it into light minikin cocks, and rake the bared surface. As the cocklits become dry, aggregate them; and continue to rake the bared grass till the hay be dry enough, and the cocks big enough. If rain beat down the cocklits, catch a dry opportunity of turning them upside down and lightening them up, not shaking them up. Thus it will be always out of harms way, and the leaf, sap, and colour be preserved. Never ted a light or a middling crop of grass of whatever species. If the weather be fine let it make itself in swath: if foul, make it in cocklits. Hay makes faster in heaps of whatever shape or size, than is generally imagined, especially in windy weather. It is amazing how much large heaps dried, after they were mixed and shook light up.

"He also observes that carters are as wasting servants as any in a farm, for while they have their hay given to them for their cattle bound, they will keep up to a truss a horse a week; but if not, they pay no attention to what quantity may be consumed. This waste of the carters must fall, more or less, to every farmer who does not attend to the minutiae of farming. He recommends every blade to be bound, even that which is to be consumed at home, notwithstanding the expence of twenty pence per load; by which he was enabled to keep an account at hay-time, of the field-loads which were put into each stack, and by that know what was yielded in each field, and how much each stack contained. Besides this he was enabled to prevent waste; as no litter was made of it in the stack-yard, &c. but every mouthful delivered to the respective feeders. This alone will repay the expence; and he could allowance each species of stock, viz. each cart-horse a truss a week; the ox-team half a load a week; the milch cows, one, two, or three trusses a week if they are wanted, &c. &c. He found by this method the men became more careful, and imper-

ceptibly learned frugality, and did not give the cattle too much by half at once, and throw what they had left, and blown upon, under them for litter. This method Mr. Marshall says enabled him to have the satisfaction of knowing how every blade was expended; how much each sort of hay-eating stock cost, during the winter; and of course the hay and stock accounts were reduced to a certainty."

For the method of making lucerne and saintfoin, see the articles LUCERNE and SAINTFOIN.

HAY-BOTE, a liberty which a tenant for life, or a term of years, has of taking bushes, wood, &c. for repairing fences, gates, and the like. It also signifies the liberty of cutting wood, for making rakes and forks used in making hay.

HAYN, or Hayn-up, implies the action of inclosing with a hedge, in order to preserve grass-grounds from cattle.

HAYWARD, or HAWARD, a keeper of the common herd of cattle of the town, who is to look that they neither break nor crop the hedges of enclosed grounds, and is sworn in the lord's court for the performance of his office.

HAZLE-Mould, a moderately compact earth, containing a large quantity of resin-coloured sand.

HEAD-LAND, the land running across the others at the head of the field, left for the turning of the plough.

HEAD of a horse should be narrow, lean, and dry, neither should it be too long: but the main point is a good onset, so as he may be able to bring it into its natural situation: which is, that all the fore parts, from the brow to the nose, be perpendicular to the ground, so that if a plummet were applied thereto, it must just raze or shave it.

Every horse that has a large head, is apt to rest and loll upon the bridle, and by that means, in a journey, tire the hand of the rider; and besides, he can never appear well with a large head, unless he has also a long and well turned neck.

HECK, a door; also a rack for cattle to feed at.

HECKLE, an instrument used in the dressing of flax and hemp. See the articles FLAX and HEMP.

HEDGE. See FENCE.

HEE-GRASS, stubble of grass.

HEIRS, young trees in coppices.

HELL-WEED. See BIND-WEED.

HELM, a hovel; also straw prepared for thatching.

HEMP, the name of a plant too well known to need any description here; but it may not be improper to remark, that the flowers and the fruit (commonly called seeds) of hemp always grew separately on different stems, and consequently on different plants, as this never has more than one stem proceeding from the root.

The flower-bearing species, which is the *Cannabis florifera*, Off. *Cannabis erratica*, C. B. P. *Cannabis femina*, J. B. *Cannabis sterilis*, Dod. Prempt. and which is most frequently termed female hemp, should properly be called barren hemp, flowering hemp, or male hemp, since it is this which bears the *farina fecundans*, or fecundating dust, without being impregnated with which the seeds that grow on the other stems of the other species would not come to maturity, or at least would not be capable of producing plants, when sown.

This other species, which bears the seeds, and which botanists distinguish by the appellation of *Cannabis fructifera*, Off. *Cannabis sativa*, C. B. P. *Cannabis mas*, J. B. *Cannabis fecunda*, Dod. Prempt. and which is commonly termed male hemp, should be called seed-bearing hemp, or female hemp; because it is this which, with the help of the impregnation it receives from the *farina fecundans* of the male, produces seed capable of yielding plants of either species.

What may chance to be the future proportion between the number of male plants, and that of female, in a hemp-ground, cannot possibly be guessed at the time of sowing, as no sort of mark can be discerned on the seed, by which they may be distinguished: nor indeed can any judgment be formed in this respect, before the male plants begin to flower, that is to say, in general, till about two months after sowing: unless it be from a remark which the most curious observers have made, that the male hemp is slenderer than the female, and that all its parts are more delicate: to which may be added, that the male plant is always forwardest in its growth, and that it generally rises about half a foot higher than the female; thereby plainly indicating it to be the design

design of nature, that the fecundating dust which issues from the flower may by that means be the more easily conveyed to the grain on the seed-bearing stalks, in order to its impregnating that seed.

With regard to the temperature of the air that is fittest for the growth of hemp, M. du Hamel observes, in his *Treatise on Cordage*, that this plant does not like hot countries; that temperate climates suit it best; and that it thrives pretty well in cold regions, such as Livonia and Canada, which produce it in abundance, and very good. M. Marcandier is indeed of opinion, that though extremely hot countries are not favourable to its growth, yet, as this plant is but a short time in the ground, it may be cultivated in any place that is habitable by men.

Mr. Young, in his *Annals of Agriculture*, inserts the following extract, translated from the Italian, on the subject of the culture of hemp in the Lower Montserrat.

"Among the many productions of the Lower Montserrat, hemp is the most advantageous; for it is without doubt that what is raised in this province, and especially in the territories of Mancalvo, Tonco, Alfiano, Villadeati, Murisengo, Montiglio, Scandaluzza, Rinco, and Colcavagno, exceeds in fineness, length, whiteness, and strength all others: since the merchants who are in this trade, and particularly the Genoese at the fair of Alexandria, prefer it to all others, collecting it in great abundance, besides the quantity which every proprietor retains for his own use.

"The influence of the air, and the constitution of the soil, are the circumstances that first contribute to good success, and to the greater perfection of all products.

"I have, with great ease, observed, that the same seed sown in different scattered lands has prospered much, when cultivated with the necessary attention; and equally degenerated from its kind. The first produces hemp, the *lisca* of which (*lisca* are the small canes of the stalks, from which the water in maceration has separated the filaments of the bark) is thin and slender, and the thread white; but of the second the hemp gained has a gross thread; and the *lisca* approximates to wood. It will be proper to indicate in the cultivation the cause of this variety, and the method of amelioration.

"The first care of those that cultivate hemp ought to be, to chuse a soil adapted as much as possible to this sort of plant; for it is well enough observed by Virgil that *non omnis fert omnia tellus*. At present the soils that agree with it best, as well as I can comprehend from the observations I have made, are those situated at the foot of hills, or rather such as are situated in plain vallies, and exposed to the rising and setting sun. The reasons why hemp flourishes in such situations are many. For first, these lands, by their nature black, and alone receiving the rain, which washes the higher grounds, are more penetrated with moisture, which, more than any other thing, contributes to the increase of this plant.

"In the second place, it is to be observed that this running water is very fat and rich, from enveloping in its course whatever the winter-rains wash from the higher manured lands, depositing it in these vales: and this sediment serves not only as a manure to the hemp, but to revive and guard it from the more burning rays of the sun. To this if we add that the soil of vallies and the slopes of hills receive new deposits of earth and of dung, they remain by consequence less solid, by which the tender hemp may more deeply push its roots. In land more compact and hard I have practised, with good success, the mixing the *lisca* and the roots of the crop of the preceding year, which I have had stamped and broken minutely and macerated in dung, which has had the effect of rendering the earth lighter, more fragil, and less solid.

"After having made choice of the earth, the farmer must think of preparing it, in which the ordinary culture and the manure which is spread upon corn-fields, are not sufficient; for if the land is not deeply stirred, and well raised oftener, the crop will always be poor, inasmuch as its nature is to push into the ground. Many of our husbandmen annually manure their land with dung of a hotter nature, as well as more minute; as that of poultry, of sheep, and also of neat cattle and horses, but not fresh and four, but kept long in the maceration of a compost. In the month of November they dig the field with a spade, stirring the soil to the depth of a foot; with the aid of this labour, the nutritious juices of the earth, that have been much sunk beneath, are raised to the surface of the earth.

"In many of our lands I believe it is enough to break with

the plough and work it with the spade every fourth year, in the above-mentioned manner. An annual digging contributes greatly to the abundance of the crop, but the hemp is apt to be too gross and of a worse quality.

"The first ploughing should be given with a deep furrow, to move every part of the staple, in the month of September, or in the beginning of October; and the manure spread in the beginning of December, in order that it may be well incorporated with the earth in the spring. It happens in certain dry years that clods, more or less large, are raised by the plough, which being penetrated by the winter's rains, and by the snow, and broken by the action of frosts, the land more easily divides, and levels by the last furrow, and rests in consequence less subject to dry: the same action of the frost and cold influences to the more efficacious incorporation of the manure with the earth, fixing the volatile salts which are more abundant in such a situation. The last earth should be given in the full moon of March, the season for sowing hemp.

"In regard to the quantity of manure, the common rule is, that to every *stajo*, which is the 8th part of a *moggio* (corresponding more or less to 1-18 less than an acre), two loads are enough, of common ox-dung well rotted, called in the Montserrat *baroffe*; less should be used if the dung is heating, reduced, and resembling that of sheep and poultry: but the nature of the land and of the manure must determine the quantity.

"Respecting the time of sowing hemp, the only observation to be made is, that the full moon of March should be the direction; it appears that that period is more favourable to the sowing, as the seed is at that season less exposed to the ill effects of frost, and the too great heat of the sun, both equally hurtful to the unfolding of the seed, and the growth of the tender plants.

"The seed ought to be buried with the harrow commonly used: the seed should be of a good kind, and sown thickly and equally, and if when fresh done there comes a moderate rain, it will be better covered and spring more easily. This effect is such that our farmers, when they foresee rain, are solicitous to sow their hemp.

"A *stajo*, the eight part of a sack of Montserrat, is more or less, the quantity of seed necessary for sowing a *stajo* of land, which, as mentioned above, is the 8th of a *moggio*.

"Care must be taken that if the earth is not sufficiently broken by the harrow, to the degree of minuteness of a garden, and be not laid perfectly level and the seed well covered, in such case it should further be gone over with a wooden machine, like a rake, to break every little clod that is left.

"The sowing being finished in the manner above-mentioned, there are divers necessary precautions, which the cultivator ought to take for contributing to the more easy and prompt vegetation of the plants: attention should be given to break that crust which easily forms on the surface of land that is strong and fat, especially when a hot sun succeeds rain; the humidity thus penetrating, with the action of the sun and air, is an advantage in enabling the plant to develop itself with greater force, and expand its roots with more freedom; thus giving, with an increased porosity, increase of nourishment. It is also necessary to remove, throughout the season, every useless and noxious herb, because the roots of the hemp will be left more at liberty, and meet a more copious nourishment; and this object will guide us in rejecting a common practice of sowing other plants with the crop, as rape or lupines; arising from the ill-founded principle that the roots of these plants will prove a manure the following year. Another attention is also important, and even necessary, for preserving and defending the seed which has germinated; and this is, to hang rags of different colours at the angles of the field, which being agitated by the wind, will frighten away the birds.

"With respect to the time of gathering hemp, there is a vulgar distinction between the male and female.

"It would be difficult to correct the error of our peasants, habituated by custom to call the male plant the female, and *vice versa* the female the male, for which reason I deem it useless to dwell on the improper denomination of this plant of two sexes, the more so as the question would not be productive of a change in the method of cultivation. The latter ought to be first gathered, when the flower is dropt and the plant appears yellow at top and white towards the root, which is generally the case towards the latter end of July, or beginning of August, according the greater or less heat of the season, or the more or less advantageous situation and position of the land; then, therefore, the plants are rooted up,

up, tied in bundles, and the roots are cut off, afterwards they are left exposed to the sun.

"The common practice of leaving the hemp exposed to the heat of the sun, in such a degree as to occasion the leaves to fall off sooner, is by no means to be approved of, but beating it against a wall, or pulling off the remaining leaves by force, is infinitely more hurtful: but great care ought to be taken to preserve them from rain, which would cause the hemp to be spotted, which black spots appear after watering.

"The method of keeping the bundles of hemp under cover, and no ways exposed to the heat of the sun, appears to be preferable; the reason is natural, the hemp exposed to the sun dries too much, by reason of the glutinous matter which surrounds it; the threads, occasioned by the mellowness produced by watering, are separated with less difficulty; they are from thence, conveyed to a pond, or pool, before they are too much dried. The pools, or ponds, being situated in the vallies, receive the running waters from the warm, and rich hills, which, from experiment, have been found more beneficial to the hemp than cold and raw streams. These pools are pits of certain dimensions and depth, are contiguous one to the other, in such a manner as to flow from certain apertures, and the super-abundant waters are communicated from one to the other; the owners of these have them cleared yearly, and require for each watering a small reward of hemp in kind.

"The peasants, who have the sole direction of this work, take particular care to put the hemp in water into the same pits; each pit commonly containing four heaps divided amongst them, vulgarly called *gombine*, composed of forty *fusare*, and each of these of ten bundles.

"The degree of time and the duration of the watering cannot be with certainty ascertained, since that must depend on the hemp being more or less thick, the situation of the pits and the degree of heat of the season: in general six or seven days are sufficient, and the goodness of it is known when the heaps begin to swell, and they raise the weight to the surface of the water in which it is contained; the same peasants, to ascertain the degree with greater accuracy, observe whether the hemp has taken a yellow colour, and whether the threads separate with ease from the liska, examining at the same time the surface, center, and bottom of the pit.

"Afterwards the male plant is not rooted up, but it is cut down when the seed is ripe, leaving the root in the ground: the ripeness is known by the stem becoming yellow, and the seed grey, which happens towards the latter end of August; or beginning of September. It ought to be cut close to the ground, because the shaking which rooting them up occasions, would be attended with loss of the riper seed; and when gathered together, and divided into bundles, it is placed in the watering pits, where it ought to remain twice as long as the female plant.

"It has above been observed, that it is not easy to ascertain the degrees, or length of time it ought to remain in the pit, since that must chiefly depend on the greater or less efficacy of the water, which, by means of fermentation, penetrates the rind of each plant of hemp, separating it from the cane, and loosening the threads one from the other, for which reason the greater or less perfection in the watering of either the male or female plant can only be known by the more or less difficult separation of the threads.

"When the watering is completed, the same peasants take the heaps of hemp from the pit, which being well washed, they distribute and spread them one by one in the shape of a coop, in order that the water may run from them with greater ease; in this manner they leave the heaps to dry by the sun, and from hence put them under cover, because hemp ought to be kept dry, that when it is placed under the *spaulatura* the cane may easily separate from the threads.

"Every operation attending the culture of hemp will be useless, if the utmost care is not taken in collecting the seed, on the goodness of which the success of each of the species materially depends.

"The seed, therefore, is gathered from the plant vulgarly called male, which, being shook and beat, is left to dry in the sun, removing it from time to time to prevent fermentation; and as too much heat, as well as dampness, is equally hurtful to the preservation of the seed, it is highly proper to keep it under cover and defended from the air.

"With respect to the method of insuring the quality, and perpetuating the species of the best seed, these ought to be gathered from the plants produced from the male, and cul-

tivated in the same field, in which the female has been produced, as experience proves that any other seed soon degenerates.

"During the time of cleansing or sifting, the larger seed should be picked from the smaller, and they alone ought to be preserved for the next sowing."

The wise legislature of this country has shewn its opinion of the importance of raising hemp in our own dominions, by the bounty given by parliament for the importation of it from North America; and our truly laudable Society for the Encouragement of Arts, Manufactures, and Commerce, likewise judiciously contributed to this desirable end, by offering a very considerable premium to the cultivators of hemp in those late provinces of the British empire.

The soil for hemp should be a soft rich loam, easily brought into fine tilth; and it should be well manured. Newly broken up land is found to be peculiarly good for this plant; but flat grounds lying on the sides of rivers, and enriched by the sediment left on them when the waters overflow, are the best of all for it. If hemp is to be sown on very strong soils, they must be brought into so good tilth, and be so well manured, that their mould may remain loose: in this case, such soils yield very great crops. Dry lands are not fit for hemp: it does not rise well in them, but remain short and stunted in its growth, and its fibres are then generally too woody, which renders them hard. All these are considerable defects, even for the coarsest works. It is however true, that, in rainy years, it succeeds better on dry grounds than on moist: but as such years are not the most common, the best situation for hemp-ground is generally thought to be along side of a stream, or of a ditch so full of water, as that the water may constantly be nearly on a level with the surface, but without overflowing it while the hemp remains on the ground.

It is the custom in some countries to form hemp-grounds, which are appropriated solely to this purpose: whereupon the author of a very judicious account of the culture of hemp, in the Memoirs of the Royal Society, of Agriculture at Tours, justly observes, that, "besides that all soils delight in a change of plants, hemp is so far from impoverishing the ground, that the leaves which fall from it become a sufficient manure, and the depth to which the roots go, especially if the crop of hemp be great, leave the ground sufficiently loose to sow upon it even a crop of wheat immediately after the hemp has been pulled, without any other expence than sowing the seed and harrowing it in; or if turnips or a spring crop be more convenient to the farmer, these also will thrive well after the hemp. It is said, that the hemp which grows on an established hemp-ground is softer and more silky than that which is raised elsewhere: but the difference, if any, is very inconsiderable; for the hemp which grows in the other parts of Anjou, for example, is found to be as good as that which is produced by any of the few established hemp-grounds in that province."

As it is essential to have the ground in exceeding fine tilth, the first ploughing should be given it as early in the autumn as the husbandman's other business will permit. Some are so curious in the preparation of their ground for hemp, that they give this first stirring by hand: and though it be a more tedious and more expensive way than ploughing, they think that the difference of the crop repays them well. In whatever manner it be done, the ground should be loosened as deep as possible, and laid rough, that it may be the better mellowed by the winter's frost, especially if the soil be strong. If the hemp is to be sown on ground purposely broken up, and which is covered with coarse grass, or other similar productions, its surface should be pared off and burnt; or it should otherwise be brought to a perfectly fine tilth. The ground should be ploughed again in February, or more early if the season will permit; and then also should be laid on the manure, whether of horse dung, or the scouring of ponds and ditches, after it has had time to ripen; for these are preferable to cow-dung; though all manures, which render the earth light, are fit for hemp. Mr. du Hamel remarks, that marle is not, to his knowledge, used for this purpose. He likewise thinks, that it is best to dung the hemp-ground every year before the winter ploughing, in order that the dung may have time to rot during that season, and that the spring ploughing may afterwards mix it the more thoroughly with the earth: for all hemp grounds should be well dunged at least once a year.

To prepare the hemp ground thoroughly for receiving the

the seed, it should have two or three good ploughings in the spring, or even more if the farmer's convenience will permit, and the nature of the soil be such as to admit of them; for the more frequently it is stirred in the spring, in proportion to the quality of the soil, the better the crop will be. About a fortnight or three weeks should intervene between each of these ploughings, and they should at last lay the ground quite smooth and even. If any lumps or clods of earth yet remain after all these ploughings, they should be broken by hand; for the whole hemp-ground must be as level, and of as fine a mould as the beds of a garden.

The first spring ploughing should be given across the former: and before the next ploughing is the proper time to spread sheeps dung, pigeons dung, poultry dung, or whatever other such like manures are used; though still it is to be feared, that, if the spring prove dry, these hot dungs may burn the seed, which they would not do if they were laid on before the winter: but in this case a greater quantity of dung must be used, or less advantage must be expected from it.

The necessity of manuring land every year for hemp, and at the same time the uncertainty of the succeeding season, whether it shall be hot and dry, or cold and moist, render the culture of hemp a matter of much difficulty to the farmer, what quantity of manure to lay upon the land, and of what quality; especially if manured with dung. There are two methods of avoiding this difficulty in some measure; one is, to give a light dressing at first, and as the season advances, to give the land repeated hand-dressings with powdered manure, to be from time to time sown over the crop, and repeated according to circumstances of weather, and appearance of the crop. This may be done at a small expence, and is ready at all times; such fine manure is readily washed into the ground by the first shower of rain, and the effects of it are quickly visible, which will direct the farmer what kinds of manure are most proper, and when to repeat the dressings. A mixture of different kinds of manure, is in general most proper for this use, or sometimes of one or two sorts only, suited to the nature of the land: but of whatever kind the manure is, it should be previously dried, and pounded fine. Such dressings are excellent for many kinds of plants; which they cherish and bring forward gradually, much more agreeably to the course of nature, than it is to lay on a large quantity of manure at once, the good or bad effects whereof depending upon the season, must ever be very precarious.

When hemp is cultivated principally for the seed, it is much the best way, as observed in the culture of flax, to sow it thin, to give it room to spread and throw out many branches, which will produce much seed; and if the plants are raised on beds or ridges, in rows, and horse-hoed, the seed will be much superior to what is obtained from broadcast hemp.

This plant may be also cultivated to great advantage, in respect of both seed and hemp, by drilling it in equidistant rows, and hand-hoeing; which will improve the land and crop, with less manure, than sowing it by hand.

The season for sowing hemp depends in a great measure on the quality of the soil. In dry light ground, it should be sown as soon as the danger of frost, or other inclemency of the weather, is over, in the latter end of April or beginning of May, that so it may get up early, and, by covering the ground, prevent the danger of drought. In wet cold grounds, it should be sown later, that is to say, not till the sun has exhale the too great moisture of those grounds; and this may not be till the middle, or even the latter end of May. The author of the before-mentioned account of hemp, in the Memoirs of the Royal Society of Agriculture at Tours, advises to sow hemp even so late as the latter end of June, in case the season for it be not favourable sooner; and he observes, that the crop sown then will be as plentiful, and of as good a quality, as if the sowing had not been delayed so long, especially if a very dry season does not come on immediately after. The truth of this is evinced by the experience of those who are obliged to sow a second, and sometimes a third crop, when their former sowing has miscarried through the inclemency of the weather, and particularly of frost, which is a great enemy to hemp. Another reason too, which he assigns in favour of late sowing of hemp, is, that the husbandman may by this means have an opportunity of destroying the first growth of weeds, which would choke the hemp, if it were sown before they had come up.

The hemp-seed that is sown should always be of the growth of the preceding year, because, as it is a very oily grain, its oil is apt to become rancid, if it be kept long, and the seed then loses greatly of its vegetative power, in so much, that, when it is two years old, many of the grains will not rise at all; and if it be older, a yet less quantity will grow. Experience has also proved, that, as in other grain, so likewise in this, it is advisable every second or third year to choose the seed from a soil different from that on which it is to be sown.

The husbandman should be particularly attentive to the weather, when he sows hemp, for the season then should neither be too dry, nor too rainy. If either of these is the case, he had better defer his sowing: though he should, if possible, always choose a time just after a gentle fall of rain.

When the soil is deep, and in fine order, it is best to sow this seed thick, especially if the hemp be intended for fine uses, because the plants run most into height, when they stand closest together, and their fibres are then by much the finer. They should not, however, stand so very thick as to choke one another; because this would occasion a considerable loss of plants. It is therefore necessary to observe a medium, the knowledge of which is easily acquired by practice: and indeed, in general, hemp-grounds seldom are too thinly stocked with plants, unless when part of the seed has been destroyed by frosts, drought, or other accidents. The usual quantity is three bushels to an acre.

As soon as the hemp-seed is sown, it must be carefully covered with earth, either by means of a harrow, if the ground has been ploughed, or with a rake, if it has been dug by hand; and besides this precaution, the whole hemp-ground must be constantly watered till the seed has risen; for otherwise numbers of birds, and especially pigeons, will destroy it entirely, without sparing even the seeds that have been well buried. It is true, that pigeons and birds which do not scratch, do no great hurt to the grains of corn that are well covered with earth; but the husks of these grains do not rise up out of the ground with their green shoots, as those of hemp always do; and then it is that these birds, mistaking them for perfect seeds, tear them away with the young plants to which they adhere, and thereby commit vast havoc. So greedy are the pigeons, in particular, after these seeds, that none of the common ways of frightening birds will keep them off: nay, M. du Hamel assures us, that he has seen strong men, and even dogs, so wearied out with fatigue, as to be forced to give up the task, when the hemp-ground has been large. Happily this troublesome work does not last long; for when the hemp has put forth a few leaves, it requires no farther tending.

Though hemp cannot be weeded without great hazard of damaging the crop, because whatever plants of it are twisted, bent down, or broken, through inadvertence of the weeders, or by any other cause, never rise again; yet if the weeds are so numerous and rank, as to endanger their smothering of the hemp, it is necessary to root them out, and the most careful persons must be employed for this work, which, when rightly executed, is also attended with this farther advantage, that the pulling up of the weed loosens the surface of the earth, and thereby forwards the growth of the plant.

In very dry seasons, it will be proper to overflow the hemp-ground, if it can be done. To this end some authors advise letting in the water from the ditches, as is practised from rice-grounds. If any parts of the hemp ground are in danger of being burnt up, it will be advisable to water them, or perhaps rather the whole in such case, even by hand.

If, by any accident, the hemp grows very thin, so as to be thereby in danger of branching out too much, and of becoming woody; this should be an additional motive for keeping it perfectly clear of weeds, in order to let it remain for seed, which will be so much the better for the plants having stood thin.

The male hemp (which is the species that produces the *farina facundans*) ripens earlier than the female, generally by three weeks, or even a month: but the time of the ripening of either depends much on the nature of the soil. The male hemp shews its ripeness by turning yellow at top, and whitish at the bottom of the stem; but this sort, in particular, should be pulled rather before it is quite ripe, that is to say, while it is yet somewhat green; for if it be too ripe, its fibres will adhere so strongly to the seed, as not to be separated therefrom, without some loss; neither

will they be so soft, and consequently not fit for domestic uses, as those of hemp that is pulled before it has attained to a perfect maturity.

The ripeness of the female or seed-bearing hemp, is known, not only by the same signs as that of the male, but also by the seeds beginning to turn brown, and by the capsules, which contain them, beginning to open.

As soon as the male hemp is ripe, it is pulled stem by stem, and with caution, not to injure the female hemp, which, as we before observed, must remain on the ground some weeks longer, that is to say, till it also is ripe, and then it must likewise be pulled stem by stem.

Each handful that is thus pulled should consist of plants, as nearly as possible, and placed as even as can be. Some tie up each handful, especially of the male hemp, with a stalk of hemp, then lay it in the sun to dry its leaves and flowers, which they afterwards beat off, by striking it against a tree or wall; they then put several of these handfuls together, so as to form a pretty large bundle, and in this condition they carry it to the watering place.

We have just mentioned what M. du Hamel says of the common practice of drying the hemp before it is steeped: but we must here observe, that it is a matter of doubt, whether this plant should be dried before it is steeped. Those who are for drying it first, say, that the hemp becomes thereby stronger than when it is steeped without having been previously dried: for my part, I must confess, that this drying seems to me to be a needless trouble; for as it is necessary in the steeping of hemp, that a certain degree of putrefaction should arise, sufficient to destroy the texture of that glutinous substance which connects the fibres to the woody part of the hemp, it certainly is more advisable to lay the hemp in the water as soon as can be after it has been pulled, because the more there is of the natural moisture left in this glutinous substance, the sooner the putrefaction will begin. If, either by design or accident, the hemp has been dried, the putrefaction comes on more slowly and more unequally, and the fibres contract a hardness which the steeping afterwards will not easily correct.

The common height of hemp, when full grown, is from five to six feet: but M. du Hamel remarks, that the stems of the hemp which is cultivated near Bischwiller, in Alsace, are sometimes upwards of three inches in diameter at their bottom, and above twelve feet high. These, indeed, are so deeply rooted, that even a very strong man can hardly pull them up.

When the female hemp is let stand till its seed is perfectly ripe, its bark becomes woody, and so coarse, that no future operation can bring it to a proper degree of fineness. For this reason, it is generally pulled before the seed is quite ripe: but as it is manifestly the husbandman's interest to sow none but the best seed, he ought not to grudge the sacrificing of the goodness of a small part of his hemp, to the superior advantage of obtaining perfect seed by letting a proper number of these plants stand till their seeds have attained full maturity. The judicious M. de Chateaufieux, whose attention extended to the most proper method of cultivating every useful plant, did not neglect so important an object as the quality of the hemp employed in cordage, and the means of obtaining its seed in the greatest perfection. However, not having had opportunities of continuing his experiments long enough to draw certain conclusions from them, he invites all those who have the public good at heart, to make experiments which may lead to the utmost improvement of the culture of this plant: "but (says this friend of mankind,) these motives of economy are vastly inferior to the inestimable advantage of saving ships, their cargoes, and their crews, which often depends on the strength of the sails and cables."

On the twenty-sixth of April, 1753, he sowed six beds with his drill plough, placing six rows in each bed. The beds were seven feet wide, and the soil strong, but in very fine tilth. He treated his plants with great care, according to the principles of the New Husbandry: but both that and the ensuing year were unfavourable to the growth of hemp. However, he observes, in general, that his plants were five or six feet high, that their stems were large, and their bark very thick and strong. They were very fruitful in seed, especially the two outer rows, which had profited most by the hoeings. M. Aimen, from forty plants of hemp raised in the common way, and which might be deemed fine ones, had only a pound and an half of seed; but a single plant which grew by itself, yielded

him seven pounds and a half, of much better seed than any that is produced in the common way. From hence it results, that it must be of great advantage to the husbandman to set apart a spot of ground sufficient to rear thereon as many plants of hemp, as will afford him seed enough for the purpose of sowing, and to cultivate them according to the principles of the New Husbandry.

In some countries, to complete the ripening of the seed, round holes are dug, about a foot deep, and three or four feet in diameter, in different parts of the hemp-ground; and the handfuls of pulled hemp are set as close together as can be in these holes, with their seed ends downward, and their roots uppermost; after which, to keep them in this position, the whole is tied round with bands of straw, and the earth that was taken out of the hole is thrown up all round this great sheaf, so as quite to bury the heads of the hemp, which, when thus covered, heat by means of the moisture contained in them, in the same manner as a stack of green hay, or a heap of dung. This heat completes the ripening of the hempseed, and disposes it the more easily to quit its husks; and when it has been brought to this condition, the hemp is taken out of these holes, where it would become mouldy, if it were left longer in them. But, as is justly observed in the excellent Memoirs of the Royal Society of Agriculture at Tours, it is hard to conceive, how an operation which tends to bring on at least some degree of putrefaction, can ripen the seed; and therefore this must be at best a very dangerous practice, especially as a seed so very oily as that of hemp, and consequently so apt to become rancid, cannot but be liable to be rendered still more so by this degree of heat.

In other places, where the crops of hemp are great, the husbandmen do not bury the heads of their seed-hemp in the manner above described, but only lay it in heaps, with the seed ends one against another: others, whose crops are smaller, content themselves with spreading upon the ground a cloth to receive their hempseed; and others again only spread their bundles upon a clean spot of ground, with all the heads turned the same way. The seed ends thus placed are beaten slightly, either with a stick, or a light flail. The seed which falls out easiest is always the ripest and best, and should therefore be reserved for sowing the next spring: and as to that which remains in the heads of the hemp after this operation, it is got out by combing the heads on the teeth of a ripple, which pulls off the leaves, the husks of the seeds, and the seeds themselves, all together. These are gathered in a heap, and left in that condition for a few days, in order that they may heat a little, after which they are spread out to dry, then they are threshed, and finally, the seeds are separated by winnowing and sifting. This second seed is much inferior to the first, and accordingly it is used only for extracting oil from it, or feeding of poultry.

It is, on this occasion, justly remarked in the Memoirs of the Royal Society of Agriculture at Tours, that by the threshing of hemp there is always danger of bruising some of its seeds, and that the bruised seed will not grow, though it may be fit for yielding oil. Nor is this all; for, by threshing out the seed, there is a mixture of imperfect seed with that which is fit for sowing: and this is the reason why husbandmen have always found it necessary to sow a greater quantity than would otherwise be requisite, in order to make up for the uncertainty of its growth.

The method of separating the finest grains of wheat for sowing, by throwing the corn to a distance on a barn floor, is equally advisable for obtaining the heaviest and best hemp seed, where proper care has not been previously taken to provide such. In this case, the ripple may be used to separate the whole of the seed from the plant, and this will prevent the inconveniencies which arise from the threshing or beating out of the seed.

The method of laying the hemp down in order to its being steeped, is to place it in bundles at the bottom of the water, there to cover it with a little straw to keep the dirt from sticking to it, and then to load it with pieces of wood and large stones, to keep it down, so that it may be always five or six inches below the surface of the water.

The intention of steeping the hemp in water is, to make its bark part the more easily from the reed, and to destroy the outer skin; or, if I may here be allowed the language of anatomists, the cellular membrane which connects the hemp with the reed. All this is effected by only a small degree of putrefaction, so that it is dangerous to let the hemp

hemp lie too long in the water, for it will then be over steeped, that is to say, the water will not only have acted upon the outer skin and the connecting fibres, but it will also have lessened the longitudinal cohesion of the fibres; in short, the hemp will be too much rotted, and in this case the strength of those fibres will be proportionably impaired. On the contrary, when the hemp has not lain long enough in water, its bark adheres to the reed,—its fibres are hard, and they cannot ever after be rendered sufficiently fine. There is therefore a medium to be observed; and this medium depends, not only on the length of time that the hemp is to remain in the water, but also,

1. On the quality of the water; it being sooner steeped sufficiently in standing water, than in a running stream; and sooner in stagnant putrid water, than in that which is clear.

2. On the temperature of the air; for it requires less time to be sufficiently steeped in hot weather, than in cold.

3. On the quality of the hemp: that which has been raised on a rich mould where it has not wanted for water, and which has been pulled whilst yet a little green, being sooner steeped to a proper degree, than that which has grown on a stiff or dry ground, and which has been let stand till it was quite ripe.

In general, when the hemp has been steeped but a short time, its fibres are thought to be the better. Hence arises the opinion, that hemp should not be steeped but in hot weather; and for this reason also it is that many, when the autumn is cold, defer the steeping of their female hemp till the next spring. It is likewise for the same cause that some prefer steeping their hemp in standing water, or even in stagnant waters, that is putrid, rather than in spring or running waters.

M. du Hamel, to whom we are indebted for the foregoing remarks, steeped hemp in different sorts of water, and it appeared to him, that the fibres of the hemp steeped in putrid standing water were softer than those of that which had been steeped in running water: but they contract in water which does not run, a disagreeable colour, which does not indeed do any real injury to the hemp, for that which has been thus steeped is afterwards the most easily bleached; but yet, as this colour displeases, and the hemp is the less saleable for it, endeavours are always used, if possible, to make a small stream of water pass through the steeping places, thereby to change the water in those places, and to prevent its becoming putrid.

He succeeded likewise in rendering hemp fit to separate from the reed, by spreading it upon a meadow in the same manner as is practised for bleaching of linen: but he found this method tedious and troublesome; nor did the fibres of the hemp so prepared seem to him to differ much from those of hemp steeped in the common way.

He also tried the boiling of hemp in water, in hopes of bringing it speedily to the same condition as it is in when taken from the usual place of steeping: but when, after having been boiled upwards of ten hours, it was taken out of the water, in order to be dried, it was not at all fit for either peeling or breaking. It is true that, while it yet remained hot and wet, its bark separated easily from the reed; but at the same time it peeled off like a ribbon; the glutinous substance which connects the longitudinal fibres, and makes them adhere closely to each other, not being at all destroyed, so that they could not be separated, nor was it possible to divide them into fine threads. It is evident from what has now been said, that no precise time can be fixed for the steeping of hemp; since the quality of the hemp, that of the water, and the temperature of the air, hasten or retard this operation.

Mr. Young, in his *Annals of Agriculture*, vol. XIV. inserts the following method of cultivating and dressing hemp, by *Abbé Rulles*.

"It is sufficiently known, that land intended for a crop of hemp must be well manured, well ploughed, cleaned, and gotten fine; and the season being arrived, which varies much according to the soil, weather, and conveniency of the cultivator, extending from the 25th March to the 15th June; sow the hemp seed, which ought always to be new seed, thin, not exceeding two bushels to an acre, and if you have the advantage of a drill-plough, still less will do. After the land is sown, go through the whole with a shovel, and with it make little paths at seven feet distance from each other, the lengthway of your piece, so that at the proper season you may reach the female hemp, which you will have occasion to pull out, without trampling on the male, which must stand at least a month longer to ripen its seed.

The female hemp (which is that which bears only flowers and no seed) is known to be ripe by the flowers fading, the farina fecundans falling, and some of the stems turning yellow. You must then draw out carefully the whole of the female hemp, breaking as little as possible the stems of that which you take, or that which you leave.

"Immediately as it is gathered, take it in as large handfuls as you can, and either cutting the roots off, or leaving them on, as you like best (I prefer cutting them off) hold the root end uppermost, and with a wooden sword dress off the flower and leaves, which you leave on the field, since they assist in manuring; pick out any weeds or spoilt plants; put twelve handfuls or gripes together to make a bundle; then lay the bundles in water: it is much the best to be a running and clear water, and if shaded and overhung with trees the better: lay poles or planks, or whatever else you have that is suitable, across a large number together, so as to keep them at least two inches under water. Take particular notice which you lay in first, and how you lay the bundles, in order that you may be able to get them out again successively as they were laid in, without breaking or entangling. At the end of six days visit the hemp, and see whether the reed will draw out from some of the bundles. The time required for soaking depends very much on the nature of the hemp, the weather, and of the water it is soaked in—from six days to nine, or even eleven. It is a trouble that is not ill bestowed, to sort the hemp for soaking, if it is of unequal sizes, the slenderest generally requiring most soaking.

"When you find any quantity sufficiently soaked, take it out with care, putting the hands under it to prevent breakage, and transport it to a trough or to a table; for there are two methods of working it. If you work it in a trough, you must be provided with one somewhat longer than any hemp you mean to work in it—twelve or fourteen inches deep, and of what width you think proper, according to the number of persons you employ at it, as one, two, or four. To this trough must be fitted two pieces of plank, of about a foot length, but of such width as to stretch over a bundle of the hemp as it lies opened in the water: these planks must be set on one side with teeth of brass wire, and when the hemp is ready for drawing, must be laid on it as it lies in the water, to keep it straight and immersed.

"If you work the hemp on a table, you must, before taking it out of the water, open a little the bundles, and rub the stems between your hands to get off what you can of the slime, and to loosen the rind. You must likewise push the bundle along in the water, with the root end foremost, to loosen the rind at that end where the operation is to be begun. If you do not thus rub and scour your hemp in the water where you soak it, you must do it in the trough. But in either case you must be careful to keep an even and steady hand to avoid breaking the reed, which, as many times as it happens, renders the operation of getting the reeds out tedious. If it is wrought on a table, the bundle must be frequently but slightly wetted. If any suitable method could be taken to make water drip gently on it, it would be best. A plank must be laid on the bundle to keep it steady.

"All matters being properly disposed, either on the table or in the trough, you must begin at the root-end to push back a little the rind from the stem; then taking hold of one stem at a time, and rather nearer the outside than middle of the bundle, keep your hand and the reed under water (if you work in a trough) and draw it out from the bundle as straight as possible, you will find it come out clean as a sword from its scabbard. As you proceed you may take two, afterwards four, and up to six or more reeds at a time, which will draw out still more easily. When you have drawn out all the reeds that you can find at the root end, lift up the spiked plank which was at the upper end, leaving on that which was in the middle, and draw out such pieces of reed as you may find at the upper end, and which have remained after drawing out what you could at the root-end, because they were broken. Lastly, take off the plank which laid on the middle, and take out all the relics of reed you can perceive. If your hemp was in good condition for drawing, you will now find all your reeds perfectly clean on the floor, and the rind, which is the hemp, lying in strait threads, in the water or on the table.

"You will perceive that among the hemp there is a great quantity of gum left, looking like a jelly; this you will wash out as if you were washing any long straight piece of cloth, observing not to displace or twist the threads, which

which would thwart the future operation of dressing or heckling. The finer and whiter you desire the hemp to be, the more waters you will run it through, squeezing it out at each time of washing; but I think it always right at the last to run it through a water in which a slight quantity of soft soap has been beat up, after the rate of an ounce of soft soap to three pounds of the hemp when dry. Do not squeeze it out from this soap water, but hang it to drain, and when a little stiffened, open a little the bundle, and lay it to dry on a grass-plat or floor; the former is preferable. This soap-water is not absolutely necessary, but is certainly of great use for softening the hemp, and rendering it pleasant and easy to dress; but may be dispensed with where it is very inconvenient, and where the hemp is intended for coarse purposes. It is obvious that all these operations would be carried on to the most advantage near to some running stream or large lake, if it be a standing water, on account of the great use that is made of that element, and to save a great deal of the trouble of transportation.

"When thus dried, the hemp is proper either for dressing or storing: if the latter, particular care must be taken that it be thoroughly dry, it will otherwise heat and spoil. As the hemp peculiarly intended to be spoken of is the female, or flower-bearing hemp, which is intended for fine uses, it is to be observed, that it must be worked with heckles or hatchels, such as are used for flax-dressing, and may be brought to an extreme fineness; and the shorts, having no pieces of straw or reed among them, may be carded and spun, and brought into use for all the same purposes as cotton, and the same methods used for bleaching and softening. It is likewise requisite to work this hemp as soon as pulled, without which the greatest softness and whiteness cannot be obtained; and as this sort generally falls ripe between hay-time and harvest, when the weather is warm and fine, and the women most at liberty, it will be a suitable occasion to draw and cleanse the hemp; the dressing may be reserved for winter.

"I now proceed to speak of the male hemp, which being a more considerable crop, cannot all be worked as fast as it is pulled or cut. It is known to be ripe enough by the stems becoming pale; for if you stay till the tuft containing the seed appears ripe, or the stem turns brown, the hemp will be in a great measure spoiled. When it is come to a proper maturity, you must get a good number of hands, so as to expedite the business, because such as remains standing after it is ripe, will have its rind fixed to the reed, the gum turned hard and dark-coloured, and the whole operation of drawing becomes difficult, troublesome, and ungrateful. The leaves are to be stripped off with a wooden sword, in the same manner as those of the female hemp, as are likewise the seed, the branches which grow laterally and even the tuft-bearing seed at the top: but if this latter should not come off clean, it must be chopt off with an iron instrument. All this must be done over a cloth, or on a spot of ground in the field, well levelled and smoothed, to avoid losing any of the seed. And it is proposed, and said to be successful, to leave the seed abroad, covered with the leaves, &c. to preserve it from birds, in order that it may heat and be threshed in the field, and the leaves and chaff strewed on the land. This certainly saves trouble, and is practised in many parts, but seems to me slovenly, and I should rather take it home to a barn; but I would certainly burn all the roots, and such parts as are too hard to rot easily, and strew the allies as well as the leaves, and such other parts as will easily rot upon the ground, as, these matters are reckoned to go half way towards manuring the land for next year's crop. The male hemp, thus stripped of leaves and seed, will generally dry for storing in 24 hours; but at any rate must not be left long abroad, but rather taken into sheds to dry, which, when thus stripped, it will speedily do. Sun and rain would soon spoil it. That which can be wrought green must be treated as before set forth for the female hemp; and it is obvious that it is a great advantage to work it in this manner, rather than to dry and store it, which causes much trouble and expence, and produces less and worse hemp; but where the crop is considerable, and the hands few, it is unavoidable. If, however, much comes, it is impracticable to dry it for storing without spoiling, as every year's experience shews in the present received method: whereas the working the hemp green entirely avoids this disadvantage and inconveniency, and the hands engaged may continue their employment under the shelter of trees, or of a temporary shed made of a few rough poles and hurdles, covered with straw, reeds, &c.

"All the same procedure is to be used with the male as with the female hemp, as to drawing, scouring, &c. but as the reeds of it are less brittle, and the rind coarser, it requires more soaking, but is easier to draw, and produces much more and stronger hemp. What is stored must, when wanted to be wrought, be soaked, peeled, washed, and in general treated as before said. In cold weather it takes long soaking."

M. Marcandier is of opinion that the finest and clearest water is always the best for steeping hemp; and he approves of the method of those who make a kind of ditch on the edge of a river, where the water being more still and warm, ferments easily, and penetrates more quickly the parcels of hemp that are laid in it. When they are taken out of this ditch, it will be sufficient to wash them in the current of the river, which will carry off all the gum and mud that would otherwise cleave to them. He holds, that the hemp which has been steeped in rivers is always whitest, and of the best quality; and that that which has lain in ditches, pools, or reservoirs of standing water, is always of a bad colour, has a very disagreeable smell, is loaded with dirt, and loses a great deal in the dressing. These are M. Marcandier's sentiments on this subject, and if they are the result of his experience, as I presume them to be, I cannot but regret his not having related the particulars of his experiments.

The judiciously accurate-Memoirs of the Society which the illustrious states of Brittany have established for the improvement of Agriculture, Commerce, and Arts, are more particular in this respect, and consequently more satisfactory. After observing, that it is still undetermined whether hemp ought to be steeped in running or standing water, that each cultivator of this plant gives the preference to the method he has been used to follow, and that naturalists have not yet written any thing decisive on the choice of the waters fitted for this preparation, the most important of any that hemp undergoes, because it is on this that the ease and goodness of the heckling, spinning, and fabricating in a great measure depends; the Memoirs, I say, of these zealous patriots inform us, that one of the members of their office at Rennes, thought that this diversity of opinions and customs might proceed from running water's being, in fact, always preferable in some cases, and from standing water's being always the best in others. For example; in cold and rainy years, the plant must be weaker, longer green, and fuller of juice, than in dry years, in which last the hemp will be stronger, but at the same time harder and more woody. Why then, say they, very judiciously, should it be expected that the same waters applied to such different productions, should have a similar effect upon each?

To remove all doubt in this respect, the Society ordered some hemp to be pulled in different parts of the province of Brittany, and in different states of growth. Some was pulled before it was ripe, some exactly when it was ripe, and some several days after it was ripe. Each of the parcels of these three sorts of hemp was divided into two equal parts, one of which was laid to steep in running water, and the other standing water. They were afterwards heckled with very great care, and examined with the most scrupulous attention by a person thoroughly acquainted with the defects and good qualities of this commodity.

Minute accounts of every circumstance attending those experiments, and of their result, were sent to the office at Rennes; and the Society, sensible of the vast importance which the ascertaining of this point may be of in many respects, desired that they might be repeated in one and the same year on the hemp of all the districts of the province, and the result of their first experiments was as follows:

1. There was a sensible difference between the same hemp pulled in the three states before mentioned.
2. All the hemp that was steeped in running water, was incomparably whiter than that of the same quality which was steeped in standing water.
3. The hemp which was pulled before it was ripe, acquired the greatest degree of whiteness.
4. The whole of the loss of substance, upon summing up the waste occasioned by each particular preparation, was least upon the whitest hemp; but that which had been steeped in standing water, yielded a greater quantity of fine fibres, and the great losses in point of quantity fell upon the dressing.
5. The hemp which was judged to be the best before it was heckled, did not always preserve its superiority when heckled. That which was at first looked upon as only of a middling, or even of an inferior quality, proved to be the finest and best after it was heckled. This observation

ervation is of great importance, especially when the hemp is intended for naval uses.

"We shall not, add these truly intelligent patriots, limit our inquiries to a bare repetition of these experiments. We purpose to extend them further, in order to have facts which may be entirely relied on. We shall cause the best hemp and best prepared of each different kind of hemp to be spun by the same hand, into as small and fine threads as the hemp is capable of affording, that so we may judge to which of the different manners of steeping this plant the preference is due, by the greater division of which its fibres may be susceptible. These threads shall be exactly weighed, and shall undergo similar preparations in exactly similar leys; after which they shall be weighed again, in order to judge of their goodness by the diminution which each shall have suffered in the leys, and by the degree of whiteness which each of them shall acquire. These experiments, though extremely useful in themselves, are, however, only introductory to a greater enterprize: they will lay a sure foundation for the improvement of every manufacture of hemp, and particularly of sail-cloth, which is an article of the utmost importance to all commercial nations."

The Memoirs of the Royal Society of Agriculture at Tours, for the year 1761, prefer river-water, especially that of rivers which run upon a bed of sand, as the best for steeping of hemp; because this water, being clear, renders the colour of the hemp brighter than it would otherwise be, as there is not any filth therein to sully it: and it peels the more easily when so steeped, not being there liable to so great a degree of putrefaction, as to break the cohesion of the fibres of its bark. It is not, however, here meant, that the hemp should be steeped in the bed of the river, because the inequality of the motion of the water on the sides, and in the middle of the hemp, would prevent the arising of that equal degree of putrefaction which is in this case essentially necessary. On the side of such rivers, a hollow should be dug three or four feet deep, and proportioned in extent to the quantity of hemp to be watered.

As it is contrary to law that the places for steeping hemp be made in running-water, it would be of advantage to contrive them so that the waste-water from the steeping places should run off upon pasture-grounds: because the quantity of putrid vegetable matter which the water wherein hemp has been steeped carries along with it, would greatly enrich those grounds; and with this view likewise all the water of pools or other places used for the steeping of hemp, should be thrown out of them upon the grass, as soon as the hemp has been removed.

It is essential to take heed, that the hemp be not, by any means, laid to steep in water in which there are any animals that might be apt to gnaw it: for these would cut asunder, and totally destroy its fibres. Of this kind are, in particular, those creatures which some people call fresh-water shrimps.

The common method of judging when the hemp has been sufficiently steeped, is by trying whether the bark parts easily from the reed, and can be peeled off its whole length without breaking; for in this case it is thought to have been watered enough. However, it must be allowed, that long practice enables the peasants who cultivate hemp to give it, generally, a due degree of steeping, though they do sometimes mistake: and it is also to be observed, that it is the constant custom of some countries to steep their hemp more than others. But the surest way of all to distinguish whether the hemp has been steeped enough, is, as the Tours Memoirs remark, to take some of the stems out the water, and then to try whether the extremity of the roots snaps off short, and whether the bark separates clear from the reed, its whole length: for in these cases it is certain that the hemp has been sufficiently watered, and it should then be immediately taken out. If the bark does not separate equally, but stops chiefly at the small knots which appear on the stem, this shews that it has not been steeped enough.

The usual duration of the steeping of the male hemp is from three to six days, according to the weather; and of the female hemp, from five to eight or ten days: but as only a small degree of too much or too little steeping is equally hurtful, the utmost attention should be exerted to hit the precise time of its being duly watered.

Some injudiciously neglect to wash the hemp when it is

taken out of the water, because, say they, the filth brought out of the water with it will afterwards fall off: but, in the drying of the hemp, this filth gives it a bad colour, and the dust which arises therefrom is extremely prejudicial to the health of the workmen.

When the hemp, after having been properly steeped, is taken out of the water, the bundles of it should be untied, and spread upon the sand, or upon strong rocky ground; or, if neither of these be at hand, it may be laid upon a field that has been lately reaped, and where the stubble still remains standing. This stubble will keep it hollow, and it will dry the sooner. Some dry their hemp by spreading it out and setting it upright against a sunny wall, or by laying it along the side of a ditch. Grass is not fit for laying it on, because there will arise from thence a moisture which will rot the hemp. For this reason, it is, that the place where hemp is spread to dry, should be as free as possible from every kind of damp. When the hemp is thoroughly dry, it is bundled up again, and carried home, where it should be kept in a very dry place till it is wanted for peeling or breaking.

The method of peeling hemp is so simple, that a description of it would be needless; even children, and the aged and infirm may perform it with ease, by only taking one stalk after another, breaking the reed, and slipping off the bark. This may likewise become the employment of every person belonging to the farm in winter evenings, and at such times as the weather will not admit of their working without doors. It must however be allowed, that there are some inconveniencies attending this method: the peeled hemp comes off in ribbands, which do not answer in the heckling so well as that which has been broken; more of the useless membranes, especially towards the root, still adhere to it, and, by increasing its weight, render it, to use the common saying on this occasion, better for the seller than the buyer; besides which, the hemp does not always peel off in equal lengths, and from thence arise considerable disadvantages, and loss in its future dressings.

The hemp which is to be broken should first be rendered very dry; because the reed will then be the more brittle, and therefore part the more easily from the bark. There are several ways of drying. Messieurs Du Hamel and Marcandier describe a kind of cave or cavern, in which it is commonly dried in many parts of France. This cavern is generally six or seven feet high, five or six feet wide, and nine or ten feet long. A hollow under a rock is often properly made use of for this purpose; but as that cannot always be met with, it frequently is necessary to have recourse to art. In this case, some form the top of their vault with dry stones, others cover it with broad flat stones, and others again only close it with pieces of wood, over which they lay a quantity of earth sufficient to stop up all the interstices: but which ever of these methods is taken, the drying place should be so situated as to be sheltered from the north and north-east winds, and be open to the south, that it may receive the benefit of the sun; because the usual season for breaking of hemp is in clear frosty weather, when the business of the field is suspended.

At about four feet above the floor of this drying place, and two feet from its mouth or entrance, three bars of wood, about an inch thick, are placed across the cavern, from side to side, and there fixed. On these bars is laid, about six inches thick, the hemp that is to be dried. A careful person, which generally is a woman, then keeps constantly burning, under the hemp so laid, a small fire made of the fragments of the reeds of hemp that has already been broken or peeled. The person thus employed must be extremely watchful, because, as this kind of fuel is soon consumed, and must of course be frequently replenished in order to keep a constant and regular fire all over the hearth (for this is absolutely necessary) very great care must be taken that the flame do not ever rise so high as to set fire to the hemp, which is exceedingly combustible, especially after it has been dried some time. The same person takes care also to turn the hemp from time to time, in order that it may be dried equally in all its parts; and likewise to put on fresh hemp, when the former is dry enough to be taken away and sent to the break.

Where but a small quantity of hemp is to be dried, an oven is doubtless the safest method; and when the hemp is dressed at home, it may perhaps be dried as fast by this means,

means, as the other avocations of the family will admit of its being wanted. The only attention requisite in this case, is that the oven be not so hot as to endanger the fine and tender fibres of the hemp: for too great a heat may not only scorch them, but likewise so parch the oil in the hemp, as that the hemp will afterwards remain harsh and dry, and not be so easily whitened as it might otherwise be.

It also is usual, where the quantity of hemp is greater than can be managed with an oven, to dry it on a kiln; and this is a good method; provided the fire here be also very moderate, and made of such materials as do not blaze or sparkle, because of the great aptness of dry hemp easily to take fire. Coke is perhaps the very best fuel that can be used for this purpose.

The operation of breaking hemp, by which general term is however strictly meant only the breaking of the reed, which some call the bunn, or woody part of the stem, within the bark; for the bark itself, of which is made the filamentous substance that is spun and used in manufactures, only bends under the hand of the dresser, and does not break: this operation, I say, has hitherto generally been executed three ways, namely, by beating the hemp with beetles, which is a laborious and tedious work; or by the Dutch hand-break, which is in every respect much preferable to the beetle; or by fluted rollers worked by horses, wind, or water, but of choice by the latter, where a running stream can be procured. This last is more expeditious, and less laborious than either of the other ways; but is dangerous to the workmen employed therein, because, if by any inadvertence the rollers should catch hold of their fingers, the loss of a limb at least is inevitable. The only means of preventing this dreadful consequence, in such a case, is to have an iron crow at hand, ready to clap instantly between the rollers, as is practised in sugar works, which are of a similar construction.

The fluted rollers are undoubtedly the best instrument for breaking hemp, because the length of the stalk and strength of the reed of this plant must render the Dutch-break a very tedious operation, especially when large quantities of hemp are raised, as must be the case wherever a sufficiency of it is cultivated to answer the purposes of the great and important manufactures in which it is employed in this nation.

The Moravian hemp mill, used in America, is also a good instrument. It consists of a large heavy stone, shaped like a sugar loaf, with the small end cut off. A body of that form will go round in a circle, if it be moved, on a plane. This is moved by a water mill, and the hemp, being laid on the floor, in its way, is bruised by the weight of the stone passing over it.

After the hemp has been broken, it undergoes a second operation, which is commonly termed swingling or scutching. The intention here is to separate the reed from the hemp, and this is done by one or other of the following ways. In the first, the workman takes a handful of hemp in his left hand, and holding it over the edge of a board, strikes it with the sharpened edge of a long, flat, and straight piece of wood, commonly called a swingle hand, or scutcher. The author of the thirty-seventh letter in the Dublin Societies Weekly Observations recommends that the cutting edge of the scutcher be made of a circular form, in order that its greatest force may fall on the middle of the hemp, and thereby spread it, by which means it will be the more equally cleared of the remaining broken pieces of the reed. But this method is, at all events, very laborious and tedious; and therefore water mills have been erected, in which several scutches, fixed in the same axle-tree, are moved with great velocity. Here the work is performed with great expedition, and much less fatigue to the workmen; but a greater waste is made of the hemp, owing to the velocity with which this engine is turned.

Before the hemp thus prepared is heckled, it usually undergoes a third operation, called beetling, the design of which is to loosen and thereby more thoroughly separate its fibres. The beetles used for this purpose are moved either by hand or by water.

We have already described the instruments invented by Mr. Macpherson for performing these operations with very great facility, under the article FLAX, and therefore need not be repeated here. See the article FLAX.

Mr. Marcandier proposes, instead of scutching and

beetling the hemp, to give it a second steeping after it has been peeled or broken, the better to soften the bark that may still remain hard, and not be easily brought to a proper degree of fineness. For this purpose, the hemp intended to be steeped a second time, is divided into small parcels; these are tied loosely round the middle with a piece of packthread, in order that they may be managed easily without mixing or entangling them; and the hemp thus tied is laid in a vessel filled with water, where it is left, more or less time, according to the hardness of its fibres, and the quantity of glutinous adherent matter remaining on it. Three or four days are always sufficient for this purpose: but a less time will do, if the hemp wants only to be cleared of that adherent matter. When it has been thus steeped long enough, it should be washed very clean in a running stream; and if many of the fibres of the hemp are found to cling together in what our author calls ribbands, he advises to beat them in the manner that linen is beaten in bleaching.—It is safer to err in too little, than in too much steeping; because, after the fibres have been loosened in the break, they will be the more liable to be destroyed by even only a slight degree of putrefaction. When the fibres of the hemp are sufficiently disengaged from each other, they seem, while immersed in water, to be as completely dressed as if they had already passed through the heckle. After this watering, the parcels are opened, spread on a board, and laid in the sun to dry.

M. Marcandier observes farther, and likewise from his own experience, that after this preparation, the hemp may be again steeped and washed in a lye of pot-ash or wood ashes, rendered perfectly clear of all filth. This will undoubtedly contribute to the removing of any such matter still remaining in the hemp, as must necessarily fall off in the future preparations, before the manufacture made of the hemp is fit for use. And, indeed, a lye of this kind bids fair to be of service in the preparing of flax as well as hemp; because, both being thereby perfectly freed from every particle which must otherwise fall off in the future operations of heckling, spinning, bleaching, &c. the cloth or other manufacture made of them will be proportionably better and more durable. The time taken up in bleaching will, in particular, be very much shortened thereby.

In the whole of this process, the water should be warm, because warm water acts more powerfully than cold in dissolving the impurities which are to be separated from the hemp; and it is also an indulgence to the people employed in this business, who might otherwise be more apt to slur over their work. It will therefore be most advisable to perform this operation when the weather is moderately warm, thereby to save the trouble and expence of making fire to warm the water or the lye.

M. Marcandier having experienced the efficacy of horse-chestnuts in the bleaching of linen and cleansing of woollen stuffs, made likewise use of a solution of them in water, as a lye for preparing hemp in the manner above described. The method of preparing this lye is as follows: the chestnuts are peeled, and then rasped, as fine as possible into soft water, in the proportion of two, or, at most, three nuts to every quart of water. This is done ten or twelve hours before the mixture is to be used, and in the mean while it is stirred from time to time, the better to dissolve these raspings and impregnate the water. The last stirring is given a quarter of an hour at farthest before the water is drawn off from the coarser part of the raspings, which sinks to the bottom; and this is done, either by inclining the vessel and pouring the lye off gently into another, or by lading it out by hand, while the water is yet white, and froths like soap-suds. In order to use this lye, it is made rather hotter than the hand can well bear, and the hemp is then steeped and washed in it, as in soap-suds.

The hemp thus prepared is carefully dried, laying the fibres smooth and as little intermixed as possible. When dry, it is doubled and twisted at the ends, or tied up in bundles. The farther business of the hemp-dresser need only be an easy beating of the hemp, and that chiefly to separate the fibres that may have clung together in the drying, and to the common operations of the heckle. The dangers so often fatal to the dressers of hemp from the dust drawn in with their breath, will also be hereby in a great measure avoided: and the hemp thus prepared will be white, smooth, soft, and flexible.

The same author extols highly the various uses to which hemp thus prepared, and even its tow, or what is separated from

from it by the heckle, may be applied. This hemp, he informs us, may be died like silk, wool, or cotton, and may be made into cloth, stuffs, and garments of all kinds; and that a great advantage attending the use of this material is, that it will not be in danger of being destroyed by those worms which eat woollen cloth. These advantages attending hemp prepared in the manner which M. Marcandier has proposed, may well deserve the farther experiments and attention of our manufacturers, especially at Manchester, or wherever else our mixed stuffs are made.

HEPS, the fruit of the species of wild rose, generally written hips.

HERBAGE, grafs; pasture in general. It is also used to signify the title and right of pasture. See **GRASS**.

HERD, a number of beasts together, generally black cattle.

HERDSMAN, a keeper of herds, one employed in tending cattle.

HERRING SCALES, for manure. Mr. Young, in his *Annals of Agriculture*, Vol. III. says, "besides other kinds of manure, the Lestoff farmers use herring scales. The herrings are washed in large tubs, previously to their being smoked, and what scales come off in the operation, are sold to the farmers at 6d. the last; that is the scales of 10,000 herrings.

"These scales are sown upon wheat on clover lays, and harrowed in with the corn; and from such treatment the crops are thought to receive considerable advantage.

"And might not then, from the same source, an additional benefit be derived? the water in which the herrings have been washed is oily, bloody, and strongly impregnated with the effluvia of the fish. Now this water might be received into reservoirs contrived at no very great expence: from these it might as occasion served, be drawn and conveyed in watering carts (such as are in use about London to water the roads) either immediately to the fields that are in a proper state to receive it, or to a heap of sods intended for compost. Sods for this purpose are preferable to dung, either rotten or fresh; for they will absorb the moisture, whereas rotten dung is too compact to admit it, and too rich to want it, as for that which is not yet rotten, much wet prevents the process of the fermentation, which is necessary to convert it into manure.

"The probability of any good arising from the use of such water, is grounded, I confess, upon nothing but that of the scales above mentioned: yet, if upon the authority of the Lestoff farmers we admit the utility of the practice, the presumption is very much in favour of the hint which is here submitted to the consideration of the experimental farmer living in the vicinity of a fishing town.

Before any great expence is incurred, let a small open spot of ground, of equal goodness throughout, be appropriated to the trial; of which, if one half receives a common dressing, and the other this alone from a watering-pot, the produce of each will decide upon the respective merits of the two modes, and plainly evince what degree of attention is due to the latter."

HIDE, the skin of beasts, but particularly applied to those of large cattle, as bullocks, cows, horses, &c.

HIDE of Land, was such a quantity of land as might be ploughed with one plough within the compass of a year, or so much, as would maintain a family; some call it sixty, some eighty, and some an hundred acres.

The distribution of this kingdom by hides of land is very ancient; mention being made of it in the laws of king Ina. Henry I. had three shillings for every hide of land, in order to raise a dowry for his daughter: this tax was called hidage.

HIDE-BOUND, a distemper in horses, when the skin sticks so fast to the back and ribs, that the hand cannot separate the one from the other, without great difficulty; his body is at the same time lean, his back-bones stand up, his guts are for the most part deficient in moisture, and his dung dry, and more offensive than common.

If a horse becomes hide-bound by hard-riding and ill keeping, he may be cured by good keeping. If it be the effect of a fever, or some other disease, if that be cured which is the cause, the effect will cease; but if he has no fever upon him, and he is hide-bound only from lowness of blood and spirits, give him boiled barley, white-water, or the like, and when his flesh is raised, harden it with good oats, beans, and moderate exercise.

Taplin recommends as a cure, to take away a small quan-

tity of blood, and in three or four hours after increase its impetus by a mash of malt, oats and bran, equal parts; continuing it every night for a fortnight, stirring in two ounces of flour of brimstone every other night; giving his other feeds morning and noon, equal parts of oats and bran with half a pint of old beans in each, to prevent relaxing the body too much by the mashes.

HILL, an elevation of ground, less than a mountain; a down.

HILLOCK, a little hill.

HIP-SHOT, is when the hip-bone of an horse is removed out of its place; this happens to a horse many ways; by a wrench, stroke, or slip, strain, sliding or falling.

The signs to know it, are, the horse will halt, and go fideling, and the fore-hip will fall lower than the other; nay, in time, the flesh will consume away; so that if it be let alone too long, it will never be cured.

HIVING of Bees, the placing a swarm of bees in a hive, in order to have the benefit of their labours. See the article **BEE**.

HOE, a tool made like a cooper's adz, to cut up weeds in gardens, fields, &c. This tool is commonly called the hand hoe.

This instrument is of great use, and should be more employed in hacking and clearing the several corners, cracks, and patches of land, in spare times of the year, which would be of no small advantage thereto.

Horse Hoe, a large kind of hoe, drawn by horses, and used to stir the intervals in the New Husbandry, and clear the corn from weeds.

Under the article **CULTIVATOR**, we have described the instruments used abroad for this purpose; and shall here give two very useful instruments of the same kind, invented by the ingenious Mr. Hewitt, who presented them to the Society for the Encouragement of Arts, &c. where they may be seen. The following letter, describing these instruments, was sent by the inventor to the Society.

GENTLEMEN,

Perusing the Essays on Husbandry, I observed particularly, that the author, page 105, expresseth hopes of seeing some "new invented plough, cheap, simple, and rightly calculated for destroying weeds; keeping plants clean; and stirring the ground;" and, page 106, further says, "now as most people prefer useful, and cheap, to elegant and expensive inventions, it is natural to wish for a hoe plough entirely simple, and not costly. For the mechanism of those devised hitherto, by the ingenious lovers of agriculture, is of so perplexed, and complicate a nature, that it will no ways answer the common purposes of husbandry: but, being perpetually out of order, will throw the poor ploughman into despondency; and the rather, as neither he, nor the country plough-wright, can comprehend how to rectify any defects, or accidents, except with extreme difficulty."

The very name of a hoe-plough suggested the idea of an instrument, which I shall call a horse-hoe; whose construction is intirely new, simple, and much less costly than a common plough, such as country plough-wrights, and smiths, are able to make; and such as common ploughmen are able to use: and which seems, according to the hopes of the aforesaid author, to be rightly calculated for destroying weeds, keeping plants clean, and stirring the ground.

This horse-hoe, a model of which I beg leave, in the most respectful manner, to present to this honourable Society, I hope may be of very extensive use in agriculture as it must be much more efficacious, and expeditious too, than any kind of hand-hoe for the destruction of weeds, and stirring the ground. For if the instrument does not cut below the crown, or head, of the roots, such roots will sprout again, and the first labour become fruitless; which indeed is too often the case of hand-hoeing: as the labourer, sometimes only scratches the surface of the earth, and shaves off the leaves of the weeds, the roots remaining intire and unhurt, to vegetate again. With this instrument the husbandman may hoe the ground so deep, that it will infallibly cut asunder the roots of every weed it meets with, below the crown or head: and consequently, either destroy them, or at least greatly check their future growth that season.

This instrument is calculated for hoeing in the intervals between the generality of plants in straight rows: such as trans-

transplanted lucerne, beans, peas, and turneps, sown with a drill plough, &c. In large gardens, hop-grounds, nurseries and plantations of young trees, much labour and expence in hand-hoeing, may probably be saved by the use of it.

In the county of Norfolk (and probably in many other places) the husbandmen, in the months of March and April, preparing their lands for barley, generally give them a certain number of earths, according to the phrase of that country; or, in other words, plough them a certain number of times. In those months the weather is frequently very dry: and the soil being turned over and over again, and exposed to the sun and wind, becomes so dusty, that a great part of the seed will not grow without rain; which sometimes not falling in many weeks after the seed time, causeth the crop to consist of different growths; so that when the first grown crop is ripe for the scythe, the latter is but just eared. This evil, perhaps, may, in some measure, be remedied by the use of this horse-hoe, instead of the common plough, at that season; for this will stir, and loosen the earth as effectually, as the other: and at the same time, neither remove, nor turn it over, which seems to be beneficial, in a drought, upon very light and sandy soils.

With respect to foul summer fallows too, it may be of singular service. The common plough buries the weeds, of which many grow again. This horse-hoe will cut their roots asunder, below the surface of the earth; and by leaving their foliage above it, exposed to the summer sun, the greatest part of them will wither and die: so that they will not give the husbandman much more trouble the remaining part of the summer. And, as this hoe may be eighteen or twenty inches broad, two acres of land may be hoed by it, as soon as one acre can be ploughed, by the common plough.

This new instrument is intended for public benefit; and to the consideration of the public, as well as of this honourable Society in particular, it is freely submitted. If it be judged an useful implement in husbandry, well; if not, the pleasure that has arisen from the hope of doing good has amply rewarded, for his trouble, the inventor, who has the honour to subscribe himself,

Gentlemen

Hadleigh,
April 19, 1766.

Your most humble,
and obedient servant,

WILLIAM HEWITT.

P. S. Since I had completed this model, I apprehended, that its utility might be rendered still farther extensive, by a very small alteration; therefore, gentlemen, I take the liberty of laying before you another model, calculated for hoeing the furrows between wheat ridges, which all farmers acknowledge to be very good husbandry, though many of them are deterred from the practice of it, for want of a cheap expeditious method of putting it in execution. An instrument of this kind I am persuaded, will very greatly expedite that useful work; and if it meets with your approbation, gentlemen, many lovers of improvement in agriculture may be induced to give it a fair and impartial trial.

An explanation of the HORSE-HOE, Plate XVII. Fig. 3.

A represents a small round curved iron-bar, fixed upon each end of the axle of the wheel, by which the horse-hoe is drawn.

B, the wheel three feet in diameter.

C c two flat iron bars, three feet long, fixed upon the axle of the wheel, at D d, and to the sides of the hoe; at E e, by bolts and screws: upon these bolts, as well as the axle of the wheel, they are moveable.

F, a small round iron-bar, fastened at each end, into the two bars; C c (to strengthen them) at G g, from and to G, these bars may be straight. From G to E, let them be curved.

H, the hoe itself; the breadth of which may vary according to the different distances of the rows of plants, whose intervals are to be hoed.

K K, two little flat curved iron-bars, fixed by bolts, upon which they are moveable, to the bars C c. Each of them

pass through a staple, fixed into the sides of the hoe at L l. In both these little bars is a row of holes. In each of the staples, is one hole; and, directly opposite to them, one hole in each of the sides of the hoe: and, by means of two bolts, passing through these holes, and some of the holes in the bars K K, the hoe is fixed to any position; so that the ground may be hoed as near the surface, or as far below it, as is necessary.

M M, two wooden handles, fixed to the two sides of the hoe, and to each other, by the cross bar O; as long and as high from the ground, as the handles of a common plough.

Figure 4, represents the horse-hoe, intended for hoeing the furrows, between wheat ridges: which differs only, in one respect from the other. That hoe is flat; this is curved. The breadth, and curvature of this must depend entirely upon the breadth and curvature of the furrows, to be hoed. In which respect, every sensible farmer can easily direct the smith how to form it. But, after all, if any persons be inclined to make trial of this instrument, I would advise them not to trust to a verbal description, but to send for a model of it to Thomas Tillet, a very ingenious smith at Hadleigh in Suffolk.

This hoe is ingeniously contrived, and serves very well to cut the weeds near the surface of the ground; but none of the broad hoes can go deep, and in that respect, are deficient in one of the purposes of hoeing, namely, to improve the land; which cannot be done in any great degree, but by deep tillage: for which reason, when this, or any other broad hoe is made use of to cut the weeds near the surface of the ground, another instrument should follow that goes deeper. It is no recommendation of this or any hoe, that it neither removes the earth, nor turns it over: for turning it, and exposing a new surface to the influences of the atmosphere, is one of the principal means of fertilizing land, as is found by experience, in the practice of the New Husbandry.—For this reason also, this instrument is improperly named a plough; for the idea of a plough, is not only to raise a furrow, but also to turn it; neither should any instrument be named a hoe-plough, or horse-hoe; these names being given to the plough invented at first, to be used in the New Husbandry for deep hoeing; and generally continued to be so called by the practisers of that husbandry. Other hoes, that are drawn by horses, may, more properly, and by way of distinction be called cultivators.

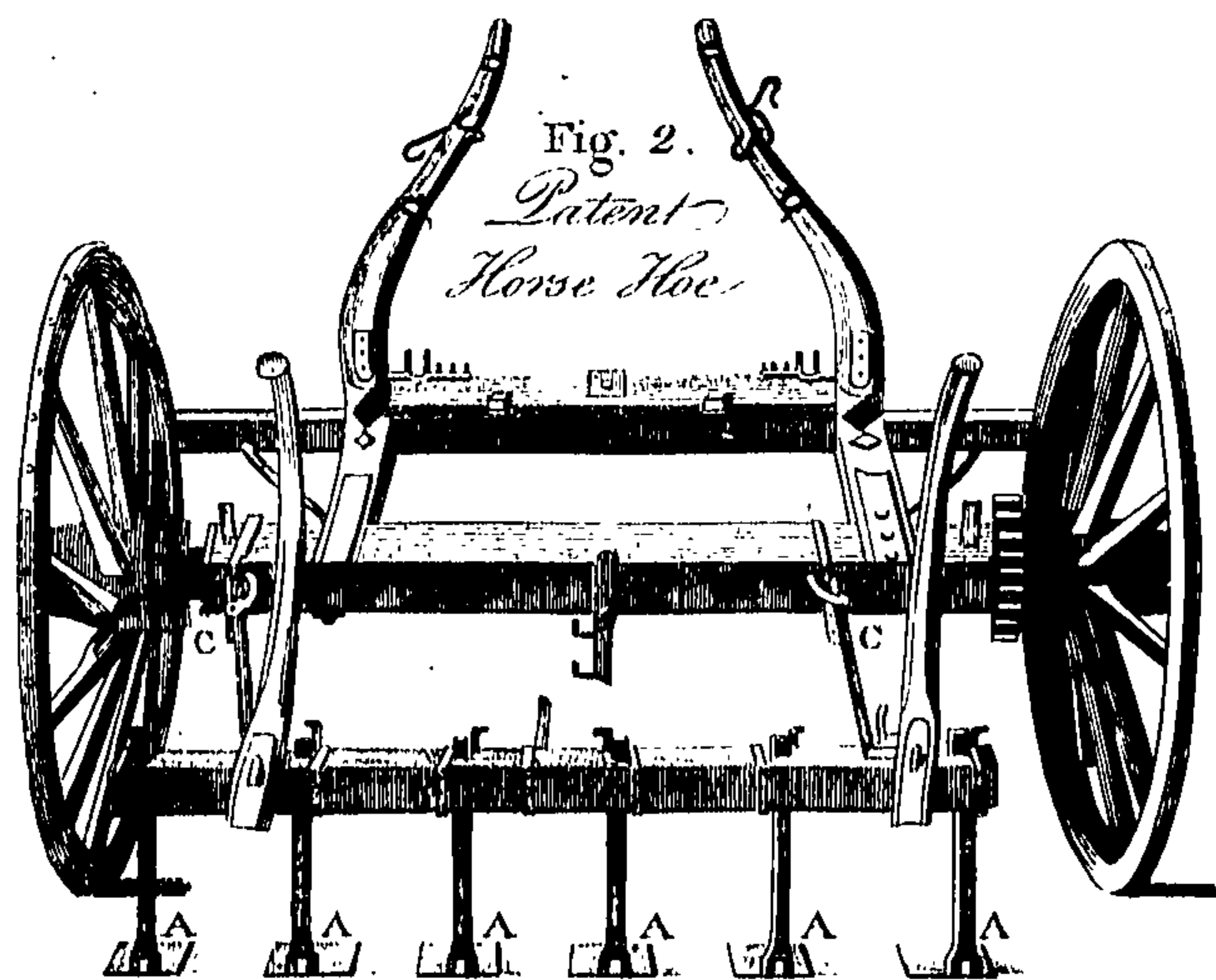
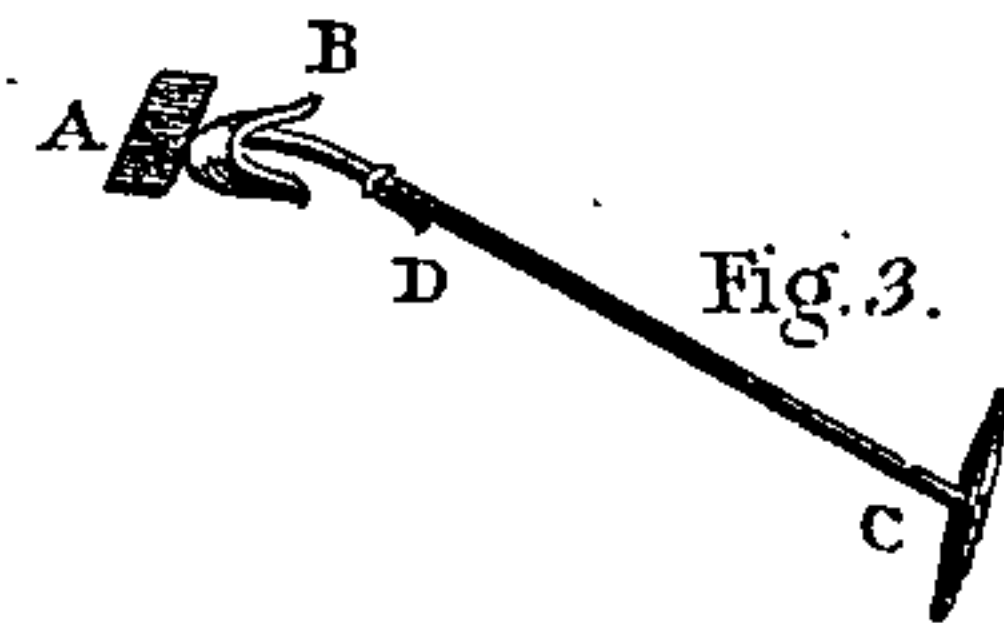
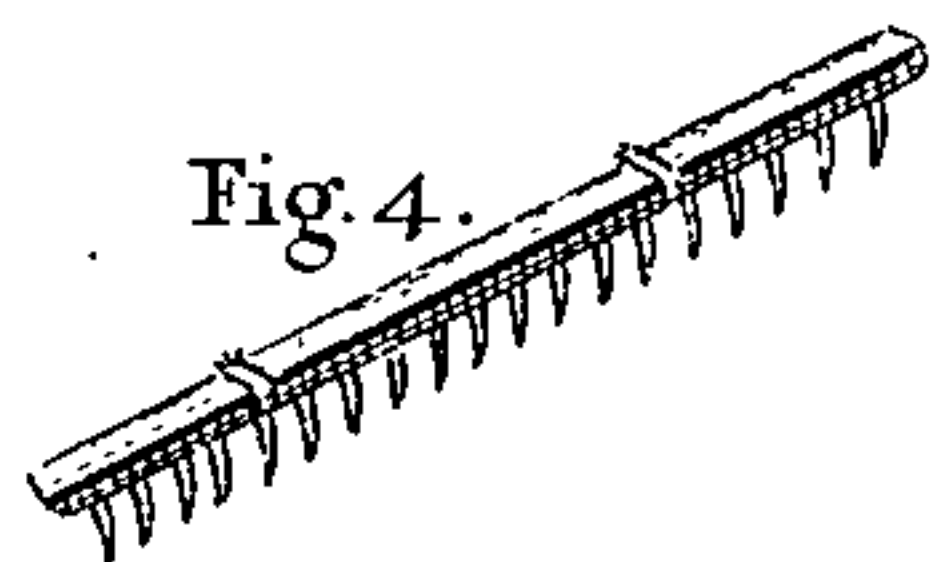
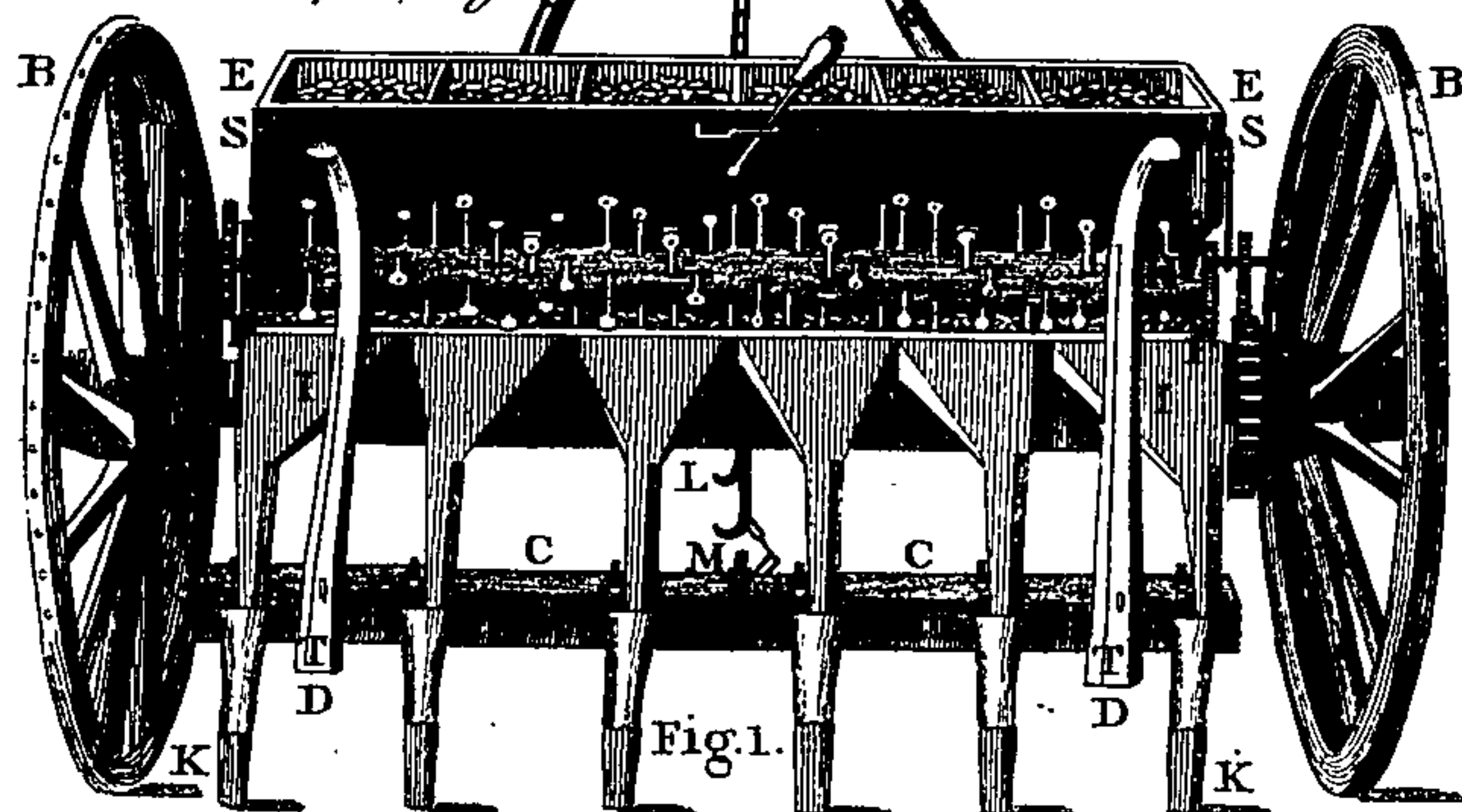
The *Double Hand-hoe*, Mr. Marshall says is one of those petty simple, cheap implements, which the more they are used the more obvious their merit appears. The whole cost of wood and iron-work is but three or four shillings, and with a trifling expence of laying the blades, it will last a man's life-time; but it is fitter for a light pea-soil, than a stiff bean-soil.

Mr. Marshall, in his *Rural Economy of the Vale of Gloucester*, says "the hoeing of crops in general has long been held out as a thing most desirable, in the arable process. Here we find it nearly in full practice. Not only the leguminous crops, which are planted in rows; but wheat, which is sown at random, are hoed: not by a few individuals only, but by husbandmen in general; the wheat crop being hoed, here, as customarily as the turnep crop is in Norfolk. Barley may be said to be the only crop, which is not hoed. But this crop is invariably fallowed for; either by a whole year, or by a winter-and-spring fallow; so that every crop which is taken, is, in reality, a fallow crop."

"Hence we see fields which have borne crops of grain, year after year without remission, during time immemorial, still affording annually portions of produce, which, in the management of some individuals, in some seasons, may be entitled to the name of crops. A fact, which nothing less than actual observation, could have induced me to give full credit to. A fact which proves, in a most interesting manner, the value of a due attention to crops while vegetating: a species of attention, which, in the management of the kingdom at large, is entirely omitted; excepting, perhaps, what is bestowed on an imperfect hand-weeding: in general terms, it may be said, that, in most other districts, crops remain in a state of neglect, from seed-time to harvest. While, here, the business of the arable process does not appear to be set about in earnest, until the crops be above ground."

"The origin of this unparalleled attention to crops, while vegetating, would now, perhaps be difficult to trace. In all probability, it originated in a kind of necessity, on the

Cooke's *Patent Drill Machine* improv'd & simplified
and capable of being converted into a *Horse Hoe*.



the every years lands; which, without it, must long ago have been wholly possessed by one continued thicket of weeds. Its good effect being there seen, it would be received, by degrees, into the fallow fields: first as an expedient to save a foul crop; and, at length, as a practice:

"The excellency of this custom, and the extent of its utility, are not confined to the field: the hoeing of corn is done, chiefly, by women and children: industry is, of course, encouraged; and the parish levies probably lessened; or, what is equally beneficial to the farmer, the wages for men's labour are lowered: while, in the saving of seed, by this practice, the farmer and the community are still more immediately benefited."

HOEING, the breaking or dividing the soil by tillage, while the corn or other plants are growing thereon.

It differs from common tillage, which is always performed before the corn or plants are sown or planted, or in the time of performing it; and it is much more beneficial to the crops than any other tillage. This sort of tillage is performed various ways, and by means of different instruments. Land which, before the tillage, would have yielded little, though the more it is tilled before sowing, the more plenty of corn it yields; yet, if tilled only before the sowing, will always have some weeds, and they will partake of the advantage of the tillage as well as the corn. This is one reason for an after-tillage, such as that by hoeing. But there is another consideration that yet more requires it; this is, that as soon as the ploughman has done his business, by ploughing and hoeing the land, after sowing, the soil, of its own accord, begins to undo it all again by tending towards its original texture and specific gravity again; the altering of which was the only business of all the former tillage. The breaking the particles of the earth, and making in it new pores, and new particles or new surfaces, is the great business of the plough and harrow; but, as soon as their use is over, the earth begins to coalesce again into its own form, the particles unite together, and the artificial pores in a great measure close up. The seed is nourished in a worse ground than it was first put into, and the more the plant grows up, and requires a larger supply of food, the worse the pasture becomes. While nourishment is thus denied the growing plants, they are at the same time choked with weeds, which being of a hardier nature than grain will grow with less supplies, and therefore thrive more vigorously, and rob them of a great part of the little food the land before allowed them.

Farmers in all ages have been acquainted, in some degree, with the use of tillage and dung to crops of useful plants; but they have so ill managed the time of giving these assistances to nature, that there is no doubt but one third part of the nourishment raised by dung and tillage, if it were given to plants and corn at many proper seasons, and proportioned to the different times of their exigencies, would be of more benefit to the crop than the whole is, when applied all together at the time of sowing.

Nature, by what she does in the animal œconomy, seems to point out to us something like the remedying this by hoeing; for when the teeth, as the plough, have tilled that soil or mass which is earth altered; and when the saliva and the juices of the stomach have served to divide and attenuate it, as the salts of dung and other manure do land; after all this, the bile and pancreatic juices are ordained to farther attenuate it, at the very time when it is ready to be exhausted by the numerous mouths of the lacteals, situate in the intestines. This last operation of these juices seems analogous to the meliorating the soil by hoeing, after the plants are grown, and are becoming fit for use.

Transplanting is nearly allied in its nature to hoeing, but it is much inferior. The nature of this will not admit of its being a general thing; and even if it would, hoeing is better: for by transplanting, the plants can only be kept up to a certain period, after which they will not bear it; but hoeing may be used to them with advantage, to their utmost standing, and make them vigorous all the while.

The roots of a plant are all necessarily broken off in transplanting, and it requires some time for it to strike a whole set of new ones; and if the earth about it is not kept thoroughly moistened all this time, the new formed-roots will not be able to shoot, and the plant will starve in the midst of plenty: but, on the contrary, in hoeing, the same advantage of a new pasture for the plant is obtained, by the breaking the particles of the earth, and at the same time no more of the roots are broken off than can easily be supplied, and the rest remaining in their places, the plant

continues growing without that stop or decay, which must happen on transplanting, and which it recovers only by degrees. It is observed, that some plants are the worse for transplanting: lucerne and sainfoin are never so good after transplanting, as when they are left in their native places, at the same distances; and finochia removed, is never so good and tender as when it is not:

This last plant receives such a check from transplanting in its infancy; that it has afterwards a disease like the rickets, which causes knots and swellings in it, that spoil it as a delicacy. All the tap-rooted plants suffer by transplanting; for it is necessary in this to cut off the long main-root, which afterwards, however good the soil may be, never arrives at the length it otherwise would have had, and which was necessary for the success of the plant.

Mr. Young, in his *Annals of Agriculture*, vol. xiv. gives the following

Description of a Patent Drill Machine, with a Six-Share Horse-Hoe annexed, and comprised in one and the same Instrument, under a new Patent: also a simple Hand-Hoe, invented by the Rev. James Cooke, White Lion Yard, opposite the Pantheon, Oxford-Street, London. See Plate, xviii.*

"The superior advantages of the present improved drill, compared with the old one, chiefly consist,

"1st, In the wheels (B B, fig. 1.) being so large that the machine can travel on any road without trouble or danger of breaking; also from the farm to the field, &c. without taking to pieces; requiring only half the draught which the old machine requires.

"2d, In the coulter-beam (C C, fig. 1. with all the coulters), moving with great ease, on the principle of the pentagraph, to the right or left, so as to counteract the irregularity of the horse's draught, by which means the drills may be made straight: and where lands or ridges are made $4\frac{1}{2}$ or $9\frac{1}{2}$ feet wide, the horse may always go in the furrow, without setting a foot on the land, either in drilling or horse-hoeing.

"3d, In the seed supplying itself regularly, without any attention, from the upper to the lower boxes as it is distributed.

"4th, In lifting the pin (M) on the coulter-beam to a hook (L) on the axis of the wheels; by which means the coulters are kept out of the ground at the end of the land, without the least labour or fatigue to the person who attends the machine.

"5th, In going up or down steep hills, the seed-box is elevated or depressed accordingly, so as to render the distribution of the seed regular; and the seed being covered by a lid, is screened from wind or rain.

"These are some of the advantages appertaining to the above improved drill, which though considerable in the process of drilling, are as nothing, compared with those which arise from the use of the horse-hoe; of which it shall suffice me to say, that from eight to ten acres of land are commonly hoed in one day, with one man, a boy, and one horse, at the trifling expence of 6d. or 8d. per acre, in a style far superior to, and more effectual than any hand-hoeing whatever, also performed at times and seasons when it is impossible for the hand-hoe to be used at all.

"From last year's official proofs and extensive experiments in horse-hoeing, I am justified in saying, that, by a proper and seasonable use of the above drill and horse-hoe, the largest farm in this island may be kept as clean from weeds (the bane of all arable lands) as any garden need be, with a clear extra profit of more than the rent of land.

"A A, fig. 1. Shafts of the machine, applied to axis of the wheels, so that the horse may go on the land, or in the furrow without setting a foot upon the land, either for the purpose of drilling or horse-hoeing.

"B B, the wheels.

"C C, coulter-beam, with holes or mortices for the coulters at different distances.

"D D, handles of the machine, applied to the coulter beam, also to the axis of the wheels, by hooks and eyes, or staples.

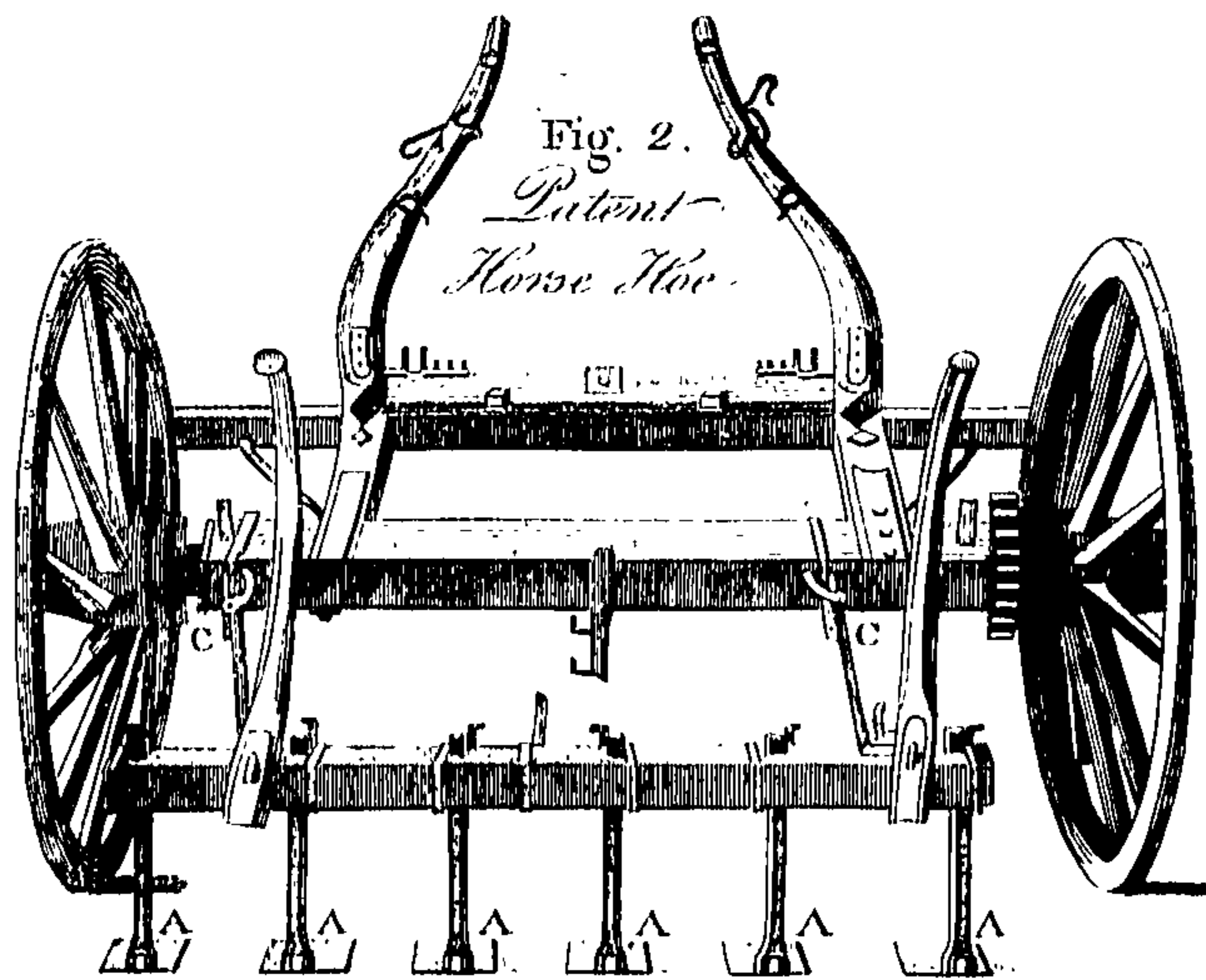
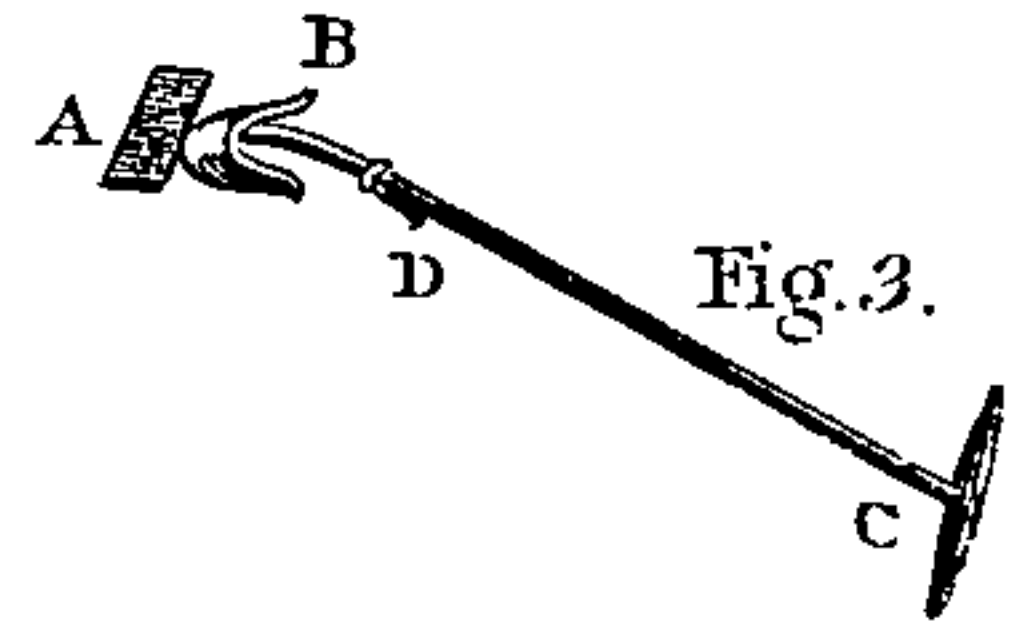
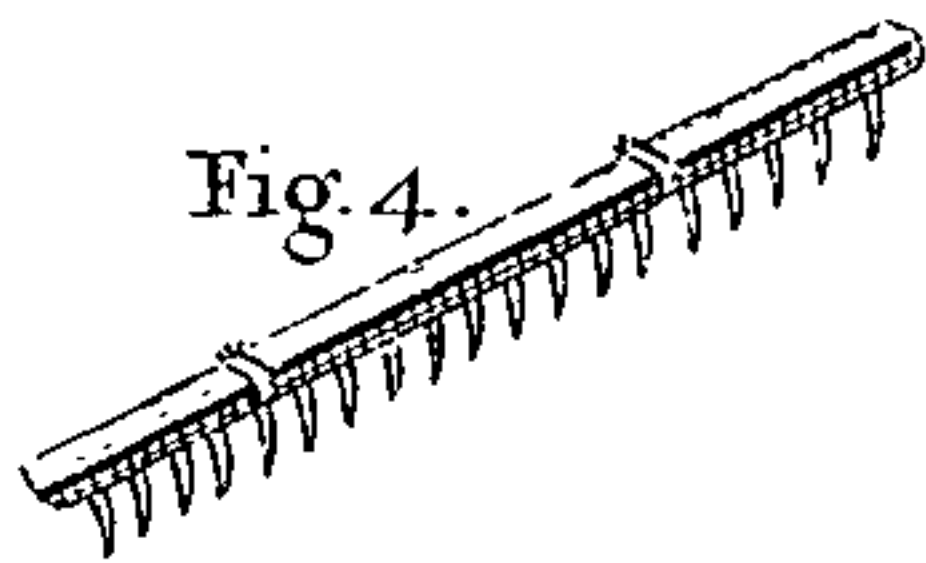
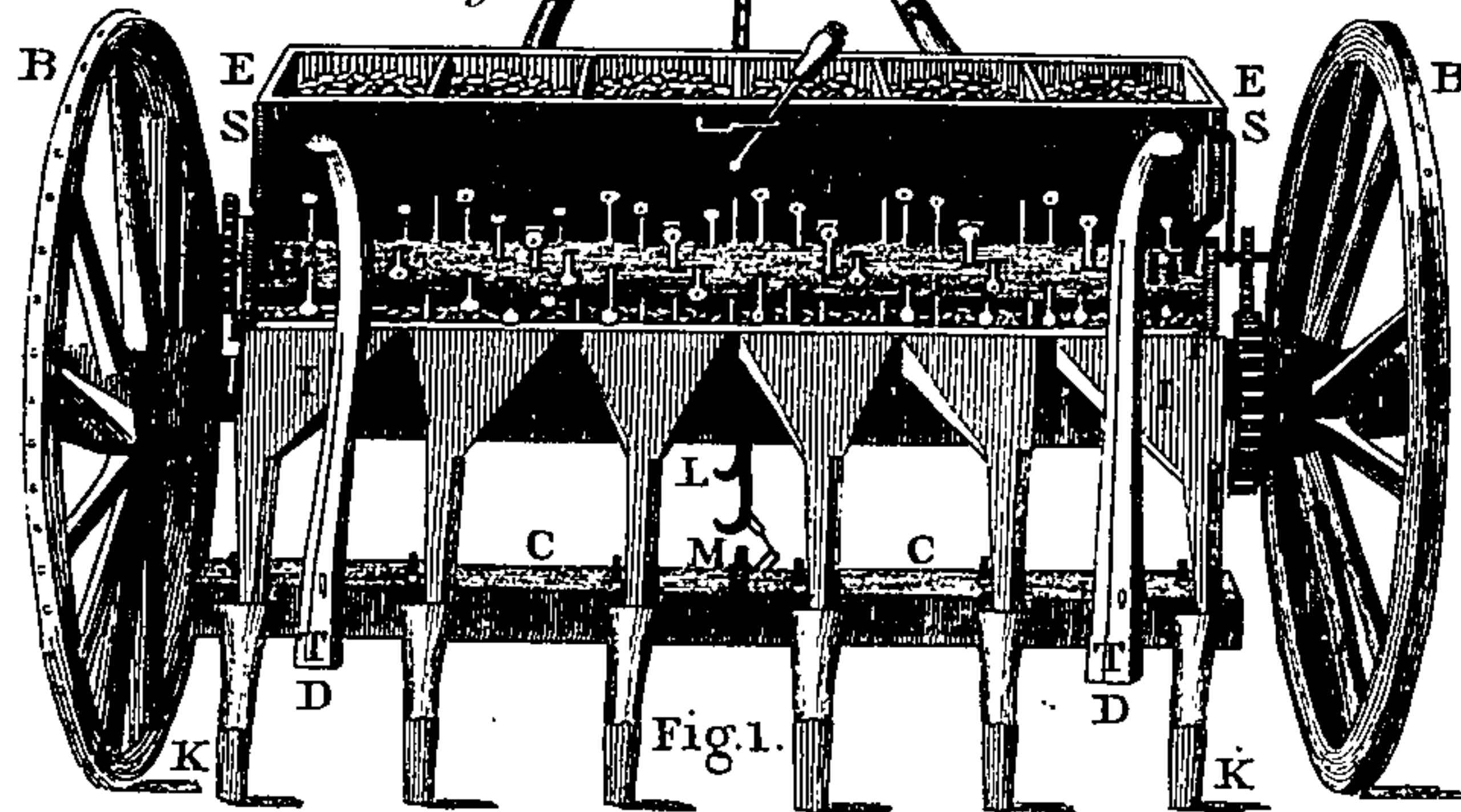
"E E, upper seed-box in partitions, covered by a lid, to protect the grain or seed from wind or rain.

"F F, lower seed-box in partitions.

"G G, slides between the upper and lower seed-boxes, for regulating the quantity of seed sown.

"H H, cylinder with cups or ladles of different sizes, for

*Cooke's Patent Drill Machine improved & simplified
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Description of a Patent Drill Machine, with a Six-Share Horse-Hoe annexed, and comprised in one and the same Instrument, under a new Patent: also a simple Hand-Hoe, invented by the Rev. James Cooke, White Lion Yard, opposite the Pantheon, Oxford-Street, London. See Plate, xviii.*

"The superior advantages of the present improved drill, compared with the old one, chiefly consist,

"1st, In the wheels (B B, fig. 1.) being so large that the machine can travel on any road without trouble or danger of breaking; also from the farm to the field, &c. without taking to pieces; requiring only half the draught which the old machine requires.

"2d, In the coulter-beam (C C, fig. 1. with all the coulters), moving with great ease, on the principle of the pentagraph, to the right or left, so as to counteract the irregularity of the horse's draught, by which means the drills may be made straight: and where lands or ridges are made $4\frac{1}{2}$ or $9\frac{1}{2}$ feet wide, the horse may always go in the furrow, without setting a foot on the land, either in drilling or horse-hoeing.

"3d, In the seed supplying itself regularly, without any attention, from the upper to the lower boxes as it is distributed.

"4th, In lifting the pin (M) on the coulter-beam to a hook (L) on the axis of the wheels; by which means the coulters are kept out of the ground at the end of the land, without the least labour or fatigue to the person who attends the machine.

"5th, In going up or down steep hills, the seed-box is elevated or depressed accordingly, so as to render the distribution of the seed regular; and the seed being covered by a lid, is screened from wind or rain.

"These are some of the advantages appertaining to the above improved drill, which though considerable in the process of drilling, are as nothing, compared with those which arise from the use of the horse-hoe; of which it shall suffice me to say, that from eight to ten acres of land are commonly hoed in one day, with one man, a boy, and one horse, at the trifling expence of 6d. or 8d. per acre, in a style far superior to, and more effectual than any hand-hoeing whatever, also performed at times and seasons when it is impossible for the hand-hoe to be used at all.

"From last year's official proofs and extensive experiments in horse-hoeing, I am justified in saying, that, by a proper and seasonable use of the above drill and horse-hoe, the largest farm in this island may be kept as clean from weeds (the bane of all arable lands) as any garden need be, with a clear extra profit of more than the rent of land.

"A A, fig. 1. Shafts of the machine, applied to axis of the wheels, so that the horse may go on the land, or in the furrow without setting a foot upon the land, either for the purpose of drilling or horse-hoeing.

"B B, the wheels.

"C C, coulter-beam, with holes or mortices for the coulters at different distances.

"D D, handles of the machine, applied to the coulter beam, also to the axis of the wheels, by hooks and eyes, or staples.

"E E, upper seed-box in partitions, covered by a lid, to protect the grain or seed from wind or rain.

"F F, lower seed-box in partitions.

"G G, slides between the upper and lower seed-boxes, for regulating the quantity of seed sown.

"H H, cylinder with cups or ladles of different sizes, for different

different sorts of grain or seeds ; by which the grain or seeds are taken up, and dropped into the funnels I I, and conducted thereby into incisions or drills made in the land by the coulters K K.

" L, a hook applied to the axis of the wheels.

" I, a chain applied to the coulters-beam, the last link of which, being put upon the lowest hook, will prevent the tubes of the funnels from being displaced, when the machine is crossing deep furrows or gutters.

" M, a pin of iron projecting from the coulters-beam, which being lifted on the hook L, at the end of the land, will bear the coulters out of the ground, while the machine is turning round, or on any other occasion, without any labour to the person who attends the machine, in supporting them.

" N, a cog-wheel.

" O, a cog-wheel, turned by the wheel N.

" P, a lever and string, passing over a pulley to the axis of the cylinder H, by moving the lever P to the notch in the staple Q, the wheel O will be lifted out of gear with the wheel N, by which means the distribution of grain or seed may be stopped at pleasure, in an instant, at the end of the land, or on any other occasion.

" R, an iron bar with holes in it, by means of which, and a pin going through the holes, the seed-box may be elevated or depressed, so as to keep the lid of the box horizontally level, whether going up or down steep hills, or on level ground.

" S S, two staples in the ends of the seed-box, for the reception of two slips of wood, with canvas to prevent the wind from interrupting the grain or seed ; also to prevent dirt or soil falling from the wheels into the funnels I I.

Patent Horse-Hoe.

" Fig. 2. (see the plate) represents the shafts, the axis and wheels, the coulters-beam, with handles, &c. as in fig. 1. being part of the said machine, and is convertible into a horse-hoe with six shares, by taking away the seed-box E E, the cylinder H H, the funnels I I, and the coulters K K, as in fig. 1. and introducing the hoes A A A A A A, fig. 2. in the places of the coulters.

" B, a guide projecting from the hoe-beam, which is useful in influencing the direction of the hoes, so as to avoid cutting up the rows of corn.

Hand-Hoe.

" A, fig. 3. the hoe plate of different sizes for drills at different distances.

" B, the wings for earthing up the soil to the rows of corn which may be taken off occasionally.

" C, the handle.

" D, a wedge, applied to the upper or under side of the handle C, so as to raise or drop the same to the height of the person who is to use it.

" Fig. 4. a rake, which may be applied to the handles of the machine instead of the coulters-beam, and may be used for making hay, clearing land from quitch, scarifying young crops of wheat, and other purposes.

Directions for using the Machine.

" The process of drilling should never be attempted but when the soil is dry, at least so dry as not to stick like daub to one's feet in walking over it, unless to regain a late, or in other respects a lost fertility.

" If the soil abounds with large dry clods, they should be reduced by a heavy roller ; and sometimes a spiked roller is necessary for that purpose. Previous to land being drilled, it should be ploughed deep, and harrowed slightly, to level the surface.

" Fig. 1. (see the plate) represents a back view of the machine, when put together for working.

" When the horse is put in the shafts, care should be taken that the chains or tugs by which he draws are of equal lengths ; otherwise the machine will have a constant tendency to deviate from the horse's line of traction. But when the horse goes in the furrow, the near side may be somewhat shorter ; and a chain may be extended from the end of the cross-bar to a part of the shaft near the horse's shoulder.

" In going from the farm to the field, or returning from the field to the farm, the pin or guide M must be lifted on to the hook L, which will bear the coulters off the ground.

And when going on rough roads, if the coulters-beam C C and the axis of the wheels are lashed together by a rope or chain, it will prevent the coulters receiving any injury, by coming suddenly to the ground.

" The grain or seed must be put in the upper boxes E E, an equal quantity in each box.

" The cups or ladles upon the cylinders, are of four different sizes, and are distinguished by the numbers 1. 2. 3. 4.

" No. 1. the smallest size (painted white) for lucerne, clover, cole, rape, &c. and will sow two pounds per acre. Also for turnip, and will sow one pound per acre ; every other cup being stopped up with a little soft clay.

" No. 2. (painted red) for wheat.

" No. 3. (painted green) for barley.

" No. 4. (painted yellow) for beans, oats, pease, tares, &c.

" By raising or lowering the slides G G, fig. 1. a greater or less quantity of grain or seed may be sown at pleasure.

" When the slides G G are as low as they can be, the wheat cups painted red, will sow something more than three pecks of wheat per acre ; and more in proportion the higher they are raised, not exceeding one bushel and a half, when raised as high as they can be, in rows at nine inches apart.

" The cups painted green, when the slides are as low as they can be, will sow one bushel of barley per acre ; and more in proportion as the slides are raised, not exceeding two bushels, in rows at nine inches apart.

" The cups painted yellow, when the slides are as low as they can be, will sow almost two bushels of beans, oats, pease, &c. per acre ; and more in proportion as they are raised.

" Upon soils well cultivated it is recommended not to sow more than one bushel of wheat per acre.

" Barley, from one bushel to a bushel and half per acre.

" Beans, from two, to two bushels and half per acre.

" Pease, two bushels per acre.

" Oats, two bushels and half per acre.

" Tares, two bushels and half per acre.

" The idea of over-stocking the drills with seed, is very absurd. The crops will be materially injured by so doing.

" It is recommended to make experiments upon different soils, by sowing different quantities of seed, in order to ascertain the most approved quantity per acre.

" If land is in a high state of cultivation, it is hardly possible to sow too little seed, provided the distribution is regular.

" The funnels I I, fig. 1. are all numbered, 1. 2. 3. 4. 5. 6. and for drilling at nine inches, must be applied to their respective places, so as to correspond with the number 1. 2. 3. 4. 5. 6. of the seed-box ; six coulters being fixed in the coulters-beam, at the distance of nine inches from each other.

" For drilling at twelve inches apart, five coulters must be fixed in the beam, at eleven inches and quarter from each other, when the order of the funnels will stand 1. 4. 5. 2. 3. 6. and no seed put in the box opposite the funnel No. 5. when placed as above ; the waste funnel may be stopped with paper to receive any seed that may accidentally fall therein.

" For drilling at eighteen inches apart, three coulters must be fixed in the left end of the beam at eighteen inches from each other, when the order of the funnels will stand 1. 2. 3. 4. 5. 6. and seed put in the boxes opposite the funnels 1. 3. 5. only the other boxes being empty.

" For drilling at twenty-two inches, three coulters must be fixed in the beam, one at each end, and one in the middle, when the order of the funnels will stand 1. 4. 5. 2. 3. 6. Seed being put in the boxes, opposite the funnels 1. 5. 6. only, the other boxes being empty.

" Two rows of pease at nine or twelve inches apart, and a space of twenty-two inches alternately, has been tried and approved.

" In level lands, without ridge and furrow, if the attendant on the machine cannot find a straight side to begin at, he should mark out with sticks or bushes a straight line, along one side of the field, for his direction ; and when drilling at nine inches, in order to make the space between the two adjoining drills, as he returns, equal to the rest, the wheel of the machine must be brought very near the last impression of the coulters, and three inches more distant from the last impression of the coulters, when drilling at twelve inches. And of other distances accordingly.

"As the machine approaches the land intended to be drilled, the lever P, fig. 1. should be lifted from the notch in the staple Q, when the coulters are two feet on this side the exact place where seed should be deposited; and the pin M removed from the hook L, by lifting up the handles D D.

"When the machine arrives at the end of the land, the lever P must be moved to the notch Q, which will stop in an instant the distribution of the seed, and the pin M lifted on the hook L, which will support the coulters out of the ground, while the machine is turning round.

"If the coulters should not make the incisions or drills something more than two inches deep in light sands or loams, and not quite two inches deep (one and a half is recommended) in strong clays or wet soils, they may be forced into the ground by the hand; or by weights, or a beam of wood four feet long and three or four inches thick, being suspended by chains or cords at the hooks T T in the handles of the machine for that purpose.

"If in attempting to make the drills straight, the horse should deviate from his proper direction, the coulters with all the coulters will be readily moved, this way or that way at pleasure, so as to make the drills straight by counteracting the irregularity of the horse's line of traction.

"If the machine should happen to be too wide for any given ridge, one or more funnels may be stopped with a little loose paper, and the seed received into such funnel, returned into the upper seed-box.

"In drilling narrow high-ridged lands, the outside coulters may be lowered, and the middle ones raised, so that the points of the coulters may form the same curve which the ridge forms.

"The top of the seed-box when shut, should be kept horizontally level, whether going up or down steep hills or on level ground. This will make the distribution of the seed uniformly the same. The higher the front edge of the box is raised upon the bar R, the seed will descend more copiously into the lower boxes, consequently a greater quantity will be distributed.

"It is apprehended, that if the driver of the machine was to sit on the seed-box, and drive with reins, he might conduct the machine much straighter than by leading the horse.

"The lower funnels placed behind the coulters should be lashed fast to the coulters with leathern thongs, or cords: and if in lifting up the coulters at the ends of lands, the upper funnels should, by chance, be displaced, a small nail may be driven into the edge of the seed-box, close above the edge of each funnel, which will prevent the funnels being displaced.

"If weeds accumulate upon the coulters, they must be displaced by a paddle; if land is dry, weeds will not be very troublesome; but if wet and clammy, and full of quitch, it will be troublesome, and, more or less, prevent the seed being distributed regularly in the drills. Such lands had better be made a fallow of, in order to clear them from weeds, than drilled with any corn whatever. This would be productive of great profit to the cultivator, and more credit to the drill system at large.

"When a piece of land is drilled, it must be harrowed once in a place, with common light harrows, to cover the seed, and level the surface of the soil, as a preparative for horse-hoeing. If the harrows are taken in the direction the drills are made, there will be no danger of displacing the seed.

"Seed wheat should be limed and brined two or three days before it is used, and made dry by spreading it thin on a boarded floor, to prevent its heating, so as to kill the seed: if seed wheat is fresh limed and brined, the lime, by acting as a cement, may cause it to clog in the cups. If this should happen upon the field, in hazy foggy weather, so much unlimed wheat as will make it separate, may be mixed therewith.

"Wheat should not, on any account whatever, be deposited more than two inches deep (one inch and a half is recommended) in strong clays or wet soils, nor less than two inches deep in all dry soils. The most approved depth is readily ascertained in soils of different textures, only by observing at what depth under the surface of the soil the secondary or coronal fibres of plants are formed in the spring.

"Lands formed into level ridges, four feet six inches wide, exclusive of the furrows, in strong retentive clays and

wet soils, and nine feet six inches wide, exclusive of the furrows, in all dry soils, are best calculated for the practical purpose of drilling, &c. in which case the horse will always go in the furrow, without setting a foot upon the land.

"Land intended to be drilled with carrot-feed should be deep ploughed; and for every half acre of land, one bushel of saw-dust and one pound of carrot-feed should be provided.

"The saw-dust must be well dried and sifted, to take out all the lumps and chips, and divided into eight equal parts or heaps. The carrot-feed must likewise be well dried, but not so as to kill the seed, and rubbed between the hands, to take off the beards, that it may more readily separate; and being also divided into eight equal parts, one of the above parts of saw-dust, and a part of carrot-feed, must be well mixed and incorporated together, and so on with all the respective portions of saw-dust and carrot-feed, till they are well mixed and incorporated together; which state, in the saw-dust with carrot-feed intermixed, may be drilled with the cups or ladles, No. 2. already described. Carrot-feed resembling saw-dust very much in size, roughness, weight, adhesion, &c. being well mixed with saw-dust, will remain so mixed during the sowing. One of the cups, No. 2. filled with saw-dust, will, upon an average, contain three or four carrot-seeds, by which means carrot-feed will be as regularly distributed in the drills as any other grain or seed whatever.

"If the wind should be high, when carrot or any other seeds are sown, it may be necessary to fix a screen of mat or canvass before the seed-box, to keep off the wind. By this, and the two side wings, S S, fig. 1. the seed will be perfectly screened from wind or rain.

Directions for using the Horse-Hoe.

"As the construction of this instrument (see the Plate, fig. 2) cannot well be misunderstood, a further description of it is thought necessary.

"For horse-hoeing a crop of any kind of corn, drilled at nine inches apart, the horse must be conducted along the third row or drill, beginning to number the rows, from the left-hand side of the six rows drilled at one operation of the machine. And the person who attends the hoes, must keep the pin B, fig. 2. directly over the third row of corn, and so long as he does this, it will be impossible for him to injure it in the least.

"For horse-hoeing corn at twelve inches apart, the horse must be conducted along the second space, between the rows or drills, beginning to number the spaces from the left-hand side of the five rows, drilled at one operation of the machine.—And the person who attends the hoes, must keep the pin B, fig. 2. directly over the middle of the second space, described as above: the same rule will hold good for hoeing at different distances.

"Where the space between the two adjoining outside drills shall happen to be irregular (i. e.) too narrow at some places for the hoe to pass, it may be advisable to take out the share, which would otherwise hoe that space, and leave it to be hoed by hand.

"Soils of different textures, will require to be hoed with shares of different sizes; nothing but experience can point out the size, which is best adapted to any particular soil. In all light sandy soils or loams, or any other soils sufficiently pulverized, shares from five to six inches broad, for nine inch drills, and eight inches broad for twelve inch drills, will work safely and effectually. In strong clays intermixed with pebbles, the hoe shares must not be so broad; and it may not be impossible to find some such soils as will bid defiance to all flat hoeing whatever. If, nevertheless, the texture of the soil in the spaces of the rows of corn, is tore to pieces by long narrow plates of iron, resembling points or chisels, being introduced in the hoe-share shanks, A A A A A A, fig. 2. instead of the hoe plates, the advantages resulting from such a process will be very considerable.

"The hoe plates or shares, may be set to enter the soil deeper or shallower, by lowering or raising the shanks A A A A A A, in the respective mortices in the beam, or by lowering or raising the hooks applied to the shank C C, on the axis of the wheels, by which the hoes are drawn.

"Lands cannot be too level on the surface, for practical, effectual, and expeditious horse-hoeing. But where lands, or ridges, are formed so round, that all the hoe plates cannot be

be brought to work at equal depths in the soil at the same time, so many as cannot be brought into use may be laid aside.

"As this method of horse-hoeing is perfectly new, it is recommended to take the horse-hoe with the machine coulters fixed in the hoe beam, instead of the hoe shares, over several acres of drilled corn; by which means, the person who is to attend the horse-hoes, will, by seeking the coulters in the middle of the spaces, become familiarized to the method of influencing the direction of the hoes, so as to avoid cutting up any of the rows of corn.

"This horse-hoe may be applied to many useful purposes, besides hoeing crops of drilled corn, particularly for cutting up the rows of stubble as soon as the crop is carried with such weeds as might escape the hoe; and for stirring of fallows; &c. &c. after the rate of ten acres a day, with one man, a boy, and two horses, particularly in the busy time of harvest, when it would be impossible to spare so many men and horses as would be required to stir the land with common ploughs, so as to answer the intended purpose. And by means of the same expeditious method of cutting up stubbles (in Kent called *shimming* or *spuddling*), immediately after the crop is carried, or rather before it is carried, as soon as it is cut and set up, in order to gain time for the sowing of grass seeds a second time, where they may have missed, or cole, or rape, or turnip, for food of sheep or cattle, in winter or spring, extraordinary advantages may be derived."

One great benefit of hoeing is, that it keeps plants moist in dry weather, the advantage of which to their growth is easily seen. This good office it performs on a double account. First, as they are better nourished by hoeing, they require less moisture, and consequently carry off less; for those plants which receive the greatest increase, having most terrestrial nourishment, carry off the least water, in proportion to their augment, as is proved by Woodward's experiments. Thus barley or oats being sown on a piece of ground, well divided by tillage and dung, will come up and grow well without rains, when the same grains sown on another part of the same land, not thus dunged or tilled, will scarce come up at all without rain; or if they do, will wait wholly for the rains for their growth and increase.

The hoe, also, particularly the horse-hoe, for the other does not go deep enough, procures moisture for the roots from the dews which fall most in dry weather; and these dews seem to be the most enriching of all moisture, as it contains in it a fine black earth, which will subside from it in standing, and which seems fine enough to be the proper pabulum, or food for plants.

A demonstration that the tilled earth receives an advantage from these dews, which the untilled does not, is this; dig a hole in any piece of land, of such a depth as the plough usually goes to; fill this with powdered earth, and, after a day or two, examine the place, and the bottom part of this earth, and the bottom of the hole, will be found moist, while all the rest of the ground, at the same depth, is dry. Or, if a field be tilled in lands, and one land be made fine by frequent deep ploughings, while another is left rough by insufficient tillage, and the whole field be then ploughed across in dry weather, which has continued long, every fine land will be turned up moist, and every rough land as dry as powder from top to bottom.

Although hard ground, when thoroughly soaked with rain, will continue wet longer than fine tilled land adjoining to it, yet this water serves rather to chill than to nourish the plants standing in it, and to keep out the other benefits of the atmosphere; it leaves the ground much harder also than before, when it is finally exhaled out of it: and when, at length, the earth is then hardened, it can receive no benefit from any thing less than a deluge of rain, which seldom falls till the season of vegetation is over.

As fine hoed ground is not so long soaked with rain, so the dews never suffer it to become perfectly dry. This appears from the flourishing state of plants in hoed ground, while others near them, but in ground not hoed, are starved for want of nourishment. The common opinion is against this, but observation proves it to be true against the common opinion. The vulgar are guided by this, however, and will not hoe their ground in dry weather, for fear of letting in the drought, as they call it; whereas hoeing this, is the only method of keeping away the drought, and without either this, or watering, they must perish in these seasons. *Tull's Horse-Hoeing Husbandry.*

Mr. Marshall, in his *Rural Economy of the Midland Counties*, says "This year (1784) I have given eight shil-

lings an acre; with beer; for hoeing turnips; and, even at this price, it has been with difficulty I have got them tolerably done.

"The price, compared with that of Norfolk; is extravagantly high. But there are two reasons for this disparity.

"In Norfolk, every plowman and every harrow boy is a turnip hoer: here, hoeing is a mystery, practised only by a few, who have it in their power to make their own terms.

"Beside, in Norfolk, the soil is light, and free from stones: the hoe passes freely through it, and the hoer, sweeping his tool round the plants at pleasure, works from hour to hour without a check. But here, the soil, in most places, abounds with pebbles, and, being of a more stubborn and cloddy nature than the sands of Norfolk, the hoer is frequently under the necessity of chopping three or four times, perhaps, in the same space of surface which a Norfolk hoer would clear with one sweep of his hoe. Were he to attempt to *draw* his hoe in the Norfolk manner (perhaps not the best), he would be liable (by reason of the obstructions turning aside his hoe from the intended direction) to cut up the plants he meant to set out, and to smother those he had already singled. Beside, he cannot, here, use so wide a hoe, as is used in Norfolk.

"The Midland hoers generally use three-cornered hoes; each side about seven inches. The reasons given for using these hoes, in preference to those of the usual one-edged form, are, that they require to be carried seldom to the grinding stone, and that they are handier to single a plant with, than a one-edged hoe. It is allowed however, that a three-sided hoe requires more labour than a single one; whose blade, forming a more acute angle with the handle, lies flatter, and passes more freely through the soil than the triangular ones; which standing nearly at right angles to the handle, are drawn against the soil rather than under it; and, while that cuts off the weeds clean, these have them to pull asunder: beside, where the soil is sufficiently loose to admit the hoe to be drawn, they are very mischievous, in burying the singled plants.

"To obviate these evils, as much as may be, the handles are made short; about three feet long; the workmen stooping, proportionably, in using them. If they were more dishd, (they are a little), the mould would lodge in the hollow, and make them still more clumsy.

"Among stones and clods, the triangular hoe has its merit; acting the part of the West India hoe, or a mattock. But, where the surface is tolerably free and friable, the one-edged hoe, from seven to eight inches wide, and about two and a half inches deep, is a more eligible tool."

HOG, the name of an animal too well known to need any description here.

These creatures are very advantageous to the countryman not only for their great increase, but also because they feed upon what would otherwise be of no use or advantage, but would be thrown away; as whey, washings of tubs, grounds of drinks, dish-water, grains, &c. and their flesh being best salted, or kept in pickle, may be eat in the spring, when other meat is at the dearest; besides the help it affords to the taking off the produce of the garden, and the variety of the dishes of the offal. Swine are indeed very greedy, and very apt to root up ground, and break the fences; and therefore the greater care must be taken to keep them both well ringed and well yoked.

The largest swine, and the greatest number for any particular places, are bred in Leicestershire, and Northamptonshire, and in the clayey countries adjacent: probably from the large quantities of beans and pease sown in those parts.

The wild kind are not so large as those just mentioned, but are much more hardy, and better meat.

In the choice of hogs, chuse such to breed out of as have long, large bodies, are deep sided and bellied, that have a short nose, thick thighs, short legs, high claws, thick neck, a short strong groin, and a thick chine, well set with strong bristles.

Mr. Marshall, in his *Minutes of Agriculture* says he found by experience that the large, long haired, dark-spotted, domestic English breed, much the most eligible; because it is the hardiest and the most tractable.

To have too many sows in one yard is not good, for their increase is so great, that they will, for want of food, not only devour whatever comes in their way, but eat one another: for a sow will bring forth pigs three times a year, that is, at the end of every sixteen weeks. It is common for them to have thirteen or fourteen pigs at a litter; but the

the sow can rear no more than she has teats to suckle them with; the rest must therefore be destroyed, or put to other sows. If the sow miss the time of going to boar, that she might in course have done, give her some oats parched in a pan, in her wash, or the small end of a runnet bag, and it will cause her quickly to go to boar. The pigs which you rear, after you have chosen out the best for boars and sows, the males must be gelt, and the sows spayed: the spayed gels, as the farmers call them, are esteemed the most profitable, because they have a much larger quantity of fat upon their inwards, than other hogs. Young shoats, which are swine of about three quarters of a year old, are best for pork, and those of a year, or a year and a half, for bacon. The best age for a sow to bring forth pigs, is from one to seven years old, and the best age for the boar, is from two to five years old, at which time it is best to geld him, or sell him for brawn; the best pigs to rear are those which are pigged in the spring, and those pigged in March, for pork in October.

The best way of taking care of swine, is to feed them so as to keep them in middling plight, till you design to fat them; for if you keep them too fat, it will endanger their health; and too lean will render them too ravenous. It is good to give them such swill as you have, every morning and evening, to make them come home to their styes. The rest of the day, let them graze, and get such food as they can; but when the corn is upon the ground, you must be careful to keep them within bounds. Moist sedgey grounds are good for them, the roots of which they will eat; and all sorts of haws, heps, sloes, crabs, acorns, mast, chestnuts, &c. with which, if you have plenty enough to fat them, the flesh will eat much better and sweeter than if fattened in a sty. Some, indeed, say their fat will not be so solid, nor so profitable, and therefore they commonly shut them up for a week or ten days, and feed them with dry peas; but this is a mistake, experience having shown, that hogs fattened with acorns only, have their fat as solid as those fattened with peas. In fattening hogs in styes, they observe to give them meat often, and but little at a time, that it may be always fresh; and likewise to give them as much water as they will drink, and to keep them very clean, which will help their fattening, and improve the taste of their flesh. But where the husbandman lives remote from woods, or the year should fail of producing acorns or masts, they commonly fat them wholly in styes with peas, if cheap; if dear, the meal of barley, rye, or offal corn, according as they are cheapest, which they mix with water, whey, or skimmed milk: with these they feed them till fat, which will commonly be in about a month's time, and then they feed them with peas a little before they kill them.

Observe, that every sty have a yard well paved with stone, if possible, for the hog to go out and ease and air himself, that he may keep his lodging the cleaner.

In Leicestershire they have a very easy method of fattening great numbers of swine, which they do by stacking up their peas and beans in the form of a small cottage. This they set near some running brook, and hedge a yard in round about it; taking some part of the stream into the yard for the hogs to drink at: into this yard they turn such a number of hogs as they think their peas or beans will fat, where they let them live till their provision is consumed, cutting the rick down, and giving it to them as can eat it. *Mortimer's Husbandry, vol. 1. p. 244.*

The London Society of Arts having, some time since, offered a premium of 20l. or a gold medal for the best account of rearing and fattening of hogs, in consequence of which Mr. Young sent them a series of trials, as a candidate for their medal, and was honoured with it.—The following particulars are extracted from his Essay.

"The importance of this animal to the farmer is not sufficiently known in every part of England; there are many dairies that do not maintain one tenth of the swine they might, with proper management. Several garden-roots are raised in large quantities, without being applied to feeding hogs; and clover is cultivated, in many countries, upon the largest scale, without its utility for the same use being the least known. No person who has tried many experiments in this part of rural economy, can fail regretting, that so many farmers should neglect a conduct that adds so much to the good of the public, as well as to their own profit.

"There are two principal objects in the rearing and fattening hogs; first, to make the greatest advantage of a

dairy; and secondly, to substitute some other food, in the place of that which arises from cows, where none are kept.

"It is the practice of several counties to use the skim-milk, butter-milk, and cheese-whey, in fattening hogs. This is a most pernicious custom; that food, for such a use, it is every where known, has twenty substitutes, viz. peas, beans, buck-wheat, barley, &c. &c. but it is not so generally known that pigs may be reared without cows. It is agreed that the dairy food is excellent for the latter purpose.

"For this reason, I shall venture to propose a different conduct, and with the greater readiness, as I have found it, by experience, to be more profitable than the common management. The dairy upon this improved system should be applied only to rearing pigs, and feeding sows which have young. But this at once opens a larger prospect of the whole management of a farm.

"The sows and weaned pigs should evidently be proportioned in such a manner to the number of cows in milk, as to consume all the dairy food without waste. And other sorts of food provided for the keeping sows that have no pigs; hogs half, three fourths, full grown, and fattening ones.

"The practice of some counties, as well as the annexed experiments, prove that clover is a most capital object in keeping all these sorts of swine; but those writers who assert that it will completely fatten them, go much too far. There is no sort of cattle in a farm that requires more attention than hogs; any method, therefore, that simplifies the management must be peculiarly valuable.

"Hogs that are a quarter (or upwards) grown, may be absolutely confined to a clover field, until it is necessary to sow wheat. Nine tenths of Britain will doubt this fact, but I have frequently experienced the truth of it. The fences, it is unnecessary to add, must, in this system, be incomparably good; which necessity, I apprehend, is a particular merit in a mode of husbandry: for a conduct that forces the farmer to have excellent fences, is so far of great utility. It is also requisite to add, that there must be a pond in the field which never fails. In a good crop of clover, well fenced and watered, swine of this sort may be locked up from the middle of May to Michaelmas, and no consumption of the clover will pay the farmer better. I shall add an experiment or two to prove this assertion. I could insert many, but a certain brevity is requisite in such slight essays as these. I have found lucerne to be equal, and in some years superior to clover for this use. Sainfoine is also of excellent utility, but ray-grass and burnet will not by any means do; natural pastures with wash are a good substitute, but never will be found to equal the artificial grasses.

Experiment of keeping Hogs upon Clover in the Field.

"Sowed common red clover with barley in the spring in 1765, on two acres of woodcock, brick-earth loam, on a clay bottom, that yielded beans, horse-hoed, in 1764. In October, 1765, manured it with thirty loads of compost, consisting of various proportions of farm-yard dung, town manure, turf, ditch-earth, &c.

"The fences around it were well repaired in the winter, and one, much worse than the rest, new made.—The 12th of May I turned in thirty head of swine, consisting of sows, large pigs, and large half and three fourths grown; they took immediately to the clover, and in about a fortnight, all discovered by their looks, how well the food agreed with them. There was a pond in the field, at which they drank perpetually; and of nights they laid all of a heap, in a corner of the piece, under a thicket of bushes, not making any attempts to get home, after walking the first evening once or twice around the border with that design. Finding that stock of hogs were insufficient to keep down the clover, more were added, and some kept in the piece till Michaelmas. The account of the expence and produce is as follows.

EXPENCE.

Seed, 10s. 9d.—Sowing 6d.	0	11	3
Manuring, at 20d. a load the manure, and the expence of carting it to the field.	2	19	4
Rent	1	14	0
	5	4	7

PRODUCE.

Keeping 15 hogs 21 weeks at 3d	3	18	9
Ditto 12 ditto 12 weeks at 3d	1	16	0
Ditto 10 ditto 16 weeks at 3d	2	0	0
Ditto 5 ditto 10 weeks at 2d $\frac{1}{2}$	0	10	5
Ditto 12 ditto 10 weeks at 2d	1	0	0
Ditto 10 ditto 12 weeks at 1d $\frac{1}{2}$	0	15	0
	10	0	2
Expences	5	4	7
Profit 2l. 7s. 9 $\frac{1}{2}$ per acre	4	15	7

"From the event of several other fields of clover this year, I am clear that no other use of it would have paid better than thus feeding it by hogs. A clear profit of forty-seven shillings per acre, after paying the expence of a good manuring, is considerable, and greatly preferable to the general profit by hay, the chance of the seasons taken into the account. Nothing can be clearer than the fact of hogs thriving excellently on clover. All these swine grew very fast, and shewed by their looks how well the food agreed with them, and there is no animal that sooner falls off in his appearance than a hog, when badly fed. Where therefore is the necessity of providing other summer food? Why consume that food for those hogs which clover will maintain, while sows and pigs, and weaned pigs cannot be kept without it, such as dairy wash, &c.

"This is a system of management that will enable the farmer to keep much larger stocks of cattle, than the methods yet common in so many counties."

A profit of 2l. 7s. 9d. $\frac{1}{2}$ per acre, is, no doubt, inviting to a farmer, to keep his hogs in summer upon clover: there is however another circumstance that he should consider in his management, which Mr. Young has not taken notice of, but deserves consideration.

The intention of sowing clover among spring corn, as oats and barley, is to obtain good crops of hay, and to prepare the land for wheat: for all succulent plants that stand thick upon land, so as to shade and cover it, are found to enrich it, as pease, buck-wheat, vetches, turnips, and clover. Most farmers are now sensible of this; it is an article of modern improvement, of great importance to them and the public. It is generally allowed that a full crop of clove prepares land for wheat almost equal to a fallow, and some think superior.

The clover is fed off by cattle, or mowed: sometimes it is mowed once, and afterwards fed, or it is mowed twice, and not fed. Which ever of these methods is pursued the land is improved: but as mowing of meadows often is known to impoverish them, it was long supposed that mowing clover had the same effect of impoverishing land, more than feeding it; but this is now found to be a mistake: land is more enriched by clover, though twice mowed, than by feeding it all the summer, as has been found in the succeeding crop of wheat, by comparative experiments of both. The reason of this, and of the fertilizing effect of shade and cover, not being our present enquiry, let us proceed to the point now before us, the benefit of feeding clover with hogs. A method which will be more or less advantageous to the farmer, in proportion to the effect of it upon the succeeding crop of wheat, and this the farmer may judge of by the condition of his land, and the luxuriance of the crop of clover. The wheat crop is his first object when that is intended to succeed, and the improvement of that is to be considered in the management of his clover, whether by mowing or feeding it.

"But in making the greatest advantage of a dairy," continues Mr. Young, "we must not confine ourselves to the summer-keeping alone; provision must be made for winter-feeding such hogs as do not require assistance from the dairy. The following experiments will prove that carrots, parsnips, beets, and potatoes, are of admirable use in feeding pigs that have been reared. They will keep the hogs that are taken care of the clover in excellent order, and even fatten them, and maintain to vast advantage, sows that have no pigs.

"By this general system of management, it appears, that hogs are to be maintained the year through upon clover and these roots, and recourse had to the dairy only for assistance in feeding sows that have pigs, and in rearing their young. It must be extremely evident, that, with this conduct, the number of swine maintained on a dairy farm

may be prodigious. The number of cows point out the number of sows and pigs, and these again must proportion the number of acres applied to the production of clover and roots. Thus the whole chain of crops is connected, and each field the support of the other.

"The second object in the management of swine, is the substituting some food in the room of a dairy for rearing pigs, upon such farms as keep no cows. This is an object of very great importance, as there are numerous extensive tracts of country that will produce clover in very great perfection, and also many sorts of roots; but where it is either unprofitable to keep cows, or only advantageous to suckle them.

"The reason I before gave, viz. keeping this sketch in due bounds, prevents the insertion of numerous experiments, which I formed for the particular determination of this point. I found, from repeated trials, that carrots and parsnips will wean pigs of a proper age almost as well as milk; that is, in such a degree of perfection as to render the keeping a large number of hogs upon that dependence, extremely advisable to any farmer, whose business or situation may prompt him to do it. And other experiments assured me, that sows, with the most numerous litters, may be maintained to great profit in the same manner. Potatoes and red beets I likewise found of very great use for the same purpose.

"It may not be improper here to consider the consequences of enabling the farmer to keep large stocks of swine by means of roots, so extremely productive as those I have mentioned. There are no soils but what, with proper management, will yield some or other of them, and the crops are immense. The number of swine to be fattened or fed by an acre of carrots or potatoes would surprise those who have never formed any experiment upon the point; and the excellency of the husbandry, in general, should plead powerfully with our farmers to adopt it upon this principle. These roots are all fallow-crops, that is, they are of the same advantage to the soils as a year of fallow, and, if cultivated in the manner they ought to be, much superior to any fallow: for this reason, their culture is beneficial to the land, and a very material method of bringing it into excellent heart. Their application to feeding swine is alone sufficient to improve a farm that is almost worn out, since it cannot be conducted without raising large quantities of the very best dung.

"Here the consequence of adopting the culture of vegetables that clean and ameliorate the soil, and in their use infinitely enrich it, must be obvious to every reader. It is no exaggeration to assert, that the best soils may be improved, and the poorest converted into good ones by this conduct, and I can assert, on experiment, cheaper than by any other method. I have found that ninety hogs will in fattening, yield as much manure as was worth thirty pounds on the spot, and where straw, stubble, or fern are to be had very cheap, to a much greater amount.

"It is from these several considerations that I apprehend the following experiments may be of real utility to those who have dairies, to those who keep cows, but apply them to suckling, to those who have no cows, but are willing to keep swine; and lastly, to those who, on any soils, are desirous of improving them."

Mr. Young then proceeds to relate several experiments he made of feeding and fattening hogs with different sorts of food, whereof the following is a specimen:

Experiment on feeding Hogs.

Exp. I. The first week in March, 1765, thirty pigs, just weaned, were drawn from forty-three, that they might be all of a size; they were then distributed into five lots, equally divided. I do not think there was half a crown difference in the value of them, and then fed with distinct sorts of meat. Each five had a sty to themselves, and all were kept clean and littered with straw.

- Lot. No. 1. was fed with pollard mixed with water.
 2. with pollard mixed with skim-milk.
 3. with boiled turnips, and pollard mixed with the turnip liquor.
 4. with-boiled potatoes and water.
 5 with skim-milk.

They were kept with this food thirty days. I then turned them out of their styes, (none had died) and view-

ed them with a person particularly skilled in hogs ; the result was,

- No. 2. the best—pollard and skim-milk.
5. the next best—skim-milk.
1. next—pollard and water.
3. and 4 equal.

It appears from hence that pollard and milk are the best food, milk alone very good. The other articles advantageous (for none of the pigs were in bad order), though not equal to the former:

Exp. III. January 1, 1766, forty pigs, that had been weaned about a fortnight, were draughted very equally into eight lots, and confined each to a sty, they were cleaned out and littered on the same day, and equally. Their food was as follows :

- No. 1. Raw carrots.
2. Boiled ditto.
3. Boiled potatoes.
4. Pollard mixed with skim-milk.
5. Pollard mixed with boiled turnips.
6. Malt dust mixed with skim-milk.
7. Skim-milk.
8. Ditto and half carrot-water boiled.

" They continued upon this food the month of January, and were then viewed, the result was as follows :

- No. 4. the best—pollard and milk.
 7. next—skim-milk.
 2. ditto—boiled carrots.
 3. ditto—boiled potatoes.
 5. ditto—pollard and boiled turnips.
 8. ditto—skim-milk and carrot-water.
 1. ditto—raw carrots.
 6. the worst—malt-dust and skim-milk.
- Two dead.

Pollard and milk hitherto maintain the superiority, boiled carrots excellent, the rest almost equal, except the malt-dust, which is evidently bad.

Exp. IV. " In the beginning of June, 1766, I confined sixty hogs, half and three fourths grown, in my hog-yard (a pond's mouth in it), and fed them fourteen days with clover, mown fresh every day ; it was given in their troughs, with racks across to prevent the soiling it. They fell off in their looks in about four days, and grew worse and worse, several dying. At the end of that time, I gave them some malt, grains, and wash every day for a few days longer, but the effect was no better, more dying. They were then all turned into the clover field whence it had been taken, and confined constantly to it for some time. Not one more died, for all thrive greatly. It will not perhaps be impertinent here to add, that I never found any method of using clover more beneficial than thus applying it to the feeding of hogs."

Exp. V. " At the time of the preceding experiment, eight hogs, of equal size, were divided into two lots, and confined to two styes. Four were fed fourteen days on clover mown, and the other four on lucerne mown ; they were given at the same time, and in the same styes. At the end of that time the same were viewed attentively : both were bad, the clover ones much the worst, one near dying."

Exp. VI. " In the month of December, 1766, twenty pigs, that had been weaned a month, were draughted into four parcels, and kept that month separately, in the following manner :

- No. 1. Boiled carrots.
2. Boiled potatoes.
3. Boiled turnips.
4. Boiled cabbages.

" At the end of the month they were turned out and viewed attentively. The result was,

- No. 1. the best—boiled carrots.

2. next—boiled potatoes.
- 3 and 4 equal—all nearly dead.

" Carrots continue, in every trial, superior to all common vegetable food. I am not at all surpris'd at the ill success of turnips and cabbages.

Exp. VII. " In June, 1767, I draughted from my hogs twenty that were of a perfect equality in size and appearance ; they were even half grown ; marked them into four lots, and turned,

- No. 1. into my clover field.
2. lucerne ditto.
3. sainfoine ditto.
4. burnet ditto.

" In another month they were drove up and viewed ; the result was,

- No. 2. the finest—lucerne.
1. next—clover.
3. next—sainfoine.
4. very indifferent—burnet.

" The result of this experiment I think decisive in favour of lucerne, and likewise in the proportionable merit of the other articles : but this must be farther enquired into in future experiments."

OBSERVATIONS.

The general result of those trials is drawn into one view, in a very few words.

Milk mixed with pollard appears to be, of all food, the most proper for rearing pigs.

Milked alone is good.

Boiled carrots excellent, and fully proved to be sufficient for any farmer to depend on who does not keep a good dairy.

Potatoes, boiled to a batter, also a very good food.

Turnips, cabbages, and malt-dust very bad.

Of green food, that which is growing is clearly the best ; mown, and given in styes, it is pernicious.

In the field lucerne is superior to all the rest. Clover comes next, then sainfoine, all these three are good. Burnet last and bad.

The next set of experiments were made in order to discover what kind of food was most proper for fattening hogs, given to them separately, and the best mixtures of them for that purpose. The following example may be sufficient to show the comparative use of different kinds of food given separately for fattening.

Exp. II. " In January, 1766, I drew from the herd ten hogs, as equal in size as possible, and weighed them alive in five lots.

No.	weighed	stone	lb.
1.		13	4
2.		12	6
3.		13	0
4.		12	11
5.		13	1

A nearer equality than this, in matters that can neither be added to nor diminished, can scarcely be expected.

No. 1. was fatted with white pease, that weighed 56 lb. per bushel ; the price 30s. per quarter.

No. 2. with pollard that weighed 22 lb. per bushel ; price 9 d. per bushel.

No. 3. with buck wheat 47 lb. per bushel ; price 2s. 3d. per bushel.

No. 4. with boiled potatoes 54 lb. per bushel ; price 2 s. per bushel.

No. 5. with boiled carrots 55 lb. per bushel ; price 1s. 1d. per bushel.

" I thought it best to fix on a given sum, as proper to fat each hog. The people I consulted were of opinion that eight bushels of white pease were necessary to fat one such hog well. This I accordingly fixed on as my criterion. The account of the expence therefore stood thus :

No. 1.

No.	Food	Weight	l.	s.	d.
1.	Pease, 16 bushels		3	0	0
2.	Pollard, 80 bushels		3	0	0
3.	Buck wheat, 27 bushels		3	0	9
4.	Potatoes, 28 bushels at	2 16 0 }	3	0	0
	Labour and coals	0 4 0 }			
5.	Carrots, 49 bushels	2 13 2 }	3	0	0
	Labour and coals	0 6 10 }			

Each lot was weighed as soon as the food was done. The result was as follows:

No.	Weight	stone	lb.
1. weighed	27	6	
2.	27	9	
3.	29	13	
4.	25	7	
5.	31	0	

"It is evident from this experiment, that carrots boiled are superior to any other food. I did not expect that potatoes would be so much inferior; but I have found, from divers other trials since, that it is requisite to mix the meal of some kind of corn with them. Pollard in this trial, as in the last, is superior to pease."

With respect to the comparative fattening quality of carrots and potatoes, it appears by this experiment that lot No. 5. gained 17 stone 13 pound weight in flesh, fed upon carrots; and lot No. 4. fed upon potatoes, gained but 12 stone 10 pound. The difference was 5 stone and 3 pounds of flesh gained by feeding on carrots, more than was gained by their feeding on potatoes, a great superiority when viewed in this light. But on the other hand, to gain this greater weight there was a consumption of 49 bushels of carrots, and but 28 of potatoes. But 49 bushels of potatoes (the same quantity as the carrots) would, in the above proportion, advance such a lot of hogs to the weight of 22 stone and 4 pounds; that is, to 4 stone 5 pound more in weight, than the same quantity of carrots did advance them, by which it appear that potatoes are really more fattening than carrots, of the same measure or weight. The hogs seem to relish carrots much, and they eat a great quantity of them; but taking an equal quantity of each, the potatoes go farthest in fattening hogs, a circumstance that merits the farmer's attention; for it is much more difficult to find a soil that is proper for carrots than for potatoes, and the produce from an acre of potatoes is nearly as great, and frequently greater than the produce of carrots; nor is there much difference in the expence. This however is certain, that in most farms, there is much more land proper for potatoes than for carrots.

The price of the potatoes, in this instance, is indeed much higher than the carrots; but that is a circumstance merely local, it is not so in all places; as the farmers may, in general, raise potatoes as cheap as they can carrots, and in much greater quantities.

The other experiments, in this Essay, were made, in order to discover the fattening quality of several sorts of food, when mixed together; pollard, bran, and of beans, pease, buck-wheat, and barley ground into meal; upon which the author makes the following observations.

"It appears from these experiments, that pollard alone, at the preceding prices, is a cheaper food than pease alone.

"That boiled carrots is much the most profitable food that has been tried.

"That buck-wheat is a more profitable food than pease.

"That several kinds of food mixed are better than given alone.

"That the meal of any one, or various kinds of grain is better, and more profitable than the whole grain mixed or alone.

"That pease and barley are a much sweeter food than beans."

HOGS, *the Mange in*. Mr. Young, in his Annals of Agriculture, vol. XV. inserts the following account (by William Norford, M. D.)

"The mange in hogs, dogs, &c. is similar to the *pruritus*, or itch, in the human body; and is to be cured in nearly the same manner. It is a local disease, and arises from an insect, which works itself under the cuticle, or outward skin, and there causes so violent an itching, that the animal scratches and rubs itself to such a degree, as to tear off the top of the pustule, which occasions a scab, and in a little time an ulceration. In the microscope this insect appears like the weaver bred in stale oat-meal; and

is said to have a snout as well formed to work under the skin, as the hog has to root and turn up the outer surface of the earth.

"From this account of the disease, your own good sense will suggest to you, that no internal medicine is necessary to make a cure.

"The idea of giving drugs to drive out the mange, or itch, is as ridiculous as it would be to give medicines to drive out the larger insects; as lice, &c. with which animals are often infested. But if this distemper should be suffered to continue so long, that pretty large ulcerations are formed all over the animal, in that case the matter of these little sores will be taken into the blood or habit, and so may make an internal disorder; for which it may be proper to give something to restore the health of the animal, after the external disorder is removed. One principal cause, perhaps, of the mange, is filth and nastiness; but when I say this, I beg to be clearly understood, that I do not think the hog is more liable to it than dogs, and many other creatures, because he is said to delight to roll himself in dirt and mire; which is so far from giving him the mange, that I believe it often prevents it; the filth and nastiness I mean, is what comes immediately from the body of the animal itself, which, in some cases, is the worst of all poisons, and may occasion the plague, or what is called the murrain, in cattle. Where many hogs lie together for a length of time, and by the carelessness of the servant, or want of attention in the master, are suffered to continue in the same litter, or straw, till it is quite ground down into short stuff, like chaff, although it should be perfectly dry, it will breed minute insects, such as lice, &c. and, I make no doubt, the very animalcule which occasions the mange. Great care, therefore, is necessary to keep hogs, dogs, &c. perfectly clean, if you expect to preserve their health; and every corner and part of the sty and kennel should be swept clean before fresh straw is put in; and never suffer them to have a clean bed laid over the dirty one, as it is too frequently done, where the immediate eye of the master is wanted.

"The following is the ointment which I recommend for the mange in hogs or dogs; and I never knew it fail of making a perfect cure, when it was properly applied, and due care taken to keep the animals clean afterwards.

Take of hog's lard, three ounces; sulphur vivum, in very fine powder, one ounce; white hellebore, fresh powdered, two drams; water of kali, half an ounce.

"Mix these ingredients very well together, by rubbing them on a marble slab, with a proper knife. This quantity will be sufficient for a hog of six or seven stone, and the whole should be very well rubbed in at one time; and if this is properly done, there will seldom be occasion for a repetition of it. Hogs that have many ulcerations, from the mange being long neglected, will sometimes, after the mange is cured, have chops, or cracks, in several parts of the body, particularly about the neck. These cracks are best cured by anointing them with tar-ointment; a little of which should be rubbed into the chops, once in three or four days, till they are well. Instead of purging the hogs after the cure of the mange, if they should not seem to be perfectly well, that is to say, if they should have a slight cough, and their bellies be too large, supposing them to be fed with proper food, give each of the hogs, according to his size, from half an ounce, to an ounce and half, or two ounces, of crude antimony, well levigated in some of his food; and this should be continued for ten days or a fortnight. The antimony is a cheap drug, and will, for the most part, restore them to perfect health.

"The tar-ointment commonly sold in the shops is often made with hog's lard instead of fine mutton suet; by which means the softness of the lard so soon melts when applied to the grieved part, that it does not cover the diseased and weak fibres a sufficient time to heal them, as it actually does when made with mutton suet. I shall therefore give a receipt how to make it.

Tar Ointment.

Take of the best tar; mutton suet, prepared; of each an equal quantity.

"Melt them over a gentle fire, and strain the ointment, while the fire is hot. This is also an excellent ointment for

for cracked heels in horses, and always ought to be kept in the stable for that use.

HOG-CISTERN. Mr. Marshall, in his *Rural Economy of Norfolk*, Min. 13. says. "Hog-cisterns, in this country, are principally built with bricks and terrace. But this is expensive: yet a hog-cistern is among the first conveniences of a farm-house. Wooden vessels are incommodious, and leaden ones dangerous.

"This summer a receptacle for water in a brick-yard being wanted, I had one built of bricks, laid in clay, and surrounded with a coat of the same material: it holds water perfectly.

"Afterwards, I built a hog-cistern in the same manner. This morning, on enquiry, I find that not only the tenant, but his wife and her maids, are fully satisfied with it.

"It was built in this manner. A pit five feet and a half long, by four feet wide, and five feet deep, was sunk in the place most convenient to the dairy, kitchen, and hog-yard jointly.

"The bottom of the pit was bedded with some extraordinarily fine clay, fetched from the sea-coast for this purpose; moistened and rammed down; and its surface smoothed over with a trowel. On this flooring were laid three courses of bricks, in clay-mortar (the best of the clay being taken for this purpose), and in such a manner, that the joints of one course fell in the middle of the bricks of the course below; the whole being laid long-ways; not crossed, in the usual manner.

"The sides were carried up half a brick thick (that is, a brick in width) with mortar of fine clay; and, in a vacancy left between the brick-work and the sides of the pit, moist clay was firmly rammed; so as to unite as much as possible the bricks, the clay, and the sides of the pit into one solid mass; carrying the brick and clay work up together; and beating back such bricks, into the clay, as were forced forward by ramming.

"The cistern when brought up level with the surface of the ground measured three feet long, two and a half feet deep; consequently the surrounding seam of clay is not more than four inches thick; and the stratum at the bottom is about the same thickness.

"Above-ground, a nine-inch wall was raised on each side, two feet high, with a gable carried up at one end; and, on these, a span or pitched roof was set, and covered with tiles; the other end being left entirely open as a doorway.

"This is an admirable covering for a cistern. A flap (whether it lie horizontally or sloping) being continually exposed to the weather, lets in rain-water; soon rots; and, from the manner in which it hangs, is liable every day to be split, and its hinges forced off, by the heedlessness of servants: whereas a door, having only a gentle fall, and being always under cover, will last a number of years."

HOG-SHEEP, or *Hoggræh*, a sheep of a year old.

HOG-STY *rubbing post*. Mr. Marshall, in his *Minutes of Agriculture*, observes that "every sty should have a rubbing-post.

"Having occasion to shift two hogs out of a sty without one, into another with a post, accidentally put up to support the roof, I had a full opportunity of observing its use.

"The animals, when they went in, were dirty, with broken ragged coats, and with dull heavy countenances. In a few days, they cleared away their coats, cleaned their skins, and became sleeky haired; the enjoyments of the post were discernible even in their looks: in their liveliness and apparent contentment.

"It is not probable that any animal should thrive, while afflicted with pain or uneasiness.

"Graziers suffer single trees to grow, or put up dead posts, in the grounds, for their cattle to rub themselves against; yet it is probable, a rubbing post has never been placed, intentionally, in a sty: though, perhaps, for a twofold reason, rubbing is most requisite to swine."

HOLCUS, or *couchy soft-grass*, a vile weed which infests arable land; the leaves springing up as high as the wheat-stubble, and the soil full of its couchy-roots.

HOLT, a wood.

HOLM, an island in a river; it also signifies the holly.

HONEY-DEW, is frequently observable on the leaves of trees, which is followed by their being blighted, but the corn does not receive any obvious injury from it.

HOOF of a horse, is all the horn that appears when his foot is set to the ground; the hoof should be of a fi-

gure very near round, and not longish, especially towards the heel, for long feet are worth nothing.

The horn of the hoof should be solid, tough, high, smooth, without any circles, somewhat shining, and of a dark colour, for the white is commonly brittle, and may be known by many pieces being broke from the horn round the foot: to be excellent, the horn should be of the colour of a deer's hoof, and the whole foot round, but a little larger below than above.

The hoofs of a horse are either perfect or imperfect; the former, but now described, is so disposed, that the horse may tread more on the toe than the heel, being also upright, and somewhat hollow on the inside.

As for the imperfect hoof, it is that which wants any of the aforementioned qualities, particularly if it be not round, but broad, and spranding out on the sides and quarters; that horse for the most part has narrow heels, and in process of time, will be flat-hoofed, neither will he carry a shoe long, or travel far, but soon subside; and by treading more upon the heels than on the toes, he will go low on the pasterns, so that his feet, through weakness, become subject to false quarters, gravelling, &c.

Others are rugged, or brittle-hoofed: when the hoof is not smooth, and full of circles like rams horns, it is not only unseemly to the eye, but even a sign that the foot is in no good temper, but too hot and dry.

Some hoofs are long, which cause the horse to tread all upon the heels, to go low in the pasterns, and by that means to breed wind-galls.

There are some crooked hoofs, broad on the outside, and narrow on the inside, whereby the horse is splay-footed; this will oblige him to tread more inward than outward, and go so close with his joints together, that he cannot well travel without interfering, or perhaps striking one leg so hard against the other as to become lame; but if it be broad within, and narrow without, that is not hurtful, yet will occasion the horse's gravelling more on the outside than the inside.

Others have flat hoofs, and not hollow within, which give rise to the inconveniences above specified in the first sort of imperfect hoofs; but if it be too hollow, it will dry the faster, and make him hoof-bound, since the too hollow hoof is a strait, narrow one, and grows upright; for though the horse treads upright, and not on his heels, yet such kind of hoofs will dry too fast, if not continually stopped.

When the frush is broad, the heels will be weak, and so soft that you may almost bend them together, then he will never tread boldly on the stones or hard ground.

Some have narrow heels; they are tenderest; so that at last the horse will grow to be hoof-bound.

HOOF-BONY, is a round bony swelling, growing upon the very top of an horse's hoof, and always is caused by some blow or hurt, or by bruising himself in his stall, by endeavouring to strike at a horse that stands next him, and so strikes against the bar that parts them.

The cure is, first to digest the swelling, either with rotten litter, or hay boiled in old urine, or else with a plaister of wine-lees and wheaten flour boiled together, to ripen it and bring it to a suppuration, or dissolve the tumour.

But if it comes to a head, lance it in the lowest part of the softness, with a thin hot iron to let out the matter.

Tent it with turpentine, deer's suet, and wax, of each equal quantities melted together, laying a plaister of the same salve over it, to keep in the tent till it be thoroughly well.

HOOF-BOUND in a horse, is a shrinking of the hoof at the top, and at the heel, which makes the skin start above the hoof and so grow over it.

It may happen to a horse divers ways; either by keeping him too dry in the stable, by strait shoeing, or else by some unnatural heat after foundering.

The signs of it are, he will halt much; his hoofs will be hot, and if you knock them with a hammer, they will sound hollow like an empty bottle.

As for the cure, that being the proper business of the farrier, I shall omit to prescribe for it here.

HOOF-BRITTLE. An infirmity in horses, proceeding either naturally or accidentally; naturally, from the fire or dam; accidentally, from a surfeit, that falls down into their feet; or else from the horse's having been formerly foundered.

For the cure, take unwrought wax, turpentine, sheep's suet, and of hog's-grease, of each four ounces; salad oil, a quart

quarter of a pint; and of dog's-grease, half a pound: boil them all together, and keep them in a gally-pot for use.

With this anoint the hoof well for two or three days, especially at the setting on of the hair, and stop them with cow-dung and hog's-grease melted together.

HOOF-CAST, or, *casting of the hoof*, is when the coffin falls clean away from a horse's foot.

HOOF-SWELLED. An infirmity that sometimes happens to young horses by being over-ridden, or too hard worked, which causes them to swell in that part, by reason of the blood falling down and settling there, which, if not speedily removed, will beget a wet spavin.

It proceeds from some founder, prick, or slap, breaking on the top round about the coronet, which in time causes it to fall off.

For the cure: take the strongest aqua-fortis you can get, and first file or draw away the old hoof somewhat near, with a file, or drawing-iron; then touch the hoof, so prepared, three or four dressings or more, with the aqua-fortis, and anoint the foot with an ointment, made of one pound of hog's-grease, patch-grease three quarters of a pound; Venice turpentine, five ounces; new wax, three ounces; and sallad oil, three ounces; all melted together over the fire: the coffin of the foot up to the top, being anointed with this, a new hoof will grow on it.

HOOF-LOOSENED, is an infirmity in a horse; it is a dissolution or dividing of the horn or coffin of his hoof from the flesh, at the setting on of the coronet.

Now if the parting be round about the coronet, it proceeds from his being foundered; if in part, then by a prick of some channel-nail, quitter-bone, retreat, gravelling, cloying, or the like.

When the hoof is loosened by foundering, it will break first in the fore part of the coronet, right against the toes, because the humours also are disposed to descend towards the toe.

But if it proceeds from pricking, gravelling, and the like, then the hoof will loosen round about equally at first; but if it be caused by a quitter-bone, or hurt upon the coronet, it will break right above the grieved part, and is very rarely known to go any farther: as for the cure of the former, they are properly the business of a farrier.

HOOP, a measure equal to a peck, or quarter of a bushel.

HOP, a well known plant of the reptile kind, whose flower is a principal ingredient in beer, and other malt liquors.

A rich, deep, mellow, dry soil, rather inclining to sand than clay, is, in general, best adapted to the cultivation of hops; but a black garden mould is excellent for this purpose. Stiff clays, spewy lands, such as are apt to be overflowed by floods, hard gravels, stony grounds, very sandy ones, and such as are not at least a foot and an half deep, are altogether improper for hops.

The best situation for hop-grounds is such as inclines to the south, or lies open to it, so that they may have the benefit of the sun during the greatest part of the day. It must also be open, for the air to have a free passage and circulation between the plants, and it should be so sheltered to the east, north, and west, that neither the frosty winds in the spring may cut off the young sprouts, nor the more stormy ones in summer and autumn destroy the full grown hops.

The ground and situation being chosen, the next business is to prepare it for the planting. In many parts of England, when the ground is broken up for this purpose, the plough goes first, and men follow it with the spades, with which they dig one spit deep in the furrows where the plough has passed, throw up the earth thus dug, and so continue to plow and dig till the whole is done. Either this tillage, if it be well performed, or the deep ploughings, cross-ploughings, and harrowings, by which careful husbandmen prepare their land for corn, will fit this for being sown with turnip seed in the end of July, or beginning of August; and if the turnips are hoed twice, so as to be left about eight inches asunder, they will yield a good crop, the weeds will be destroyed, and the ground will be rendered loose and fine. Another good ploughing after the turnips are taken off, will, with the ensuing winter mellowing, render it fit for being planted with hops in the spring.

The best time to begin ploughing is in October, in order that the soil may be properly prepared to receive

the benefits of the winter's frosts, rains, and snows; after which, in the beginning of spring, it should be well and deeply ploughed again, and well harrowed; and after another ploughing in March, which will be of very great service, it should be harrowed fine, and laid as even as can be.

When the ground is in proper readiness for planting, stretch along a straight side of the field, at fifteen or twenty feet distance from the hedge, and parallel to it, a line with knots or rags tied in it, as far asunder as you design your hills to be, and stick in the ground a sharp-pointed stick at every knot, as marks for the places where the hills are to be made; continue the line in this manner the whole length of the ground, and from this first row you may mark out the rest of the field, either in squares, chequer-wise, at the intended distance of the hills, or in the quin-cunx form, where the hills of every row lie opposite to the middle of the first, in a triangular form.

The distance of the hills should be, in some measure, regulated by the nature and goodness of the soil: but, in every case, they should be far enough asunder to admit the hoe-plough at all times without danger to the plants. If the soil be dry and shallow, six or seven feet will be a convenient distance: but if it be rich, moist, and apt to bear large hops and leaves, it may be right to allow eight or nine feet between the hills.

The most proper season for planting hops, is from the beginning of March to near the middle of April, at the time when they begin to shoot. The Kentish husbandmen approve likewise of October: but the common sorts are not to be procured then, unless it be from a ground that is to be dug up or destroyed; besides which there is some danger of their rotting in the earth, if the winter should prove very wet.

There are several sorts, though the botanists allow but one species of hops. The most esteemed are, the long white, the oval, and the long square garlic hop. These differ from each other in the colour and shape of their bells, or hops, in the degree of bearing, and in their time of ripening. The long white is most valued, because it is a great bearer, and produces the most beautiful hops; for the beauty of hops consists in their being of a pale bright green colour. The oval hop is beautiful, but does not yield so large a crop. There is a sort of this kind of white hop, called the early, or rath hop, which ripens a week or ten days before the common, and is therefore of advantage to those who would be first at market: but it is tenderer than the other, and does not bear near so plentifully. The long square garlic hop is the greatest bearer, more hardy, and somewhat later ripe than the former; but by reason of its redness towards the stalk, it is not so beautiful to the eye, and therefore is not so much esteemed as the other sorts.

Few hop grounds are without some plants of a sort of hop which many call the female hop, but very erroneously; for the female hop is that which is cultivated for use, and this, which others name more properly the wild hop, is the male. Towards the middle of July, it puts out a great number of long loose bunches of small flowers, not at all like the true hop; and in somewhat less than a month after, that is to say, just before the true hop begins to blossom, they ripen, and with the least motion of the wind shed a farina, which is wasted all around, and is by some, not improbably, thought to be of use to impregnate other hops. Those who are of this opinion advise, therefore, to leave one or two hills of them standing in the hop-ground. But the common practice is to mark them at their first appearance, and to root them out afterwards, because they do not bear bells or hops, and as they are generally the strongest plants, sets might otherwise be taken from them by mistake.

There is also a poor starved hop, called a wild hop, which is not judged to be a distinct sort, but a hop which has degenerated for want of culture.

The planter of hops ought to be extremely careful in the choice of his plants, or sets, particularly in regard to the kind of the hop; for it is a great trouble and loss to him, when his garden proves to be a mixture of several sorts of hops, ripening at different times. He who plants the three sorts abovementioned, viz. the early, the long white, and the square hop, in three distinct parts of his ground, will have the convenience of picking them successively as they become ripe.

Hop sets are cuttings from the roots or branches which grow

grow from the main root or stock: They should be procured, if possible, from grounds planted with none but the sort which is desired; and they should be from five to seven or eight inches long, with three or more joints or buds on them, all the old blind and hollow part of the set being cut off.

The ground being prepared for planting, as before directed, towards the latter end of February, or in the beginning of March, if the soil be light, or late in March, if it be strong and moist, make, in the places marked out by the sticks stuck in them, holes about twelve or sixteen inches wide, and of a depth proportioned to the nature of the ground. In general, ten or twelve inches will be a sufficient depth. If the ground be shallow, and you meet with hard clay or gravel, by no means enter into this, for you would then make a basin to retain water; but, in such case, instead of going deeper, raise up a small hill of good mould. If there is a good depth of rich mellow mould, dig the hole a foot and a half, or two feet deep; and you will find the hops thrive the better; for their tap roots naturally run downward.

When all things are ready for planting, fill up the holes with the mould before thrown out of them, if it be naturally good, after having first broke it fine with a spade: but if the same earth be not rich enough make use of fine fresh mould, or of the compost provided for this purpose. About a peck or two of this will be sufficient for each hill; but no new dung should be put into the hole on any account.

Then, with a dibble, or settle stick, such as gardeners generally use for planting of beans, make five or six holes, the depth of your sets, one in the middle, perpendicular, and the rest round about, sloping and meeting at the top near the center: put your sets therein, so that they may stand even with the surface of the ground; and then press the mould close to them, and cover them with fine mould two or three inches thick. A stick should be placed on each side of the hill to secure it.

The ground being thus planted, all that is to be done in the following summer, is to keep the hills and alleys clear from weeds by frequent hoeings; to dig the ground in the month of May, and to carry off all the stones that are turned up by digging; to raise a small hill about the plants; to throw some fine mould on their roots; and, in the latter end of May, or beginning of June, to twist all the vines and branches together into a bunch or loose knot, and lay them thus twisted on the top of the hill.

Towards the latter end of February, or in the beginning of March, in the second year, when the weather is kindly, open the hills, and with a sharp knife, cut off the shoots of the first year to within an inch of the old stock, together with all the younger suckers that have sprung from the sets, and cover the stock with fine earth. To keep the knife sharp, you should have a whetstone always by you at dressing.

In the third and following years, when you dig your hop-ground in February, let the earth be taken away with a spade or hoe, round about the hill, very near them, that you may the more conveniently come at the stock to cut it: then in fair weather, towards the beginning of March, if your hops be weak, begin to dress them; but if they are strong, and in heart, the middle or latter end of March will be the best time; for late dressing restrains their too early springing, which is the cause of many injuries to the hop.

After the hops are dressed in the second year, the next business is to pole them. Poles of only ten or twelve feet long will do then; but in the third year, by which time they come to their full bearing state, they will require poles of full size: this, if the ground be rich, and the hop vigorous, will be from sixteen to twenty feet, or even more; or there will be danger of losing great part of the crop.

If the hop be weak, and the ground not rich, the poles should not be more than from fourteen to eighteen feet long, for fear of impoverishing the root; for the hop will soon run itself out of heart if over poled; so that, as was said before, there is more danger in over poling than in under poling; neither can a good crop be expected from an over poled ground, because the branches which bear the hops grow very little till the buds have over-reached the poles, which they cannot do when the pole is too long. Two small poles are sufficient for a hill in a young ground.

Towards the latter end of July hops begin to blossom; about the beginning of August they bell, and, in forward years, they are sometimes ripe at the end of August, or beginning of September. When they begin to change colour, or are easily pulled to pieces, when they emit a fragrant smell, and when their seeds begin to look brown and to grow hard, you may conclude that they are ripe: then pick them with all expedition; for a storm of wind will do them great mischief at this time: and hops picked green and bright, without bruising or discolouring, will sell for a third part more than those that are otherwise.

When the poles are drawn up in order to be picked, the vines around them should be cut asunder, at the height of about three or four feet from the ground; for the cutting of them lower, especially while the hops are green, would occasion so great a flowing of the sap, as would weaken and hurt the root.

The most convenient way of picking them is into a long square frame of wood, called a bin. This frame is made of two poles, or pieces of wood, each nine or ten feet long; and three or four inches broad, joined together at about a foot and a half from each end, by two other pieces three feet long; and it is supported by four legs three feet and a half high; so that there remain in the middle of it a space six feet long, three wide, and three and a half deep. In this space is fixed a coarse linen cloth, or hop-bag, cut open on one side, and hung hollow, either by hitching it on tenter-hooks along the inside of the frame, or by stretching it on the outside with wooden skewers, to receive the hops as they are picked. Three men or women, or four boys or girls, may stand on each side of the frame, and pick two poles at a time.

When you have raised some poles, bring them with the hops and vines on them, and lay them lengthwise upon the frames; or erect a forked prop at each end of the frame, and rest the poles thereon, in order to their being picked. There is no occasion to strip the vines from the poles in order to their being picked. The workmen who raises the poles generally carry them to the frames, and the latter being very light, may be easily removed from one part of the ground to another.

The ripest hops should be first picked: but if the hops appear to be equally ripe in all parts of the plantation, it is best to begin to pick them on the east or north-side of the ground, the more effectually to guard against the south-west wind's breaking into the garden.

Having chosen a spot of ground which contains eleven hills, place the bin upon the hill which is in the center, and after these are picked, remove it into another spot of the same extent, and so proceed till the whole is finished.

The hops should be picked as free as possible from leaves and stalks: for these would be of greater prejudice to the sale, than any seeming advantage which might be expected from their weight. The bin should be emptied two or three times a day into a large cloth of coarse linen, in which the hops should be immediately stitched up with skewers, and carried directly to the oast, or kiln, to be dried: for if they remain long in the bin, or cloth, they will sweat and be discoloured.

If any brown hops are met with in the picking, care should be taken to separate them from the rest, by putting them into a basket by themselves.

If the weather be very hot, or rainy, cut no more hops than may be picked in an hour: but, if it be possible, gather them in fair weather only, and when they are dry; for this precaution will save some expence of coals, and contribute to the better preservation of the colour when they are dried. No hops should be gathered when the dew is on them, for that would make them become mouldy.

When you have taken the poles from the hills, twist together the remaining ends of the binds, that they may not get among the people's legs, and hinder their work.

Before you draw the poles, observe whether the hops on one pole be entangled above with those of another, and if they are, cut them asunder with a sharp hook fixed at the end of a long pole.

If the garden be large, it may be worth while to raise a shed in the midst of it, to shelter the pickers and the hops from the sun and rain; and to lay hops in over-night, to be picked early the next morning before the dew is off the other hops. This shed will also serve for preserving your poles in winter.

If there be either rain or dew upon the hops at the time when they must be gathered, shake the pole, and they will dry

dry the sooner. If they are over-ripe when gathered they will shed their seeds, in which the chief strength of the hop consists; nor will they then look so green, but somewhat brown, which is a great diminution of their value. It therefore is better to pull the hops, a little before they are ripe, than to wait till they are full ripe. Four pounds of undried hops, thorough ripe, will make one pound of dry; and five pounds of hops scarcely ripe, though in their full prime, will make no more when they are dried.

There are two principal sorts of hops, viz. the green and the brown. The former yields by much the best colour when dried, and the other is the most plentiful bearer.

Brown hops are fit for brown ale, but the hops for fine pale beer must be green; for which reason these last are most esteemed.

As fast as you pick hops, dry them on a kiln; otherwise they will change colour: but if you cannot dry them immediately, and must keep them a little while, spread them on a floor, and by that means the damage which they will receive in a day or two will not be great. They who have five or six acres of hops, may employ ten frames at a time in picking.

If any of the rath-ripe, or early hops, which blossom and ripen a week or ten days sooner than the other sorts, happen to be intermixed in the same plantation, they should be watched carefully, in order to their being gathered in time; for if they hang till they are over ripe, they will shed their seeds, turn brown, and thereby not only become bad themselves, but spoil the sale of the others with which they are mixed. It is therefore advisable to mark at the blossoming season, the hills in which they are, in order to dig them up and replant those spots; for the trouble of pulling them up separately, when they are scattered here and there in a hop-ground, and of carrying them sometimes a considerable way, to a convenient place, to be picked, is very great, and cannot be avoided otherwise than by either banishing them totally, which would not be quite consistent with the husbandman's profit, as they fetch a good price by their coming first to market; or, which is the best way, by planting them in a garden by themselves.

Very particular care should be taken that the hops be thoroughly and equally dried. In this lies the greatest difficulty in the art and management of them: for if they are over-dried, they will change colour, look brown, and be judged to be burnt, whereby their value will be greatly diminished; and if they be under-dried, they will lose their colour and flavour. Experience has shewn, that an handful only of under-dried hops spoil many pounds of others, by taking away their fine smell and colour.

The best way of drying them is with a charcoal fire, on a kiln covered with hair-cloth, of the same form and fashion as is used for drying of malt, under which head this common sort of kiln will be more particularly spoken of hereafter. It is found to suffice in places where only a few hops are raised, and a great deal of malt is made: but where the hop-planters have a much greater quantity of hops than can be dried in due time on their malt-kiln, (for hops, as was said before, ought to be dried as soon as possible after they are picked), they build, in the following manner, several small kilns on purpose for drying of hops.

Eight or ten acres of hop-ground require a building of about sixty feet long, and fifteen wide in the clear. At one end of this building is a boarded room, to receive the green hops which are brought from the hop-ground, and which lie spread out there, till there be room to put them on the kilns: at the other end of the building is another large boarded room, for receiving the hops from the kiln when they are dried, and for them to lie in heaps to sweat till they are fit for bagging. In the intermediate part of the building, three or four kilns, of eight or ten feet square each, are constructed thus, close to one another.

If the middle-building is, we will suppose, twenty-eight feet long, and fifteen feet wide, there will be room for three kilns of eight feet square each on the clear, and for their respective walls. These kilns should lie in a line along the back wall, and will come forward above nine feet; so that there will remain a passage five feet wide and twenty-eight feet long at the front of their kilns.

To form each kiln, build the walls of brick, nine inches thick, and let each of the four sides be eight feet long in the clear, and seven feet high. The principal parts of the kiln are, in the upper part, the bed or floor whereon the hops are to be laid, in order to their being dried; and in the under part, the furnace, steddle, or lanthorn, for the fire. The

bed or floor in a kiln of eight feet square, should be about six feet from the lower floor, so that it will be about a foot below the top of the wall. This foot of wall rising above the bed, serves to keep in the hops on the kiln, and for men to walk upon round about the kiln, to look to the drying of the hops. The bed, or floor, may be made of wooden rails an inch square, laid very even and level, into a cross beam, a quarter of an inch asunder: or if the kiln be arched below, the floor may be laid with long bricks or stones resting on the tops of the arches, at about two inches distance from each other.

In making the lower part of the kiln, place the mouth of the furnace at the bottom, in the middle of the front wall of the kiln, and let it be fourteen inches wide and sixteen high. Joining to the mouth of the furnace on the inside, build the steddle or lanthorn, of brick, four inches thick. This lanthorn should be fourteen or sixteen inches wide, three feet perpendicularly high in the side walls, and it should reach from the front wall of the kiln to within a foot and an half of the back wall, so that there will be room for a man to pass between it and the back wall, and the length of the lanthorn thus made will be about six feet. On its side walls, bricks of a foot length are to be raised on their ends, leaning to and bearing upon one another; so as to form a covering like the roof of a house; or the top of the lanthorn may be regularly arched over.

In building the side walls of the lanthorn, after you have laid the two first rows of brick, leave at the end of every brick, in the three or four following rows, an open space or hole, four or five inches wide, chequer-wise, both in the sides and in the back, and lay the uppermost row or two of bricks close together, as in the bottom rows, for the better support of the roof. By this means there will be three or four rows of holes, which are designed to convey the heat equally to all parts under the hair-cloth. The roof should be well plastered on the inside with hair and lime, that it may the better reflect the heat.

In the front-part of the kiln, on one side of the furnace, and at the height of two feet from the ground, a small door should be made, three feet high, and two wide, so that a man may easily get in to set every thing to rights about the steddle. There should also be steps or stairs to go to the upper floor, where the hops are dried; and as there is a passage below, five feet wide, along the front of the kilns; so will there be, directly over head on the upper floor, a like passage, which will be of use for bringing green hops from their room, and laying them on the kiln, and for carrying them to the store-room after they are dried. For greater conveniency, both these rooms should be on the same floor as the upper-part of the kiln.

A farther caution necessary to be observed, is that no holes be made within a foot of the fire-place or mouth of the furnace, and that all the parts about the kiln be constructed so close that no wind or air may possibly get in. The farther end of the steddle should be built of brick up to the top, with holes in it, as in the sides.

The kiln should be square, and may be ten, twelve, or fourteen feet over at the top; but there should be a due proportion between the height and breadth of the kiln, and the size of the steddle where the fire is kept, viz. if the kiln be twelve feet square on the top, it should be nine feet high from the fire, and the steddle should be six feet and an half square; and so proportionably in other dimensions. These kilns are made at a small expence.

In drying of hops, first lay the hair-cloth very even on the bed or floor of the kiln, and spread the green hops thereon, about six inches thick, laying them with a rake as smooth as possible, not thicker in one place than another. Let the kiln be moderately warmed before you lay on the hops; then keep an even and steady fire under them, but not too fierce at first, for fear of scorching them; and let not the fire slacken, but rather increase it till the hops are nearly dried, lest the moisture or sweat, which the fire has raised, fall back and discolour the hops. For these reasons chiefly it is, that no cool air should be suffered to come into the kiln while the hops are drying, and that wind, which would make the fire burn too violently, should not be permitted to blow on the mouth of the furnace. After the hops have lain thus about seven, eight, or nine hours, having left off sweating, and leap up when beaten with a stick, then turn them upside down with a broad malt-shovel, or scoop made for that purpose, or cast them up into a heap in the middle, and afterwards spread them equally on all sides. Let them remain in this situation for two

two or three hours more, till every hop, if possible, be thoroughly and equally dried; and then with a hair-cloth, remove them to the heap where they are to lie till they are bagged. If they do not dry in one place so much as in the rest, which may be perceived by touching them with a stick or wand, and observing whether they rattle when so touched, as they will do when dry; make them thinner in the places where they rattle least. They must not be turned while they sweat; for that will burn them, and make them lose their colour. The fire may be diminished a little before they are turned, and refreshed again afterwards: but those times excepted, the heat should be as equal as possible.

Hops are fully dried when their inner stalks become brittle, and break short on rubbing, and when their leaves fall off easily, and feel very crisp. When they crackle and leap a little, as they will do upon the bursting of their seed, then is the time to take them off the kiln.

If the fuel used for this purpose be either wood or turf, it should be charred first, because smoke spoils the colour and smell of hops. Charcoal made of old rotten poles is most commonly used. Cinders of sea-coal are also very good, and it is found by experience that Kilkenny coal dries hops perfectly well, because it does not smoke, and gives a constant uniform heat for a long time. The fire should be made at the mouth only of the furnace: for the air will disperse the heat sufficiently from thence to all parts of the kiln: and that it may be constantly of the same gentle degree, neither too strong nor too weak, it may be of service to make use of a thermometer, by marking upon which the degree of heat proper for drying hops, as soon as that degree is ascertained by experiment, you may always after know how to regulate your fire with great exactness: for, putting the thermometer within side the kiln for a short time, you may observe, by the height of the liquor, when the heat is come to a right pitch, and when it is either too high or too low, and so increase or slacken the fire accordingly. Any servant may, with the help of this instrument, be able to mend and correct the fire with great certainty, and not be liable to commit mistakes, which often prove exceedingly detrimental to the hops. When you begin drying, lose no time in the prosecution of that work, but employ people night and day, to attend it with the utmost care, till it be finished. A large malt-shovel full of charcoal, thrown into the mouth of the furnace of a kiln eight feet square, will last an hour.

It is observed that hops dried in the sun lose their richness of flavour, as other herbs do when they are dried that way. If they are laid on a floor to dry, without using a fire, they will lose their strength, be apt to sweat or ferment upon change of weather, and not be fit for packing. Fire exhales their watery parts, and, by retaining the oily, preserves their flavour and colour.

Hops break all to powder if they are bagged hot from the kiln. To prevent this, they should be laid in a heap, to sweat and grow tough; and if they are then covered for a while close with blankets, to keep the air from them, they will bag the better. There is no limited time for their sweating, that varying according to the weather: three or four days are commonly sufficient: but it is a certain rule, that when the hops feel moist and clammy, and can be squeezed in the hand, or trodden close, without breaking, they are then fit for bagging. The harder they are trodden, the better they will keep.

The bags proper for this occasion are made of coarse linen cloth. They are commonly about eleven feet long, and near two yards and a half in circumference, and contain about two hundred and a half weight of hops. The small bags, called pockets, contain about half that weight.

The manner of bagging is thus: make a round or a square hole, but a round one is most convenient, about twenty-six or thirty inches over, in the floor of the chamber where the hops are laid in heaps after they are sweated. This hole should be large enough to receive the bag, and for a man to go up and down it with ease. Tie with a piece of pack-thread, an handful of hops in each lower corner of the bag, to serve as handles for the more easy lifting or removing of the bag; and, with pack-thread, fasten the mouth of the bag to a frame, or hoop, somewhat larger than the mouth of the hole, that the hoop may rest on its edges, and strong enough to bear the weight of the hops when the bag is full, and of the man who treads

them. The upper part of the bag being thus fixed by the hoop, let the rest of it hang down through the hole; but not so near to the lower floor as to touch the ground: then throw into it a bushel or two of hops, and let a man go into the bag, and with shoes that have no heels, tread the hops down on every side, as hard as he can, till they lie close. Let more hops be then cast into the bag, and be trodden down as before; and continue this till the bag is full. When that is done, untie it from the hoop, let it down, and sew up its mouth as close as you can, observing at the same time to tie up some hops in the upper corners, as was done before in the lower. The harder the hops are pressed, and the closer and thicker the bag is, the longer and better the hops will keep.

When they are thus bagged, lay them upon a boarded floor, and in a dry place; for dampness would injure them greatly. At the same time all proper measures must be taken to guard against rats and mice, which, though they do not eat hops, are very apt to spoil them, by making nests and lodging in them.

Some, in treading the hops, use a fifty pound weight, fastened to a rope, and placed in the middle of the bag. The man in the bag treads about with his feet, and lifts it up now and then, to press them the closer together.

As soon as the hops are picked, strip their haulm or vines from off the poles, and, as your last work, lay the poles up so that they may be preserved. This is done either by stacking, piling, or housing.

The stacking is performed thus: set up three poles, like an erect triangle, or rather six poles, let into the ground with an iron crow, and placed circularly, but inclining to one another so as to meet; and be tied fast together with bands of the haulm of the hops, within a yard of the top. The poles destined for the same stack should then be erected speedily against this frame; for if they are suffered to lie on the ground, especially in wet weather, they will receive more damage in a fortnight, than by their standing out upright all the rest of the year. When they are set up, about three hundred to a stack, bind them round with a rope of twisted haulm, to keep them together. By this means the outer poles only are subject to the injuries of the weather, and keep all the inner ones dry, excepting at their tops and bottoms, the former of which are for the most part exposed to the air, as the latter are to the moisture of the earth. It is therefore a good method to cover the top of the stacks of poles with haulm, and to lay stones, bricks, or sand, at their bottom, to preserve their butt ends from rotting.

Many chuse to pile them up lengthwise, in different parts of the hop ground, laying three or four old poles athwart at bottom, to preserve them from the dampness of the earth, and setting several poles erect in the ground on each side of the pile to prevent its slipping: they then lay the poles on one another, placing the smaller ends inwards, and the bigger outward; so that the pile should consequently be somewhat longer than the poles: and when it is raised high enough, they bind it across with ropes of twisted haulm, to keep it upright and steady, and then cover it with haulm, to defend the poles from rain. This is a better method than the former; but the best way of all to preserve the poles, is to build in the hop ground a shed or two, which may serve as a shelter for picking the hops in summer, and laying up the poles in winter, with least danger of their being hurt or stolen.

From October to March, there is nothing to be done in the hop-ground, but to provide and bring manure into it, and to give the alleys their winter's digging or ploughing.

If you bring dung into your ground, be sure it be well rotted, and lay it on the alleys to mix with the earth, but not on the hills, dung being apt to produce vermin, which are extremely injurious to hops. Cold dungs, such as cows and hogs-dung, are better for hops than horse dung, unless the soil be cold and wet, and then hot dung, such as that of sheep, and even of pigeons, will not be improper.

A small dunging every second year is sufficient, and a plentiful dunging will serve for three years, if the soil be tolerably good.

Dung was formerly more in use for hop grounds than it is at present, experience having shewn, that lime, lime-stone, gravel, sea-sand, marle, especially the shelly marle, ashes, and many other manures, are the most proper means

of correcting the defects of soils, answer the end better, and last much longer.

The management of the hop-ground during the third and every subsequent year (for it will continue to yield good crops during upwards of twenty years, if it be rightly cultivated) is the time as above directed; so that it will require pretty constant care and attendance, especially from the beginning of March to the end of September. This you may lay down as a certain rule, that the more pains you take, and the greater expence you are at, in the due culture of the ground, and management of the hops, the greater will be your profit.

The charge of an acre of hop-ground, in most parts of England where hops are cultivated, is computed thus; three pounds for the husbandry, four pounds for the wear of the poles, five pounds for picking and drying, one pound ten shillings for dung, one pound for rent, and ten shillings for tythe; in all, fifteen pounds a year: but in some places they pay four or five pounds an acre yearly for the rent of the land.

The hop planters in England commonly agree with hop-dressers, to do, for three pounds to three pounds ten shillings an acre, all the husbandry part, in which is included the summer and winter digging of the ground, the pruning and dressing of the hops and hills, the poling and tying, several hoeings and making up the hills from time to time, the laying of the dung on the ground, and all other works, except the bringing of the dung to the ground, and the picking and drying of the hops, which last businesses are performed by others; so that a gentleman has little trouble with his hop-ground: he need only be careful that the undertaker does every part of the work in its proper season; and it is so much the interest of the undertaker to be punctual in this, that, if he neglects hoeing when the weeds appear, he will, by such neglect, greatly multiply his trouble and labour in rooting them out afterwards.

An English acre requires about three thousand poles, the price of which varies according to their size. In several places it is usual to give as many shillings for an hundred poles as the poles are feet long; so that for an hundred poles of twenty feet long they give twenty shillings; but where poles are in great plenty, they give but fifteen shillings for those of that length. A recruit of five hundred poles yearly will keep an acre of hop ground in constant repair; so that poles are about a third part of the yearly charge, the picking and drying are estimated at another third, and the rest is laid out in the managing of the ground.

The hop planters in England reckon, that they have but a moderate return when the produce of an acre of hops does not sell for more than thirty pounds. They frequently have fifty, sixty, eighty, or an hundred pounds for an acre; nay, some have got considerably more than even this last sum for every acre of hops, at a time when the crops of other hop grounds have failed in general, and their's have succeeded. But if, on one hand, such extraordinary profit, being very uncertain, is not to be depended upon; so, on the other, it should not be passed over quite unnoticed, because it is among the chances which may make amends for failing years. Upon the whole, if the total charge of an acre of hops is computed, as above, at fifteen pounds a year, and its produce, at an average of years, at thirty pounds only, the clear profit from an acre will be fifteen pounds a year.

Though it be common in England to see ten, twenty, thirty, or more acres of hop ground in the hands of one man, and though some who spare neither care, industry, or expence, to make their plantations of this kind flourish, receive two thousand pounds a year for their hops, notwithstanding the high price of labour, manure, and every other article relating to their proper management; yet the intelligent husbandman will easily perceive, that it is not prudent for poor farmers, or men of small fortune, to engage far in this branch of improvement: for it requires a pretty considerable stock at first to cultivate a large plantation, to furnish it with poles, and to perform every other requisite. The expence will necessarily be great, and the undertaker must expect to lie out of his money for two or three years, before he can have any return of profit; and even when his hops do come to their bearing-state, and he is in hopes of making good the charges he has been at, a bad season may frustrate his expectation.

Small parcels of hops, suitable to the abilities of the farmer, for even the poorest may easily spare time and labour, to plant a few of them in a corner of his garden, or other ground, and to set sallies, willows, or ash, for poles in his hedges or elsewhere, will yield him a pretty profit, without his laying out any money: so that, in setting forth the expences and risk which attend the cultivation of hops, we mean only to caution the husbandman, whose circumstances are but middling, against embarking too far in this branch of agriculture.

Ground that is fit for the raising of hops, is also fit for the raising of hop-poles of one kind or other. But to be more particular: low, wet, cold, marshy, boggy soils, or such as are situated near rivers, are fit for all the aquatic sorts, such as poplars, abeles, alders, willows, osiers, and sallies, which produce hop-poles in four or five years from their first planting. If the soil be dry and warm, or a strong, mellow, rich loam, the ash and the chestnut, which makes the best poles for hops, will thrive greatly therein, and be fit for poles in nine or ten years from the time of setting them: and if these are planted around the hop-ground, they will both shelter the ground, and afford a supply of poles without the expence of carriage. Elms also are quick growers; and when they are planted close together, they shoot up tall and strait, and make good poles.

Ash and chestnut poles, but especially those of chestnut, are so tough and durable, that three sets of them will last twenty years: but poles of alder, poplar, abele, osiers, or sallies, soon rot, or become brittle; so that five sets of them, at least, will be requisite within that time. The aquatic kinds are therefore to be esteemed only for a first supply, till the plantations of ash and chestnut become fit for the future recruit of the hop ground.

Hops are, like other vegetables, liable to various accidents and distempers, the principal and most fatal of which are the fly, the fen, or mould, the mildew, and what the planters call fire-blasts.

The reverend Dr. Hales, treating of this subject in his excellent Treatise of Vegetable Statics, gives us the following account of the state of hops in Kent, in the year 1725, which he received from Mr. Austen of Canterbury, who was a very great planter, and an accurate observer.

"In mid April, not half the shoots appeared above ground; so that the planters knew not how to pole them to the best advantage.

"Upon opening the hills, this defect of the shoot was found to be owing to the multitude and variety of vermin that lay preying upon the roots, and of which the increase was imputed to a long and almost uninterrupted series of dry weather for three months before. Towards the end of April, many of the hop vines were infected with flies.

"About the 20th of May there was a very unequal appearance, some vines being run seven feet, others not above three or four, some just tied to poles, and some not visible; and this disproportionate inequality in their size continued through the whole time of their growth.

"The flies now appeared upon the leaves of the forwardest vines, but not in such numbers here as they did in most other places. About the middle of June the flies increased, yet not so as to endanger the crop; but in distant plantations they were exceedingly multiplied, so as to swarm towards the end of the month.

"On the 27th of June some specks of fen appeared. From this day to the 9th of July the weather was very dry. At this time, when it was said that the hops in most parts of the kingdom looked black and sickly, and seemed past recovery, ours held out pretty well, in the opinion of the most skilful planters. The great leaves were indeed discoloured, and a little withered, and the fen was somewhat increased.

"From the 9th of July to the 23d, the fen increased a great deal; but the flies and lice decreased, it raining much daily. In a week more, the fen, which seemed to be almost at a stand, was considerably increased, especially in those lands where it first appeared.

"About the middle of August the vines had done growing both in stem and branch, and the forwardest began to be in hop, the rest in bloom; the fen continued spreading where it was not before perceived; and not only the leaves, but many of the burs also were tainted with it.

About

“About the 20th of August, some of the hops were infected with the *fen*, and the whole branches were corrupted by it. Half the plantations had escaped pretty well hitherto, and from this time the *fen* increased but little: but several days of wind and rain in the following week distorted the plants so that many of them began to dwindle, and at last came to nothing; and of those which then remained in bloom some never turned to hops, whilst many of those which did were so small, that they scarcely exceeded the size of a good large bur.

“We did not begin to pick till the 8th of September, which is eighteen days later than we began before. The crop was a little above two hundred on an acre of ground, and not good. The best hops sold this year at Wey-hill, for sixteen pounds the hundred.”

As a farther means of investigating the cause of this pernicious distemper, Dr. Hales relates the following experiment, which he himself made on hops. In the month of July he cut off two thriving hop-vines, near to the ground, in a thick shady part of the garden, and left the pole still standing. He stripped the leaves from off one of these vines, and left them on the other, and then set their stems in known quantities of water in little bottles. That with leaves imbibed in a twelve hours day, four ounces, and that without leaves only three fourths of one ounce.

He took another hop-pole with its vines on it; and having carried it out of the hop-ground into a free and open exposure, these plants imbibed and perspired there double the quantity of the before-mentioned which had leaves on it in the hop-ground. This seems to indicate that the reason why the hop vines on the outside of gardens, where they are most exposed to the air, are short and poor, in comparison of those in the middle of the ground, is, because, being much drier there, their fibres harden sooner, and therefore they cannot grow so kindly as those in the middle of the ground, which, by the shade and shelter they afford each other, are always kept moister and more ductile.

From this perspiration of their fluid, the same attentive observer of nature forms the following calculations. There being a thousand hills in an acre of hop-ground, and each hill having three poles, and each pole three vines, the number of vines will be 2000, each of which perspiring four ounces, the sum of all the ounces perspired by an acre in twelve hours of day will be 36000, equal 1575000 grains, equal 62007 cubic inches, or 220 gallons, which being divided by 6272640, the number of square inches in an acre, it will be found, that the quantity of liquor perspired by all the hop-vines will be equal to an area of liquor as broad as an acre, and $\frac{1}{8}$ part of an inch deep, besides what is evaporated from the earth.

Now this quantity of moisture, in a kindly state of the air, if daily carried off, is sufficient to keep the hops in a healthy state: but in a rainy moist state of air, without a due mixture of dry weather, too much moisture hovers about the hops, so as to hinder, in some measure, the kindly perspiration of the leaves, whereby the stagnating sap corrupts and breeds mouldy *fen*, which often spoils whole tracts of, till then, flourishing hop-grounds.

This was the case in the year 1723, when, for twelve or fourteen days, almost continual rains fell, about the latter half of July, after four months of dry weather; upon which the most flourishing and promising hops were all infected with mould, or *fen* in their leaves and fruit, while the then poor and unpromising hops escaped, and produced plenty, because they, being small, did not perspire so great a quantity as others, nor did they confine the perspired vapour so much as the large thriving vines did in their shady thickets.

The planters of hops remark, that when a mould, or *fen*, has once got possession of any part of the ground, it soon over-runs the whole, and that even the grass, and other herbs under the hops, are infected with it. The reason probably is, that the exceeding small seeds of this quick growing mould, or moss (for such in fact it is) coming soon to maturity, are easily blown over the whole ground; and it is undoubtedly owing to the same cause, viz. to the remaining dispersed seeds of the preceding year's *fen*, that some grounds are infected with this distemper for several years running. The means pointed out for curing the moss on fruit-trees should therefore be assiduously recurred to here, at least so far as they can be applied to hops; and, at all events, particular care should be taken to

keep the land always in fine tilth, constantly free from weeds, and to burn all the fenny hop-vines, in a place remote from the garden, as soon as they are picked. We have already seen instances of the cure of moss upon fruit-trees, by the use of hog's-dung; and there is no room to doubt the efficacy of the same remedy when applied to mouldy, or mossy hops.

Mr. Austen, of Canterbury, observes that the *fen* is more fatal to those grounds which lie low, and are closely sheltered, than to such as have a high, and open situation; to those that look shelving to the north, more than to those whose slope is towards the south; to the middle of hop-grounds, more than to moist and stiff soils. This was very apparent throughout his plantations, where the land was prepared and planted in the same manner, and at the same time.

The mildew, which lights upon hops, is a white dew, that falls in summer at sun-rise, chiefly when the hops are in flower. Its fall is so unequal, that it sometimes embraces a whole district, and sometimes only parts of it. This dew dries up the hops, withers and consumes their leaves, and consequently ruins the crop. “There is,” say the authors of the *Journal Oeconomique*, whose account of this distemper, to which hops are extremely liable, we shall copy here, “no other remedy from nature against this mischance, except rain sufficient to wash the plant, and clear it entirely from the fatal dew: but as rain seldom comes quite seasonably to the relief of the plant thus affected, artificial means have been sought, for insuring it against this accident. Some have surrounded their hop-grounds with hogs-dung; others have employed persons to go through the ground with vessels full of beech-ashes, and to throw them upon the hops while the mildew was falling; and both sides, profiting by their experience, pretend to have found a specific preservative against the bad effects of the mildew. They have even proceeded so far as that each side affirm theirs to be the only remedy. Those who use hog-dung say, that the ashes may probably hinder the action of the dew upon the plant; but that they must, at the same time, stop up its pores, and deprive the soil of its humidity; a circumstance equally ruinous to the plant: and that, besides, beech is not to be found every where, and if it must be brought from afar, the remedy would in some measure become impracticable, by the scarcity and difficulty of procuring it. The partizans of the ashes say, that they cannot comprehend how hog-dung laid round the hop-ground in the spring, should preserve such virtue as to destroy the bad quality of this mildew in the summer. In short, to render this discussion complete, each side alledges, that the trials which they have made of the other's remedy did not succeed.

“This dispute, the subject of which is highly interesting to all countries where beer is the common drink, excited a naturalist to examine the nature of this mildew; and with the assistance of a microscope he perceived it to be full of the eggs of little insects, which fly in vast numbers in the air while the hop is in blossom. These insects gnaw the leaves even of trees, and like others of their species, undergo various metamorphoses. This discovery induced him to believe, that, as insects are not apt to attack perfectly healthy trees, or vigorous plants, but only such as are feeble and sickly (they being endued with such nice sensations as to distinguish by the outside only, perhaps by the smell, a plant which is vitiated within, though it may appear to us to be quite fair and sound) hog-dung might probably give such vigour to the hop, as to render these little animals afraid to attack it: for it has been remarked, that the insects which nip a leaf, leave it as soon as they find in it an abundant juice, the salts of which, it may be presumed, are too strong for them; and that they fix on those only which begin to decay and lose their sap. Ashes may likewise have the power of hurting them, and its salts may be capable of giving them disturbance. But late experience hinders us from giving entire credit to these two remedies, and shews, that if they have sometimes preserved hops from the effects of mildew, we are not to conclude that they will always answer this desirable end.

“A very good husbandman saw his hops spoiled by the mildew, notwithstanding the dung with which they were surrounded, and the ashes that were thrown upon them: in a little time the leaves of the plants were covered with millions of small white insects. The ashes, indeed, seemed to kill them; but, as was observed above, they at the same

same time deprived the soil of its necessary moisture. Desirous of saving his hops, he recollected an axiom in medicine, importing that bitter things kill worms: *amarum necat vermes*. He then ordered a quantity of wormwood to be bruised; and having infused it in water, he sprinkled his hops with the infusion, by means of a forcing pump; but he was too late, the hops being already destroyed. A clergyman in his neighbourhood, who was well versed in matters of agriculture, and to whom he related his bad success, answered that when such an accident happened to him, he, without giving himself so much trouble, ordered his people to strip off immediately all the leaves of his hops, and, that, the stalks pushing out other leaves, he had at least one half and sometimes two thirds, of his ordinary crop."

"The publication of the above account concerning hops," add the writers of the *Journal Oeconomique* (whom we continue to copy) in one of their subsequent papers, "has excited a skilful farmer to communicate his experiments on this subject. The reader will perceive, by the following extract of his letter, which we are impatient to publish to the world, the obligations that are due to him from all those who cultivate hops, and the credit he deserves in what he relates.

"I was informed some years ago, that hogs-dung might be employed to great advantage in hop-gardens: nevertheless, as I could not conceive the reason of the advantage which the hops derived from that sort of dung, I gave myself no trouble about using it preferably to any other; but having this last year lost almost all my hops by the mildew, and having observed but one single place where the fruit remained entire, and in a perfect state, I found, upon diligent enquiry, that my servants had laid hogs-dung upon that very spot, precisely where the mildew had not injured the fruit. I am therefore convinced of the good effects of this dung in hop-gardens, and the more so, as I am certain that my land was prepared with dung of all sorts. The farmer will therefore find his account in using for his hop-grounds all his hogs-dung (which, it is likewise to be considered, is in general thought to be the least serviceable to lands) and in covering his hop trenches, both in autumn and spring, with the same kind of dung new, before it is rotten."

The latter part of this letter is calculated for such general utility, that we cannot refrain from adding it here, though at the hazard of digression from the present subject. The directions given in it are indeed uncommon; but we can hardly suppose, that the writer of it would instance facts, without having a foundation for so doing.

"When hops are scarce, their leaves and sprigs ought to be gathered for several useful purposes; but they must be gathered with great care: no leaves should be taken, but such as are clean, young, whole, and green; and only the tips of the sprigs that are green, young, and full of juice. They must be dried in a very clean and airy place.

"These may be used in brewing, for an after-beer, or for common small beer; for by throwing in the leaves and sprigs of hops, that beer acquires an additional strength, becomes the more wholesome, and will keep the longer.

"The leaves and sprigs of hops are, during the excessive colds of winter, an excellent cordial to cattle, whom they strengthen most prodigiously. The method of using them, is to infuse them in boiling water, and to mix this infusion with the ordinary drink of the cattle.

"Cattle may be still more strengthened, by mixing with their drink the tops of pines or firs: and to render these the more efficacious, it is proper to boil them in a kettle, that all the resinous substances may dissolve, and to pour the extract into their drink. Some of my cows, then kept on a little farm, which is surrounded with mountains, were so affected by a prodigious cold, that the very marrow was almost frozen in their bones: they lay helpless upon the ground, and though the best of fodder was given them, could not use their limbs or rise up. I can ascribe to no other cause, than the remedy which I have just now pointed out, the surprising cure of these animals. In one month's time, they were so well recovered, that they rose without any assistance, and ever since they have resisted the most violent cold, without being in the least affected. The singularity of this event determined me to impart it to you, in order that every body may, upon the like occasion, have recourse to the same remedy."

As to the fire blast, as it is commonly called, we shall only add here, what Dr. Hales had related, that in the month of July, which is the season when this blight is most apt to

affect hops, he had seen the vines in the middle of the hop-ground scorched up almost from one end of a large plantation to another, when a hot gleam of sun-shine came immediately after a shower of rain; and that, at such times, vapours may be observed, with the naked eye, to ascend so plentifully, as to make an object, which was before clear and distinct, become immediately very dim and tremulous. It was therefore probably owing to the much greater quantity of vapours in the middle of the hop garden, than there was towards its skirts; and that middle being the densest medium, the rays of the sun may have been collected nearer to a point, by passing through that denser medium, than they were in the outer parts of the ground. The course of the scorch was at right angles to the beams of the sun about eleven o'clock, at which time the hot gleam happened. The hop ground was situated in a valley, running from south-west to north-east; there was very little wind, and that in the course of the scorch.

HOPPER, a kind of basket, in which the seed-corn is carried at the time of sowing. See the article DRILL-
PLOUGH.

HORN-BEAM, the name of a tree very common in many parts of England, and in some places cultivated for its wood, which is very hard and serviceable for many purposes, especially turnery-ware, mill-cogs, &c.

Horn's universal Five-furrow sowing Machine.

Mr. Young, in his *Annals of Agriculture*, vol. xii. says that "this most useful and celebrated invention, justly claims the attention of every occupier of land in the kingdom. The profits derived from the use of it, over and above what can be produced by the usual methods, will alone, in general, amount to more than the whole rent of the land, without any additional expence in the culture.

"It sows all sorts of grain and seed with equal regularity and ease; and the quantity of seed sown, can be varied readily, and in any degree. The machine also possesses the peculiar advantage of sowing turnips, so as to ensure the crop against the ravages of the fly, which is of great importance to many, and will, independent of every other advantage, make the machine a real treasure to most farmers, and give it a decided superiority over every invention yet offered to the public. This advantage is obtained by sowing the usual quantity of turnip-seed, broad-cast, by the machine, and at the same time striking furrows at a proper distance apart in the land; by this means part of the seed is deposited in the drills, and the rest sown broad-cast between them, so that if it proves a dry season, it is favourable for that deposited in the drills; if a wet season, for that which is sown broad-cast between them: and if that part of the seed which is sown broad-cast is carried away by the fly, that which is deposited in the drills, by coming at another period of time, is saved, and *vice versa*. If the whole grows, the farmer has then the opportunity of selecting the most vigorous plants from both."

HORSE, a well known quadruped, and one of the noblest animals we are acquainted with.

The most noble conquest ever obtained by man, was over this proud and spirited animal, which shares with him the fatigues of war, and the glories of battle. The horse, not less intrepid than his master, sees danger, and defies it; he inures himself to the din of arms; he delights in it, seeks it, and is animated with an ardour equal to that of man. He also shares with his master in the pleasures of the chace, the course, and tournaments; but his docility being equal to his courage, he is not carried away by impetuosity; but checks its impulses, and not only submits to the hand of the rider, but seems even willing to consult his desires. Ever obedient to the impressions he receives, he darts forward, slackens his pace or stops, as they happen to indicate: he renounces his very being, and exists merely by the will of another which he frequently anticipates, and by the celerity and precision of his motions, at once expresses and executes. He feels as much as is desired, and performs no more than the rider pleases; he gives himself up without reserve, and declines no service; exerts all his strength, and, that his obedience may be complete, will strain every nerve till he even expires under his generous efforts.

Such is the horse, whose talents are improved, and his natural qualities perfected by art: from his birth he is carefully attended, exercised, and fitted for the service of man: his education commences with the loss of his liberty, and is completed by restraint. The servitude of these animals is

to universal and perpetual, that we seldom see them in their natural state. When employed, they are loaded with harness; in the seasons of rest, they are not entirely free from shackles, and even in the fields and pastures, they carry the badges of slavery, and frequently bear the cruel marks of labour and pain. Their mouths disfigured with furrows, occasioned by the bit; their sides deformed with ulcers or cicatrices from the spur; their hoofs perforated with nails, and their attitudes, by the continued pressures of the harness, cramped and constrained; even those, whose servitude is of the easiest kind, being kept chiefly for shew and magnificence, and whose gilded chains are not so much intended for an ornament to them, as to display the opulence of their master, are still more disgraced by the elegance of their foretop, the plaiting of their manes, the gold and silken caparisons with which they are adorned, than by the iron fastened to their feet.

Nature is more elegant than art; and in an animated being, the freedom of motion constitutes the beauty of nature. Observe those horses in the American dominions of Spain, where they enjoy all the sweets of liberty; how elegant in their attitudes, their running and leaping! Free from all restraint and stiffness, they are proud of their independence; they fly from man, and disdain his care; they seek and find themselves proper food; range and frisk at liberty, in immense pastures, cropping the fresh product of a perpetual spring. No settled abode, no other shelter than the canopy of a serene sky, they breathe a purer air than in those vaulted palaces where we confine them in narrow spaces. Accordingly these wild horses excel most of their species in strength, fleetness, and vigour. In them spirit and dignity are the gifts of nature; the other possess only the gifts of art, viz. skill and gracefulness.

The nature of these animals is not ferocious, they are only wild and spirited. Though superior in strength, they never molest other animals; and if molested themselves, they despise to dispute, or trample upon the aggressor. They are attached to each other, and herd together; not through fear, but from a natural love of society. Grass and vegetables being all they desire, a sufficiency of food is never wanting; and not being carnivorous, they have no wars either with other animals or among themselves. They never dispute about subsistence, never contend with one another for prey or booty, the usual causes of quarrels and battles among carnivorous animals. Thus they live in peace; every individual has enough, and their appetites being simple and moderate, they never envy each other.

All these particulars may be observed in young horses brought up together; their dispositions are mild and gentle, the social qualities are seen in them, and their strength and mettle are conspicuous only in acts of emulation. They strive to excel in speed, and to accustom themselves to danger: they defy each other to cross a river, or leap a ditch; and those which, in these natural exercises, set the example, those which voluntarily lead the way, are always the best, the most generous, and often, when tamed, the most docile and tractable.

Some ancient authors mention wild horses, and even the places where they were found. Herodotus observes, that on the banks of the Hypanis in Scythia, were wild white horses; and he describes others in the northern parts of Thrace, beyond the Danube, clothed with hair five inches in length. Aristotle mentions Syria; Pliny, the northern countries; Strabo, the Alps and Spain, as countries that produced wild horses. Among the moderns, Cardan says the same of Scotland and the Orkneys; Olaus of Muscovy; Dapper of the isle of Cyprus, adding, that, its wild horses were remarkable for their beauty, swiftness, and strength; Struys of the isle of May, where there is a breed of wild horses extremely small. Leo Africanus relates that wild horses were found in the deserts of Africa and Arabia; and affirms, that he himself saw in the wastes of Numidia, a white colt with a frizzled mane. Marmol confirms this account, and observes that in the deserts of Arabia and Lybia, these animals are small, of an ash colour, and some of them white, with short bristled manes; and that neither dogs nor tame horses can equal them in fleetness. The Lettres Edifiantes mention very small wild horses in China.

All parts of Europe being at present inhabited, and almost equally peopled, wild horses are no longer to be found in it; and those in America came originally from tame horses bred in Europe, and carried over thither by the Spaniards, where they have since multiplied in the vast tracts of that uninhabited country; for this species of animals were wanting in the new world. The amazement and terror of the inhabitants

of Mexico and Peru, at the sight of the horses and the cavalry, sufficiently intimated to the Spaniards that the horse was unknown in these climates, which induced them to transport great numbers both for military service, private convenience, and the propagation of the species. Some they turned loose in different islands, and even on the continent, where they multiplied like other wild animals. Monsieur de la Salle, in the year 1685, saw some of these horses near the bay of St. Louis, in North America; but so wild that he could not come near them. The author of the Adventures of the Buccaneers says, "that in the island of St. Domingo, troops of above five hundred horses are often seen; that at the sight of a man they make a general halt; while one of them approaching within a certain distance, snorts, flies away, and all the rest follow him." He adds, that whether these horses have degenerated during their being wild, he cannot pretend to say; but he did not think them so handsome as those of Spain, though undoubtedly of that breed. "Their head and legs, he describes, as very large, the latter full of knots; their ears and neck long. The inhabitants easily tame them for their several employments, and the hunters load them with their hides. They are taken in toils, laid in places where they frequent, are easily entangled, and if by the neck, strangle themselves, unless some person happens to be ready to assist them. They are fastened round the body and legs to trees, and there left two days without either meat or drink. This renders them tame, and in time they become as tractable as if they had never been wild: and if they should by accident recover their liberty, they never regain their former wildness, but know their masters, and quietly suffer themselves to be retaken."

This demonstrates, that these animals, naturally mild, are very much inclined to become familiar with man, and attach themselves to him. Accordingly, none of them are ever seen to leave our dwellings for the forests and deserts; but, on the contrary, express the greatest desire of returning to their stables; though all they meet with there is a gross food, always the same, and generally measured out rather by parsimony than their craving appetites; but the kind treatment they meet with compensates for their other losses. When spent with fatigue, the place of rest is a place of delight: they smell it from afar; they find it out in the midst of the most crowded cities, and seem in every thing to prefer servitude to freedom. The habits they have contracted become a kind of second nature; horses left in the woods have been known to keep a continual neighing, in order to be heard; and at the voice of a man, have ran to him with transport: and amidst a rich variety of agreeable nourishment, while deprived of human society, they have been known to lose their flesh, and to become strangely emaciated in a very short time.

Thus education gives the whole turn to their manners; and this education requires an assiduity, care, and attention, that man will not bestow on any other creature; but the continued services of the horse makes him ample amends.

The finest horses known in Europe are the Arabian: they are larger and fuller than the Barbs, and not inferior to them in shape. But as few of them are imported into France, the riding masters have not made any circumstantial observations on their perfections and defects. The Barbs are more common, their chest is long and slender, rises beautifully from the withers, have little manes, the head well-shaped, small, and lean; the ears handsome and well-placed; the shoulders flat and slender; the withers narrow and plump; the back straight and short; the flank and sides round, and not belying out; the haunches firm, and well-shaped; the croup or breech generally somewhat long, and the tail pretty high placed; the thigh well-shaped, and seldom flat; the legs handsome, well-shaped, and without hair at the pastern joint; the foot well made; but the pastern often long. They are of all colours, but generally brown. The Barbs are something negligent in their goings; but, properly encouraged, shew an amazing swiftness and vigour; they are very light, and fit for running; and seem, of all others, the fittest to breed from. It were however to be wished that they were of a taller size, the very largest being only fourteen hands; and one of fourteen hands and an inch is very extraordinary. Experience has shewn that in France, England, &c. they get colts larger than themselves. Among the Barbs, those of the kingdom of Morocco are accounted the best, except the mountain Barbs. Those of the rest of Mauritania are inferior to them, as are also those of Turkey, Persia, and Armenia.

All horses from a hot climate have a smoother coat than others. The Turkish horses are not so well proportioned as the Barbs; the neck slim, a long body, and the feet too slender; but are very laborious and long winded. Nor will this appear strange, if it be considered, that in hot countries the bones of animals are harder than in the cold; and for this reason it is, that though their shank bones are smaller than the horses of this country, yet their legs are stronger.

The Spanish horses, which are placed next to the Barb in rank, have a long thick neck, with a large mane; the head full large, and sometimes the fore top large; the ears long, but well placed; the eyes full of fire, and the air noble and spirited; the shoulders thick, and the chest broad; the back often something low; the ribs round, but the belly often too large; the croup generally round and large, though in some longish; the legs beautiful and without hair; the finew well detached; the pastern sometimes longish like the Barbs; the foot a little lengthened like that of a mule; and the heel often too high. The fine bred Spanish horses are plump, well-set, and place the legs well on the ground; they have also a great deal of motion in their paces; great agility, fire, and stateliness. Their coat is generally black, or a light chestnut; though there are some of all the usual colours. But this is very seldom that any are seen with white legs or muzzles; the Spaniards having such a dislike to these marks, that they never breed from horses which have them. A star in the forehead is all they require; but they value horses of one entire dark colour as much as we despise them: both these prejudices, though opposite, are perhaps equally ill-founded, there being very good horses with all kinds of marks; and some excellent among those which are all of one colour. This minute difference in the coat does not proceed from the nature or constitution of the horse; but from an external, and at the same time so superficial a quality, that a slight wound in the skin is sufficient to produce a white spot: further, the Spanish horses, whether intirely of one colour, or not, are all marked on the off thigh with the mark of the stud where they were bred. They are not usually large sized; though some rise to fourteen hands and one or two inches. Those of Upper Andalusia are esteemed the best of all, though they are apt to have the head too long; but this blemish is overlooked in consideration of their excellent qualities; as courage, gracefulness, obedience, ambition; and in activity, they even exceed the Barbs. These advantages recommend them above all other horses in the world, whether for war, state, or the manege.

The finest English horses greatly resemble the Arabians and Barbs in shape; indeed they owe their origin to them; but the head is much larger, though well made, and has a fine fore-top; the ears longer, but properly placed. By the ears alone an English horse may be distinguished from the Barb: but the greater difference is in the size; the English horses are much larger and well-set. Their common height is fourteen hands two inches, and even fifteen hands is not very extraordinary. They are of all colours, and all marks; are generally strong, mettlesome, bold, bearing great fatigue, excellent for hunting and racing, but want air and agility; they are stiff, and have little freedom in their shoulders.

The Italian horses were formerly much finer than at present, the studs having been neglected there for some time past: the kingdom of Naples, however, still affords fine horses, especially for carriages; but they have, in general, large heads and thick necks: they are also untractable, consequently are difficult to be trained. These defects are, however, in some measure compensated by the largeness of their size, their spirit, and the beauty of their motions. They are excellent for parade, and very much affected stateliness.

The Danish horses are of such a large size, and so well set, that they were preferred to all others for coach horses: some are perfectly well-moulded, though in general their formation is not very regular; most of them having a thick neck, broad shoulders, the back a little too long and low; and the croup too contracted for the breadth of the chest; but they all move well, and are in general excellent for war and state. They are of all colours, even the most uncommon; the pyed and spotted being seldom seen but in Danish horses.

Germany affords some fine horses, but the generality are heavy and thick winded; though most of them come from Turkish and Barbary horses, of which there are many

studs; as also of Spanish and Indian horses: thus they make no figure in hunting and racing; whereas the horses of Hungary, Transylvania, &c. are very light and fleet: the Hussars and Hungarians slit their nostrils, with a view, it is said, to mend their wind, and, at the same time, to prevent their neighing in the field; it being affirmed that horses, whose nostrils have been slit, cannot neigh. It has not indeed been in my power to examine this particular; but it seems natural to think, that the operation can only weaken their neighing. The Hungarian, Croatian, and Polish horses are noted for having what is called the mark in all their fore teeth, which continues to old age.

The Dutch horses are very good for coaches, and are most commonly used in France. The best come from Friezland. The countries of Bergue and Juliers also breed very good ones. The Flemish horses are far inferior to those of Holland; they have generally large heads, broad feet, and their legs subject to dropical swellings. The two latter are capital faults in coach horses.

France produces horses of all kinds, but not many which may be called fine. The best saddle horses come from the Limosin, being something like the Barb, and excellent hunters, but of a slow growth. They must not be broke young, nor put to any service till they are eight years old. Auvergne, Poitou, and the territory of Morvant, in Burgundy, also produce very good ponies. But Normandy, next to Limosin, affords the finest horses; and if not such excellent hunters, they are preferable to the rest for war, are better set, and sooner trained. Lower Normandy and Cotentin, are famous for very fine coach horses: they are lighter, and more sprightly than the Dutch horses: Franche Comté and the Boulonnois furnish very good draught horses; but a general fault in the French horses, is the width of their shoulders; whereas those of the Barbs are too much contracted. *Buffon.*

Mr. Marshall, in his Rural Economy of Yorkshire, says, that "Yorkshire has long been celebrated for its horses. Fitzherbert, who wrote two hundred and fifty years ago, mentions his going to Rippon fair to buy colts.

"The influence of climature on the constitution, or changeable part of the nature of animals, is a matter difficult to be demonstrated. There are men who deny it. Nevertheless, strong evidences of its existence may be from the animal under consideration.

"No man has yet been able to breed Arabian horses in England; English horses in France or Germany; nor Yorkshire horses in any other district of England. Some good horses, no doubt, are bred every year in different parts of the kingdom; but they are few in proportion to the number of bad ones bred in those parts.

"In Norfolk, the breeding of saddle-horses has been repeatedly attempted without success. Yorkshire stallions have been, and still are sent into Norfolk in the covering-season. The foals may be handsome, but they lose their form as they grow up.

"On the contrary, in Yorkshire, let the foal when dropt be ever so unpromising, it will, if any true blood circulate in its veins, acquire fashion, strength, and activity, with its growth.

"This in my mind accounts fully for the superiority of Yorkshire-bred horses; and is a strong evidence that air, water, soil, or herbage, has an influence on the constitution or changeable nature of animals.

"The district more immediately under survey, may, perhaps, be considered as the first in the county for the breeding of horses. Nevertheless, it cannot even here be called an universal practice. Men are led into it by accident or caprice.

"It would be difficult to ascertain the exact number annually bred. The Vale, the Wolds, and Holderness, probably employ a hundred stallions. One hundred mares are considered as the full complement for one horse. Some of them, perhaps, do not get fifty. On this calculation, there are from five to ten thousand horses bred between the Eastern Morelands and the Humber.

"This calculation, however, is grounded on little more than supposition. It would be difficult to ascertain the exact number of stallions kept in so wide a district.

"It will now be necessary to consider separately, the breed; the method of breeding; and the management of worked horses in this district.

"Thirty years ago, strong saddle-horses, fit for the road only, were the principal breed of the Vale.

"During the last twenty years, some capital hunters have

have been bred in it. This change was principally effected by one horse, Jalap; a full-bred horse; whose pedigree and performances are well known upon the turf.

"He died in 1787; and, what is remarkable, at the age of thirty, covered several mares. His leap five guineas each, for blood mares; two guineas for "Chapmen's," mares."

"But notwithstanding the credit which the Vale has justly acquired of late by its hunters, the breed is at present changing to fashionable coach-horses; namely, tall, strong, over-sized hunters. The breed, therefore, may be said to have increased in size, rather than to have undergone a change. In 1783, the stallion-shows exhibited beautiful groups of animals, nimble as the greyhound, and spirited as the lion.

"There may be several reasons for the alteration which is taking place in the breed of horses in the Vale. The Jalapian breed has degenerated; very few of the sons of this celebrated horse have been good stock-getters. Another reason, and perhaps a better, is the unfitness of high-bred hunters for beasts of burden and draught. Not only brood mares, but growing horses, are used in husbandry. The operation of plowing with two horses requires strength. Slender horses are unfit for it; but a three or four year old coach-horse may be occasionally used; and, in cases of deformity or lameness, may be continued as a farm-horse. If to this be added, the extravagant prices which this description of coach-horses have recently borne, the Vale farmers may be right in propagating the breed.

"Be this as it may, they are most assuredly wrong, when they give encouragement to the Fen Breed, the "Howden mack" of black cart-horses, which I am sorry to see worming their way into the Vale. The breed of grey rats, with which this island has of late years been overrun, are not a greater pest than the breed of black fen horses: at least while cattle remain scarce, as they are at present; and while the flesh of horses remains to be rejected as an article of human food.

"Let the Vale-farmers continue to plow with coach-horses, and use oxen in carriage: a breed of horses better calculated for eating than working, and whose main tendency is to render their drivers as sluggish as themselves, are ill-adapted to the present rents of the Vale. Norfolk has already experienced the evil consequences of encouraging that breed; and I hope this country will not suffer by the same indiscretion. It is laughable enough to see a slender half-bred mare, who perhaps a few years ago, received the embraces of Jalap or his offspring, bending under the weight of a cumbersome animal, whose very legs, in all their admired roughness, are nearly equal in size to the body of her former gallant. No wonder that monsters, having not their likeness, in nature, should be the produce of such unnatural amours.

"From what has been said respecting the superiority of Yorkshire horses, it will no doubt, be expected that great attention is paid to breeding; and that the mysteries of it will be disclosed; while, perhaps, others have conceived that their superiority is more owing to the art of breeding than to the geniality of climate. I should be sorry if truth oblige me to discover the misjudgment of my readers; and feel myself awkwardly circumstanced in being under the necessity of disclosing the misconduct of my countrymen.

"In different parts of the kingdom the breeding of race-horses is reduced almost to science. In the Midland counties, the breeding of cart-horses is attended to with the same assiduity as that which has of late years been bestowed on cattle and sheep; while the breeding of saddle-horses, hunters, and coach-horses, is almost entirely neglected; is left almost wholly to chance: even in Yorkshire! I mean as to females. A breeder, here, would not give five guineas for the best brood mare in the kingdom; unless she could draw, or carry him occasionally to market; nor a guinea extraordinary for one which would do both. He would sooner breed from a rip which he happens to have upon his premises; though not worth a month's keep.

"But how absurd. The price of the leap, the keep of the mare, and the care and keep of her progeny, from the time they drop to the time of sale, is the same, whether they be sold from ten to fifteen, or from forty to fifty pounds each.

"Almost every thing depends upon the mare. There is an instance, in this neighbourhood, of the offspring of one mare being sold to dealers for four or five hundred

pounds. What are a few guineas in the first purchase of a good mare? and what are a few days plowing, or a few rides to market, compared with the difference between a race of good and of ordinary horses?

"It appears to me evidently, that much remains to be done in this department of Rural Economics. Good stallions may be had for money; and different hunts in the south of England will, so long as they remain, be a source of mares most suitable to the purpose of breeding capital hunters. Mares lamed or stiffened by severe exercise, and improper treatment, are generally to be bought in the neighbourhood of these hunts, at moderate prices. And mares fit for the breeding of coach-horses are to be met with in every county?"

"The present prices given for hunters and coach-horses, and more especially the declension of the breeding of the former, are incitements sufficient to induce men of spirit to make an attempt. Nothing appears to me to be wanting, but a Bakewell to take the lead.

"While the nation remains in its present state of refinement, horses for the road and the field are in a degree necessary; but racers and cart-horses might, with less inconvenience, be dispensed with.

"The king's plates have probably had their use in improving the English horse in activity and fleetness. But the original intention of them has long ago been answered: race-horses are now fit for the purpose of gamesters only. They are in general drawn much too fine for use. Therefore to continue these prizes will be distributing the nation's money toward the worst of purposes: the encouragement of gaming; and the injury of the breed of English horses. The broad-loined, deep-chested, old English hunter is giving place to the lank feeble racer. If it should be still thought proper to continue the king's plates, it would certainly be wise to raise the limited weight to twelve stone.

"With respect to cart-horses, if extending the saddle-horse tax to farm-horses in general would lessen their number, and increase that of working oxen, it would be political to extend it without loss of time.

"Under the present head it may be proper to register an idea which I have met with in this country; and which, evident as it may seem, never occurred to me before, either in theory or practice.

"It is a fact, well-established in the common practice of this district, that spayed heifers work better, and have in general more wind, than oxen; and it is not doubted that spayed mares would have an equal preference to geldings.

"I do not, however, find that the experiment has ever been tried. The reason held out against it, though formidable at first sight, proves a mere shadow on examination. The spaying of fillies would undoubtedly spoil them for brood-mares. But does not the gelding of a colt spoil him for a stallion? What breeder, when his mares foal, wishes for fillies? and what dealer would not willingly give half-a-crown a piece to have his mares changed into geldings? or perhaps into animals superior to geldings?

"In the spring of the year open mares are faint and troublesome. Nothing seems to be wanted but a safe cutter and a man of spirit to set him to work, to bring the spaying of female foals into common practice.

"It does not follow that, because a part of the female foals should be cut, there would not be open mares to breed from, any more than it does, that because some heifers are spayed for the yoke, or for fattening, there are not cows enough sufficient for the purposes of breeding and the dairy.

"I do not mean to recommend a practice of which I have had no experience; but if the experiment has not been tried, it strikes me forcibly that it is worth the trial; and that it is more than time it were set about.

"In a district where the working of oxen has been for many ages the established practice, it cannot be expected that any very accurate management of draught-horses can have taken place. But in a country which has always been considered as the source of good hunters, and the school of good horsemanship, it may be reasonably supposed that a superiority of management prevails.

"This, however, is not, from what I have seen, the case. The only striking feature of management which has caught my notice is, that of turning hunters and other hard-ridden horses out into the field in the day-time in winter; cold or warm, and sometimes wet or dry: a practice which has been cried up by many great horsemen, and is to be met with in every part of the kingdom; though no where so prevalently, perhaps, as in this country.

"It

"It has always struck me as a bad practice. Nevertheless, in compliance with the custom of the place I was in, I let a mare, which I rode into the country in 1782, run out to graze on leisure-days, and lie in the house at nights. The consequence was unfavourable, and sufficiently striking to induce me to minute the circumstances at the close of the occurrence.

"As the subject appears to be of considerable importance, I will here copy the minute.

"1783, *March 11*. There are perhaps few horses which will bear to be hunted one day and turned out to graze the next. My brother's practice is to let his horses run at graze in the middle of the day throughout winter. In conformity with this plan, mine was turned out in the day-time whenever I did not want to use her. On my arrival here in November last, though I had rode her a journey of two hundred miles, she was as fat as a mole, and her carcase round as a barrel. In the early part of winter I rode her a good deal, and shewed her the hounds generally once a week. With this exercise I was not surprised at her shrinking. But having more lately given her ease in order that she might recover her flesh and spirits, without finding any alteration, I had good reason to think that it was not altogether the work, but the treatment, which kept her down; for with all the indulgence I could give her, her sides, ten days ago, were clapped together, and her hide stuck as close to her ribs as if it had been glued to them. Her appetite for dry meat at least was gone. She would let her corn lie in the manger untouched; though for the time I have had her—six years—she has always been a remarkable good feeder. I had some blood taken from her, but she still remained the same. Suspecting that hanging after the graze was the only cause of her ill-thriving, she has for the last ten days been kept entirely in the house. Her skin is already loose and silky, and she calls for corn every time the stable-door is opened. The other day she wanted spurs; now she is all spirits again.—Turned out a mare, which he had hunted the day before, to graze, on a cold day. She got a violent cold; was seized of her limbs; and it has been with great difficulty he has saved her.—Began to turn out a valuable mare which he hunted occasionally; but finding that she refused her dry meat, he discontinued it; and now finds that she has taken to her hay and corn again. My brother's horse, used to it as he has been from his infancy, and pampered as he constantly is, looks more like a common hack than a hunter.

"There are two reasons why a horse which is subjected to violent exercise should not be exposed at graze, in severe weather. It takes them off their dry meat: and horses which sweat much are in the nature of things more chilly, suffer more from pinching cold, and are more liable to be seized by acute disorders, than horses which have more moderate exercise, and whose frames are less relaxed. A horse which has been enured to those transitions of heat and cold will, no doubt, bear them better than one which has always been used to a warm stable; and which certainly ought not to be exposed to such dangerous treatment without the greatest precaution.

"I am nevertheless of opinion, that letting a horse run out in winter keeps his legs cleaner and more supple than standing always in the stable. My mare was not fresher on her legs at four years old than she has been this winter. And if hunters could be turned out on leisure-days, when the weather is tolerably fine, into a spacious place to hay and corn, without graze, I am of opinion it would be of great service to them. Horses which are unavoidably exposed to transitions from heat to cold, as hunters frequently are, in sauntering by the side of a cover after a hard run, ought, indisputably, to stand in a cool stable, and to be exposed to the open air on leisure-days, so far as the state of perfect health and vigour will permit: but no farther."

"I make no comment on the foregoing facts and reflexions. I insert them as a caution to the inexperienced: and as hints to those who wish to hit the happy medium of treatment.

"I met with an idea in this district respecting the first turning out of a horse entirely to graze, which deserves to be generally known. When a horse is thrown up, or turned out at nights to graze, in the spring of the year, it is common to choose the forenoon of a fine day to do it in. The natural consequence is the horse fills his belly during the sun shine, and lays him down to rest in the cold of the night; thereby probably exposing himself to disorders.

A much better practice prevails here. The horse, instead of being turned out in the morning, is turned out at bed-time. The consequence is, he eats all night, and sleeps in the sunshine of the next day.

"It is generally understood here, that horses at graze do not require water. They are frequently kept for months together in dry upland pastures without water, and without any apparent inconvenience."

Though the most experienced horsemen are not always agreed in some points relating to shape, make, and goings of a horse, yet they almost always accord in this, that there ought to be a just proportion in all his parts. That even when he is taken to pieces, and examined singly in his particular members, though some defects may appear, yet when they all bear a just correspondence one to another, and concur in such a manner as to render his action easy, just, and regular, such a horse cannot be greatly disagreeable, but will, for the most part, move well, and with a tolerable good grace. On the other hand, suppose a horse has some parts exquisitely fine, and others indifferent, which frequently happens, it will mar his beauty, and cause him to look disagreeable, and for the most part affect his gait and action.

In order to have a horse beautiful and fine made, it has been agreed, on all hands, that his head should not be long, nor too large, rather lean than fleshy; his ears thin and narrow, and of a becoming length, well set on, pointing inwards; his brow or forehead not too broad and flat; his nose somewhat rising, and of a good turn; his nostrils wide and thin; his muzzle small; his mouth neither deep nor too shallow, with a star or snip down his forehead or blaze, which is no way unbecoming, unless it be too large and disproportioned.

Horses that are thus marked have generally one or more of their feet white, which is also very beautiful, and looks lively. His jaws should be thin and sufficiently wide, not approaching too near together, nor too high upwards towards the onset, that he may have sufficient room to carry his head easy, and in good place. His eyes well formed, sprightly, and of a middle size. His neck should be arched towards the middle, arising by a beautiful gradation out of his breast and shoulders, the muscles thereof distinct, but no where overcharged with flesh, growing smaller and thinner, as approaches towards his head. His shoulders should be thin from the withers, with a gradual enlargement downwards, that his bosom or breast be not too narrow nor too gross. His fore-legs straight and well placed; his joints lean and bony; his knees not bending, and his pasterns not too long; his feet round and smooth, and his sinews firm and well braced; his carcase rather round than flat; his back not too low, and for strength and durability pretty even and straight. His ribs rather home than open, as they approach towards his haunches; his buttocks round, and the muscles not too fleshy but distinct; his hocks or gambrels neither standing too wide, nor too near together; his hocks should be lean and no ways puffed or fleshy; his pasterns short, his legs flat and thin, and his tail set in a good place, rather high than low, rising upon every motion of his body. The more these properties concur in any horse, the more beautiful he must be, especially when they correspond and agree in due proportion, one to another; and the more a horse is wanting in these, the more plain and ordinary he will appear. See *CART-HORSE, and DRAUGHT-HORSE*.

HORSE-HOE, see the article CULTIVATOR and HOR.

HORSE-HOEING, the operation of cultivating plants according to the principles of the New Husbandry; viz. by hoeing the intervals or alleys between the rows of corn, and by that means supplying the plants with fresh nourishment.

"I have tried, says M. de Valliers, to hoe my alleys after M. de Chateaufieux's method, which I look upon as the best and most expeditious; notwithstanding that several difficulties which I have met with in the practice of it, have obliged me to give it up. For example, the great furrow in the middle of the alleys is, according to his directions, to be filled up by two turns of the plough, one on the right-hand, and the other on the left, after which it is to be opened again by one turn of the cultivator with two mould-boards, or two or three turns of the common plough.

"When I set about this work, the first turn of the plough, if the share went to any depth worth speaking of, always filled up the furrow in such manner, that to prevent it,

its being poached by the horses, I tried to make them walk on one side, upon the upper-ground, and consequently very near to the rows of corn: but then, in the first place, I could not avoid the destruction of a great number of plants, without giving such attention as was not only excessively troublesome, but almost impracticable: and secondly, I could plough only on the surface; because, as the furrow was filled, the plough could turn up but very little earth, without being choaked, and becoming extremely heavy.

"If, to save the plants, I made the horses tread partly upon the mould turned over into the furrow, the plough choaked equally, and for the same reason, whenever the furrow was cut deep. All I could do in this case, was to give only a superficial ploughing: and with that it was impossible to use the cultivator with two mould-boards, to form the furrow, because that instrument cannot work in any but a loose well-tilled ground.

"All these inconveniences may not happen in a soil different from mine. I am the more inclined to think this, as M. de Chateauxvieux certainly does not experience them: but at the same time I must likewise observe, that this justly celebrated gentleman has instruments so perfect, and directs his servants with such superior judgment, that few can expect easily to equal him in the practice of the New Husbandry.

"Not being able, for the above reasons, to do with one turn of the cultivator with two mould-boards, what, as M. de Chateauxvieux himself observes, can frequently not be done with less than three or four turns of the common plough, which, added to the two turns that are given to fill up the furrow, make in all five or six bouts; I pursued, and with great advantage, nearly the method before described. I say nearly that method, because I have made some few alterations, by which I think it is rendered both easier and better.

"1. I make the mould-board twelve or thirteen inches deep, instead of nine or ten that it was before. The furrows are by this means made wider, and the plough is more easily drawn, because it finds more room to discharge its load of earth in, and suffers less pressure.

"2. To give the second hoeing with the plough, instead of continuing to turn the earth over towards that side of the alley where only one furrow was turned up at the ending of the first ploughing, I, on the contrary begin this second at that furrow, approaching, if possible, to within two or three inches of the row of corn, and then I make a furrow in the contrary direction, which turns the earth up against that row.

"My reason for ploughing so near the rows, when I gave this second hoeing, is that I have observed that the rains which fall pretty frequently in the spring, between the first ploughing and the second, harden the earth greatly, and that drought afterwards hardens it still more, so that the roots of plants can no longer pierce or spread in it with ease; and yet nothing is more necessary, in order to their being benefited by every culture of the earth, than that they should find an easy passage into the mould, which lies next to the rows. It is therefore highly proper to stir that mould, when the second hoeing with the plough is given, which, with me, is when the corn has begun to spindle; that being the time when the plants shoot with the greatest vigour, and when their roots ought consequently to begin to extend to some distance.

"I have not perceived that the plants have been at all damaged by the plough's coming so near them. They ought to be so much the less hurt thereby, as the rows are placed over a furrow which has been cut deep; a situation which, alone, is capable of making the corn tiller, and push strongly: though the assistance of culture is likewise necessary, to supply the stalks and ears with plentiful nourishment.

"I am the better pleased with this method of bringing the hoe-plough almost close to the rows, as it facilitates a very important operation strongly recommended by M. Duhamel, and which I never before thought practicable: I mean, the raising up of the earth about the bottom of the plants; as well to give them greater nourishment, as to prevent their being lodged. The following is my method on this occasion.

"When I fill up the furrow which I have cut as close as possible to the row, I hold the plough sloping, in such manner that the earth is forced away from it, and is raised up about the plants. If this slope is not sufficient, which

may sometimes depend on the condition of the ground, or the dexterity of the ploughman, I, in that case, make the mould-board two or three inches wider, when I used to fill the furrow, than it was when I made that furrow: and to this end I screw on to the extremity of the mould-board, a thin plate of iron about four or five inches wide. Those who practise the New Husbandry in so extensive a manner as to employ several ploughs, will find no inconvenience in having one, larger than the rest, purposely for this important operation. As I do not give this second hoeing with the plough, till after the corn has begun to spindle, it is easy for me to avoid burying the plants, especially if there are no great clods in the ground: but, at all events I always earth the plants up as much as possible, when there is no other danger than that of burying here and there a few of them, because that accident is easily remedied afterwards, if it be worth while.

"When I am to give the third hoeing with the plough, I consider the condition of the ground. If it is in good tilth, well loosened, and free from weeds, I use only the cultivator: otherwise I use the plough, three or four turns of which are sufficient to perform this operation in the following manner:

"The first cut turns the earth over into the middle furrow: the second and third are on a contrary direction; and the fourth takes up what was loosened by the third, whereby the furrow is replaced in the middle of the alley. Some time after this, and especially if a shower of rain has fallen, I cut that furrow still deeper, by one turn of the single or double cultivator, as M. de Chateauxvieux directs.

"But as, even after all these ploughings, the great furrow may chance to be neither deep enough, nor sufficiently cleared of mould, owing either to the imperfection of the instrument made use of, or to the inaptitude of the ploughman, that defect may easily be remedied after harvest, by giving one ploughing more, which is to be begun by throwing up the earth to the right and left towards the summit of the beds; that is to say, over the stubble. This practice is also confirmed by M. de Chateauxvieux's instructions.

"The one ploughing extraordinary which this operation requires, ought not to be thought much of; because the most important point in the New Husbandry certainly is, the providing of a good depth of well-stirred mould, for the plants to extend their roots in."

The difficulty complained of by this gentleman, and some others abroad, in hoeing their crops, cultivated according to the New Husbandry, was occasioned, by their putting one or two wheels to their hoe-ploughs and cultivators. The hoe-plough should have no wheels; neither should any cultivators be substituted in the room of the hoe-plough. See the article CULTIVATOR.

HOT-BEDS, beds of earth enriched with manure, in order to forward vegetation, when the season or climate is not warm enough for the purpose.

By means of hot-beds, skilfully managed, the seeds of plants, brought from any country between the tropics, may be made to flourish even under the poles.

Heat and humidity being the great instruments of vegetation, to promote the growth of any plants, these must be duly proportioned, so as neither to exceed nor come short of the bounds nature has allotted for it.

The usual way of making hot-beds, is of horse litter and grass mixed together, and left on a heap for eight or ten days to putrify, and then removed into a bed, and covered up with glasses.

For raising cauliflowers, cucumbers, melons, radishes, and other tender plants and flowers in January or February, Mortimer directs to provide a warm place, defended from all the winds, by being inclosed with a pale or hedge of reeds or straw, about six or seven feet high. Within this raise a bed two or three feet high, and three feet over, of fresh horse dung, about seven or eight days old; then tread it down very hard, make it level, and, if you will edge it round with boards or brick, laying fine rich mould about three or four inches thick on it. When you find by your finger, that the extreme heat of the bed is over, plant your seeds at pleasure, and set your forks four or five inches above the bed, to support the frame, and cover with straw or mat, to secure the seeds and plants from cold and wet; only uncover them in a warm day, an hour before noon, and cover them again an hour after. Observe to earth up your plants, as they shoot up, and, when able to bear the cold, transplant them.

In Holland they use hot-beds made of sand; and likewise

wife of tanner's bark, which, when once rightly prepared, will maintain an equable heat for six months.

Bradley proposes very justly a thermometer to be used to regulate the heat of the hot-beds. Thus, a hot-bed for cucumbers must be kept so hot as to raise the spirit in a glass to the same height as the natural temperature of the weather will raise it about the end of May and June, when cucumbers will grow without artificial heat or shelter.

HOVEL, a shed open on the sides, and covered overhead.

HOVEN, a disease common to cattle, on eating too greedily of green clover. It consists in the paunch of the creature being swelled to a very great degree, which often, if not prevented, puts an end to the creature's life. The surest method of curing this terrible disease, is that of making an incision into the paunch of the beast, and by that means the wind, which caused the swelling, will escape through the orifice, and the creature recover.

A correspondent of the editors of the *Museum Rusticum* has given the following account of his performing this operation.

"I took, says he, a sharp-pointed pen-knife, and fixing my eye on the most prominent part of his belly, thrust the blade through the integuments quite into the abdomen: there issued out a great gust of wind very foetid, with some water of a reddish colour; the bullock seemed easier, but far from well; for the wound presently closed up, and admitted no more air to escape; so that I was under the necessity of stabbing him twice more in different parts of the belly before he was thoroughly relieved, which, by the help of a clyster after the last stab, was presently brought about: and here give me leave, gentlemen, before I leave this subject, to give a few cautions to those who may be under the necessity, one time or other, of performing this very useful operation: reflexion and experience warrant me in them; therefore I shall freely proceed.

"First then, if it be performed with a pen-knife, not to be fearful in pushing in the blade a proper length, till you find wind issue out; for if the wind be in the cavity of the belly, you cannot possibly hurt the gut, the whole body of the wind being between you and it, which no reasonable bladed pen-knife can touch; and if the wind should be pent up in the intestine, you must penetrate it before the beast can be relieved. To this last, perhaps, it may be objected, that we run the hazard of killing the beast by wounding the gut; but I am far from thinking so, as I have seen many wounds of the intestine, both in man and beast, very happily cured: yet granting there might be some danger in it, still we are certain, if the poor beast can get no relief, it must die; and so circumstanced, surely, a doubtful remedy is better than none at all.

"Another caution is, that where these wounds are made in the belly with a proper pen-knife, it is not advisable to have them sown up; for where there is a continual motion or action, as there is in the muscles of the belly and parts adjacent, such a practice is not only unwarrantable, but cruel; and why should we not behave with humanity to the brute species, as well as to any other.

"My last caution and advice is that upon all these occasions, when the beast is relieved of his wind, a proper clyster should be thrown up immediately, as hot as he can bear it: these clysters strangely relieve them, by acting as a warm comforting, bath to their distempered bowels, and emptying the same of the load of muck within them."

This account was sent by Mr. John Wynn Baker, near Dublin, to be published in the *Museum Rusticum* in the year 1764. Since that time Mr. Baker has made improvements upon the method of stabbing cattle, hosed, or swelled, by eating clover, or other grass, while it is very succulent; and moist with rain or dew, and which he has fully set forth in his report to the Dublin Society, for the year 1769, from whence the following is extracted.

"Farmers in general, are pretty well informed of the danger, to which horned cattle are liable, from their eating clover, by its hosing them. This unfortunate circumstance may deter many from the using clover, in the manner already mentioned. I am therefore to shew the means of avoiding the danger.

"And therefore, when they begin to use clover, it should be mowed two or three hours before giving it to the cattle. Begin the business in dry weather, and give it them sparingly in the commencement; a few days will ren-

der any further precautions unnecessary; because it may be mown and brought home immediately to fodder with, even when wet: until the second growth begins to be fit for cutting, and then a little caution will be again required, and that more particularly, if the weather be moist; and also when the clover is too short for mowing, it will be proper to be cautious in turning the cattle in to graze for a short time, in the beginning, and when no rain or dew is upon the clover; for it is the youth or softness of the clover, and rain or dew upon it, which are productive of the disease; when cattle, in their first feeding upon it, are allowed to eat too freely of it.—And it is very remarkable, that I tried some of my cattle with mown grass, and mown clover, and they rejected the grass for the clover; because I presume it is sweeter and more juicy; that juiciness is the very thing, as I conceive, which generates the air, to the great annoyance and infinite danger of the beast. These matters being attended to, the necessity of any further care ceases; unless upon a change of pasture, and then to clover again: in that case, I conceive the like precautions should be observed.

"I speak of these precautions from experience; for it may be remembered, that in the year 1764, I lost a bullock by his eating clover. And last summer, I had one bullock much diseased from the same cause; and also another bullock and cow, from their eating young lucerne; all from the carelessness and disobedience of servants; who imagine they know things and consequences better than any other person whatever. However, I happened to be at home upon both these occasions, and had the remedy in my own hand. I stabbed them all three, according to the method related in my report of the year 1764. A method so easy, now so familiar to me, and attended with so much safety, and speedy relief, that if I had five hundred head of cattle diseased in that way, I should not fear losing one by the operation.

"One of the plough bullocks, which I saved by stabbing last summer, was the very fellow that was in the cow's belly, which I saved in the year 1764, when she was diseased in the same manner, as related in my report for that year. And what seems to prove the inoffensiveness of this method of cure, namely stabbing; this bullock was stabbed about seven o'clock at night, and was ploughing all the next day, with as much unconcern, as if he had not been diseased or stabbed at all. And since finishing this report, I have stabbed this bullock twice in a fortnight, this summer, 1770, and we cannot tell the cause of his swelling. He is now very well, and was worked in the plough the day after being stabbed.

"With this knife (Plate XIX. fig. 7.) I stabbed the second bullock, which I had hosed last summer. Half an hour had not elapsed, before the boy who used to drive him in the plough, came running to me with the ploughman's phrase, who was helping to drive the bullock about, crying out, "Sir! Sir! the bullock is bursting!" I ran to him, not being at the time above twelve or twenty perches off, with the knife in my pocket. The man told me the bullock had fallen down, not being any longer able to move. Observing no wind to pass the wound, without hesitation I passed the knife into the same external orifice, and so into the paunch, or great receptacle of the intestines, when the quantity and impetuosity of the air was astonishing.

"The distress of the beast, at this second time of my seeing him, was truly pitiable. His tongue hung out of his mouth; his eyes full, as if they would have started out of his head; his rectum distended externally, at least five inches, and his hollow groans such as would move inhumanity itself.

"This second operation being necessary, requires some further explanation. We have seen, that although the bullock was stabbed, yet that he grew worse, inasmuch that a second operation was necessary. Looking at this consequence superficially, may induce one to imagine, that stabbing will not afford the expected relief. But it will as certainly do it, as wounding a blood vessel will be productive of the emission of blood. But as I conceive here is the cause. When the bullock came to move about, that motion had altered the position of the internal orifice, so that the air could not pass with the same rapidity, with which it rarefied internally, and when the bullock fell, (or laid down, I am rather willing to believe) the internal orifice was still more removed from its opposite position to the external one, and consequently no air could pass the wound: and therefore

therefore the disease must inevitably increase every minute with great rapidity, and thereby also contribute to moving the internal orifice farther from the external one.

"But the moment another puncture was made in the paunch, opposite the external one, we see the air rushed out, the beast got well, and was, I think, ploughing all the next day. Whereas, had not the second wound been given, I am persuaded he would have died in ten or fifteen minutes.

"In performing this operation, there is one circumstance which I must not omit to recommend to the attention of those who may have occasion to practise it: that they are careful not to enter the knife too near the hip-bone; which may be easily done by the deception which the flatulency excites, for the beast, when diseased, is so distended, that the operator may be deceived in the position of the hip-bone, not being so apparent as one would imagine. I therefore recommend the feeling for the short ribs, before the puncture is made; and they being found, pass the knife as near the center as may be, between them and the hip-bone.

"I mention this circumstance thus particularly; because, in stabbing the cow already mentioned, I made the wound too near the hip-bone, which I suppose wounded the vessels, and verge of the muscles adjoining to it; by which means the cow bled, I suppose not less than three or four ounces. Were that all it would be of no moment; but to the improper position of the wound, I attribute in some measure, the festering which ensued: whereas the bullocks did not bleed half a tea-spoonful: their wounds never festered; neither did they require any thing to be done to them, save that of rubbing on a little tar to keep off the flies.

"I was induced to invite the public, to see the remedy which I use, from hearing, that a great number of cattle are lost every year by the disease before us: as I hope thereby to diffuse the knowledge of so simple an operation through the kingdom. I am informed of a man in the county of Dublin, who lost seventeen fine cows in an hour last summer, by this disease; one with another worth seven pounds a cow. A poor woman in my neighbourhood had but two in the world; I am told she lost them both in half an hour, by their slipping into a gentleman's clover; and I hear of several cattle lost this summer.

"The bullock stabbed as above-mentioned (he being a strong beast) gave me a kick, which knocked me down, and rendered me incapable of standing for some time. That other people may not meet with the like accident, I recommend to them, that they stand with their left side close to the left shoulder of the beast to be relieved, laying the left hand upon the back of the animal, and with the right hand perform the operation, in the part, and with the knife disposed as described above. A pen-knife is too small.

"From A (Plate XIX. fig. 7.) to the point, the knife is as sharp as a lancet. From A to B, the flank gradually swells, and does not cut at all, but has a round edge on each side, that it may not cut, in with-drawing the instrument.

"C C, into, or upon the shoulder of the handle, screws an hollow socket or case; that, and the handle both of lignum vitæ. The handle five inches long.

"The blade is also five inches long, and when used, is sent quite home to the hilt."

Mr. Marshall, in his Minutes of Agriculture, recommends salt and water, or strong brine, and exercise of running, of service in relieving cattle that are hoven or sprung as it is sometimes called. He tried the experiment on a cow that had eaten too heartily of cabbages. The dose was three or four handfuls of salt to about three pints of water. This was given three times, to the last was added half an ounce of pepper.

HOUGH of a horse, is the ply or bending of the hind legs, and likewise comprehends the point behind, and opposite to the ply, called the hock.

The hams of a horse should be large, full, and not much bended; as also discharged of flesh, nervous, supple, and dry, otherwise they will be subject to many imperfections.

HOVER GROUND, light ground.

HOUSE-BOTE, an allowance of timber out of the lord's woods, for the repairs of a house.

HULLS, the chaff, or husks of corn.

HURDLES, are certain frames made either of split

timber, or of hazel-rods, wattled together, to serve for gates in inclosures, or to make sheep-folds, &c.

HURDS, or *Hords* of flax or hemp, the coarser parts separated in the dressings from the tear of fine stuff.

HURLE-BONE, in a horse, a bone near the middle of the buttock, very apt to go out of its socket with a hurt or strain.

HUSBANDRY, the business or employment of a farmer, or person who cultivates land, &c.

Husbandry is divided into two kinds, and distinguished by the epithets Old and New. The former is that which has been practised in all countries from the most early times; and the latter that introduced by the ingenious Mr. Tull, and often called the horse-hoeing husbandry.

Experience shews, that land though ever so well tilled in the autumn, when wheat, for example, is sown, hardens and soddens in the winter; its particles, beaten down by heavy rains, and sunk by their own weight, approach each other daily more and more; the roots of the plants cultivated have consequently less and less room to extend themselves in quest of their necessary food: and their interstices in the earth become of course so few and close, that they are not able to pierce through them, whilst weeds spring up, and rob them of their nourishment. By this means the earth, reduced to nearly the same condition as if it had not been ploughed at all, is unable to assist the plants sown in it, in the spring, when they ought to shoot with the greatest vigour. They consequently then stand most of all in need of the plough to destroy the weeds, to lay fresh earth to their roots in the room of that earth which they have exhausted, to break the particles of the ground anew, so as to enable their roots to spread, in order to their gathering an ample provision of food, which then does them the greatest service.

In the common husbandry, the whole attention is to provide a great store of nourishment for the wheat, at a time when it scarcely consumes any, as it then produces only a few blades, after which it is left to itself, at a season when it might, and should be most assisted by proper culture; a management as preposterous as it would be to give a child a great deal of food, and diminish it gradually as he grows bigger; or, to use Mr. Tull's comparison, to give silk-worms, before they are hatched, treble the full stock of leaves necessary to maintain them, till they have finished their spinning, and not to allow them any when they really want being fed.

The great advantage of having land in fine tilth before it is sowed, is universally acknowledged: but we must not stop at those first preparations. Plants require a continuation of culture while they grow, and must not be forsaken till they have attained their full maturity.

Those who are against the frequent ploughings used in the New Husbandry, are afraid of drying the earth too much; because, say they, the moisture escapes more easily from a well loosened soil, than from a hard and close earth.

In answer to this it will appear from many of the following experiments, that, even in the driest weather, land cultivated according to the new method, continues constantly moister than that which is managed in the old way. Instead of a stagnant wet, more hurtful, perhaps, than beneficial, to plants; earth made fine to a good depth, is prepared, as the reverend Dr. Elliot expresses it, "with open mouth, to drink and retain the dew, which, when it falls upon the land that is untilled, or but poorly tilled, does not sink far, but is carried off by the next sun's heat." That dew is one of the greatest fertilizers of the earth, has been repeatedly proved; and that it will penetrate so deep in a fine loose soil, as to keep that moist, while the ground badly tilled is parched up, appears, among many demonstrations, from Mr. Evelyn's experiment of digging a hole, and filling it up with its former mould well pulverized; or as Mr. Tull observes, till a field in lands; make one land very fine by frequent deep ploughings, and let another be rough, by insufficient tillage, alternately: then plough the whole field cross-wise in the driest weather, which has continued long; and you will perceive, by the colour of the earth, that every fine land will be turned up moist; but every rough land will be as dry as powder, from top to bottom.

Another proof of the benefits which arise from stirring the ground well and often between plants while they grow, and consequently a confirmation of the fundamental principle of the horse-hoeing husbandry, is thus drawn by Dr.

Dr. Elliot, from the common manner of raising Indian corn.

"The land, says he, being previously prepared, planted, and the corn come up, we plough a furrow off from the corn on each side, then hoe it, and the next time plough up to the corn; so that this tillage is nearly the same as is now proposed for wheat, or whatever we would plant: only by the way, I would observe, that the ploughings between the rows, for Indian corn, is so shallow, that one would be apt to think it intended for nothing more than merely to kill the grass and weeds; whereas it is found by experience, that, though there be neither grass nor weeds, the ploughing and hoeing will make the corn grow, and that the more the land is ploughed and hoed, the better and longer it will resist drought, and yield the better crop: nay, what is still more remarkable, if the Indian corn be well tilled, the next crop, whether it be oats or flax, will be proportionably greater and better; so that the land must have gained strength and richness. If it were not so, why did not the Indian crop exhaust and spend the strength of the land, especially when we consider how large that corn is made to grow by good tillage? but we find the contrary; the better the crop of Indian corn, the better the crop will be of oats. There is no sort of husbandry, wherein the superior force and virtue of tillage doth so evidently appear, as in the raising of Indian corn: for if you should plough and harrow the best of land, and sow or plant the corn, and never do any thing more to it, there will be less corn than if you should plant poor land, and tend it well: the poor land well ploughed and hoed, shall bring a greater crop than the rich land. We hereby see the efficacy and advantage of this repeated tillage, which falls in successively, according to the exigency and want of the plant in its several degrees of growth, and keeps the land in a proper state. Why should it not have the same effect upon wheat, and every other plant that is susceptible of the like culture?"

If several rows of wheat are sown in a poor but well ploughed land, the blades of the corn will turn yellow in the spring, especially in dry weather. Let the earth bordering upon these rows be ploughed deep, in some places near, and in others farther from the rows, and the plants will resume their proper colour; first in the places nearest to the new ploughed ground, and afterwards gradually in the others, according to their distance; which proves that they recover their verdure, in proportion as their roots reach the loose mould. This holds equally true in all plants; for Mr. Tull declares, that he does not remember ever to have seen a poor one contiguous to a well-hoed interval, unless overpowered by a too great multitude of other plants, an exception which must be equally made if it were a plant that required more or less heat or moisture than the soil or climate afforded; and that, on the contrary, he has seen plants grow to an amazing size, when the earth around them has been frequently tilled. He mentions, among others, a plant of ray-grass, which chanced to stand in a turnep field, where, being hoed as the turneps were, it acquired a bulk at least equal to a thousand plants of the same species; and a plant of mustard, which grew higher than he could reach, so as to be more like a tree than an herb.

The stirring of the earth about the plants whilst they grow, is productive of such excellent effects, that, in some parts of Berkshire, and in many places in France, they hand-hoe their corn, particularly wheat, and find that the crops amply repay all the charge and trouble of this expensive operation: which, however, cannot be performed but in well-peopled countries. Every husbandman will immediately see, how much a hoe-plough is preferable for this work, and that, to use it rightly, the corn must necessarily be planted in regular rows, as it is in the New Husbandry.

Our reason tells us, that the longest lived plants stand most in need of this culture. Perennials require it more than annuals, and wheat which is sown in autumn, and does not ripen till nine months after, want it more than spring-corn, which occupies the ground only for a few months. The former has to conquer a soil rendered hard during the course of the winter; but the other has not that difficulty to surmount, though both of them, and indeed all sorts of plants, are greatly invigorated by the repeated laying of fine fresh earth to their roots. Every one knows the vast efficacy of wood-land, before its native strength and vigour are exhausted; and such, in some de-

gree, is that which this tillage furnishes; besides being constantly attended with the advantage of destroying weeds. How far this last important part of agriculture was well executed by the sarcling, or sarrition, as Mr. Tull calls it, of the ancients, we shall not pretend to say, because we have no clear account of the manner in which it was performed; but it does not seem to have been in any way equal to the horse-hoeing husbandry, which likewise, among its many other excellencies, keeps the land from going out of tilth.

We shall here add M. Duhamel's observations on the use of dung, as given by that gentleman in his *Elements of Agriculture*.

"It is often, says he, more advantageous to increase the fertility of land by ploughing, than by dung: 1. Because, in general, only a certain quantity of dung can be had, the product of twenty acres being scarcely sufficient to produce enough for four or five; whereas the particles of the earth may be divided and subdivided almost to infinity. The help derived from dung is therefore limited; whilst no bounds can be set to the benefits that may accrue from ploughing.

"2. Few plants raised in dung ever have the fine flavour of those which grow in a good soil moderately dunged. Our kitchen gardens and our other grounds afford daily instances of this truth. Pulse, pot-herbs, and fruit, are seldom so good in the neighbourhood of great cities, where dung abounds, as in country gardens, where but little of it is used. The corn raised in those excessively dunged lands, yields a great deal of bran, and not much fine flour, and is difficult to keep. Nice horses will not eat oats of the growth of fields manured with human ordure. But nothing is so striking as the difference between the wine of an undunged vineyard, and that of vines which have been greatly dunged.

"3. Dung, which is supposed to act by fermentation, causes indeed an inward division of the particles of the earth, which must be very useful, as well as the food which it furnishes to plants: but the plough, besides dividing those particles, changes their situation, and turns the ground upside down, so that the part which was exposed to the influences of the air and dews, takes the place of another part which is brought from within the earth, up to its surface. The consequence of this is, that well ploughed land is not exhausted by weeds, and that it admits the moisture of rains and dews, together with the rays of the sun, all of which contribute greatly to render it fertile, as has been proved by very many experiments.

"4. Dung attracts insects, and those insects gnaw plants. It is well known that the roots of trees planted in dunged ground, are very liable to be damaged by insects: and this is one of the chief reasons why florists banish dung from their gardens. Worms, grubs, and other such like vermin, make dreadful havock in their beds of flowers; and I have seen meadows where the grass has been entirely destroyed, by their eating its roots.

"I must add, that most sorts of dung contain a great many seeds which fill the land with weeds.

"5. It is true that dung is equally serviceable to light lands, and to strong; but the same may be said of ploughing.

"Land is too strong when its particles lie so close together, that the roots of plants cannot extend between them, without great difficulty in quest of their necessary food; for want of which they will remain poor and sickly: but when the ground has been well loosened by repeated ploughings, and its plants are set at greater distances from each other, those roots will be able to spread freely on all sides, to pervade every minute chasm, and to collect such quantities of food as will make the plants grow strong and vigorous. The friendly influences of the atmosphere will then penetrate to them. What plainly proves the good effects of loosening such soils, is, that their fertility is sometimes increased by a mixture of sand, instead of dung. Now sand does not afford any nutritive substance; but only hinders the particles of the earth from re-uniting too closely.

"Ploughing is equally beneficial to light lands, for the very contrary reason; though these do not require so much of it as the other. There is no danger of their being exhausted by any exposure to the sun; but, on the contrary, they acquire an additional degree of fertility by the stirring, and grinding of their particles, and are thereby the better fitted to receive the moisture of rains and dews, and the salutary

salutary influences of the air and sun; whilst their inward pores are at the same time better adapted to the proper extensions of the roots of plants, by their being lessened.

"But let the benefits arising from dung be ever so great, let the means of obtaining enough of it be ever so easy, and let even its defects be corrected as much as can be, still it will not be the less true, that frequent ploughing is of infinite service to land.

"For this reason it is, that land intended for wheat is ploughed three or four times before the grain is sowed. Some farmers, who could not dung all their lands, ploughed part of them double the usual number of times, and reaped greater crops from these, than from those which were dunged. The expence of the ploughings extraordinary will be much less than the price of the dung necessary for the land, if the farmer is obliged to purchase it.

"In 1759, M. Delu gave three ploughings to some of his fields intended for oats; and though that year was very dry and unfavourable to spring corn, his oats kept up well till they were perfectly ripe, and yielded a full crop of excellent grain.

"He gave five ploughings to a piece of wheat-land which had not been dunged, and at harvest, had taller and finer corn there, than in the neighbourings grounds which had been dunged and cultivated in the usual way. In short, the advantage of thorough tillage, while the plants are growing, is so great, that, in many places, it has been found amply to repay even the expence of digging between the rows of corn.

"The farmer must not think of practising the New Husbandry in land which cannot be brought to a fine tilth: for as no remedies are proper for all diseases, so no one culture can suit every kind of soil.

"I have met with very zealous husbandmen, who have been in a great hurry to procure all the instruments proper for the horse-hoeing husbandry, before they had examined whether their ground was fit for using them. In walking over the fields, I have found them in so bad order as to be full of clods, stones, and all sorts of weeds: only the bare surface of the land had been scratched, by what they called ploughing; and indeed their common instruments of tillage were so imperfect, that it was hardly possible for them to do more. I advised them to destroy those weeds by good and frequent ploughings, to procure good instruments, to loosen the ground to a proper depth, to collect good manures, to drain their land well by trenches and ditches, and, in short, to practise the Old Husbandry completely, before they attempted the New; for, in fact, all the requisites in the former must be the foundation of the latter.

"To answer the ends of this husbandry, the seeds must be distributed so sparingly, that each plant may have room to extend its roots in such manner, that they may be able to collect an abundant quantity of food; each plant must be enabled to tiller greatly, so as to produce a considerable number of stalks; and each stalk must be enabled to bear a fine long ear, well filled with grains to its very point.

"To effect the first of these qualities, the field, after being thoroughly ploughed and well harrowed, must be divided by furrows, the spaces between which may be of such breadth as shall be judged most proper; for neither their precise width, nor the distance between the rows of corn, is yet fully determined. In the middle of these spaces, which will be distinguished by the name of beds, the wheat, or other grain, is to be sown in one, two, or more rows. An inch will be sufficient for the distance between the grains, lengthwise of the row; though that may be somewhat less, if the ground be not very good for wheat; or, on the contrary, somewhat more, if it be excellent for that grain. By this distribution, each plant will find, in the intermediate spaces between the beds, and in the beds themselves, a sufficient extent of earth wherein to collect its necessary food; for those intermediate spaces, which I shall call alleys, must be wide enough to admit of stirring the ground in them while the plants grow: but to answer the second and third intentions, it is of consequence that these stirrings be performed at proper seasons, because each of them is to produce its particular effect.

"It is essentially necessary that the rows of corn be sown very straight; a circumstance which, though it be attended with some trouble, ought not to discourage the husbandman, because the great difficulty will be only the first time. After the ground has been once rightly sown, it will be

easy to continue in the same regular tract every following year, without taking the precautions I am now going to observe.

"If the field be not very large, a furrow traced with a spade or pickaxe, directed by a line stretched across the ground, will enable the ploughman to guide the horse that draws the drill; and he will take care to leave a proper interval between one furrow and another, if three rows are to be sown.

"If the extent of ground be too great for the above method, poles or stakes may be stuck, five feet asunder, at each end of the field, to guide the ploughman, who, with a common plough, will trace small furrows, by the help of which the horse and drill may be properly directed.

It will be right, if possible, to suit the direction of the furrows to the declivity of the land, that the water may drain down to the lowest part of the field, where a ditch should be dug to carry it off: and it will also be necessary, to make them lengthwise of the field, if convenient, that the less ground may be lost by the space which must be left for the plough to turn in.

"After the seed is put into the hoppers of the drill, the horse which draws this instrument must be made to walk slowly in the furrow before traced by way of guide: and in order to drop as nearly as possible the intended quantity of seed, the outlet of the hopper must be proportioned to the size of the grain.

"As it will be somewhat difficult to manage the drill rightly at first, till the husbandman becomes used to it, he should look over his field as soon as the corn has sprouted, and then drop by hand a few grains in the place where it may have failed.

"The land should be sown about the middle of September, or, at farthest, by the end of that month: and it will be right always to try the goodness of the seed beforehand, by sowing fifty or an hundred grains of it in a fine mould, or moist ground, where it will soon appear whether they all rise.

"Land which retains water should be ploughed once in October, when the weather is fine. In doing this, a furrow should be first cut in the middle of the alleys, and then it should be filled with the earth on each side, even so far as to arch it up, and leave only a small furrow on either side, close to the beds, to drain off the wet, which would prove very prejudicial to the plants if it were to remain long near their roots. This loosening of the earth will also fit it for being mellowed by the winter's frosts; to which, however, care must be taken not to expose the roots of the corn, by leaving them too bare of mould. The most proper time for this stirring of the ground is when the plants have shot out some blades.

The second horse-hoeing, which should be given as soon as the hard frosts are past, that is to say, by the end of March, is intended to make the plants tiller; and will have this effect, if, after the earth near the rows has been stirred a little, that which was before laid up in the middle of the alleys be returned back to the furrows at their sides. This earth, having been mellowed during the winter, will afford excellent nourishment to the plants, now beginning to vegetate apace, and they will soon put forth their multiplied stalks.

"The third hoeing, which is the second after winter, and is intended to strengthen the stalks, should be performed when the ears of the corn begin to appear. This culture, which is looked upon as the least important of all, and is sometimes even omitted without any great inconvenience, need not be any thing more than a slight stirring of the earth, in which it will however be right to begin to hollow the alleys.

"The last stirring of the earth between the rows of corn is one of the most important, being that which makes the grains swell, and grow full-bodied to the very point of the ear. The most proper time for this is, when the ears begin to bloom: but as the corn is then high, only one furrow can be cut in the middle of the alleys, the earth of which should be laid up to the stem of the plants on each side. The plough will hardly be able to pass more than twice in this furrow, which should, however, be made as deep as possible, in order to bank up the greater quantity of earth. By this operation, the now fallow alleys are prepared for the next sowing; for it is in the middle of them that the corn is to be planted the following year; and the now eared wheat is earthed up, to prevent its being lodged; though in general corn thus cultivated is less apt to be

beaten down, than that which is raised in the common way, because the straw of this being more exposed to the air, becomes harder and acquires a firmer texture, especially toward its bottom. It is for this reason that a tuft of corn, which stands quite single, is scarcely ever beaten down by the weather.

"These repeated hoeings of the earth will certainly be rewarded with a very plentiful crop, unless the seasons prove extremely bad.

"When the corn is reaped, all possible care should be taken not to trample upon the adjoining ploughed ground.

"It is well known, that vigorous plants do not ripen their seeds so soon as those which have been stunted in their growth: for this reason the corn cultivated according to the principles of the New Husbandry, ripens later than in the common way, and should therefore be sown somewhat earlier.

"We will now suppose that the crop is reaped, and that the same field is to be sown again with wheat the next year, and every year after, as it may be, because the rows of corn are placed each time in the middle of the former alleys, which have been ploughed during the whole year, without producing any thing. Thus, the only difference between this new method and the old husbandry, is, that instead of resting, or fallowing, a whole field, whilst another whole field is under corn, and each of them is separate from the other, the fallow here is in the same field as the corn, being interposed by means of alleys, which is the part rested between the beds, and is the part cultivated: but there is this great advantage here, that the stirring of the earth in the alleys, which are not planted, not only prepares the soil admirably for being sown the next year, but invigorates the plants actually growing in the beds.

"If it be thought proper to dung the alleys, in order to prepare them for the reception of the seed, the dung, which should be thoroughly rotten, must be laid in the bottom of the deep furrow before made in the middle of them, and there covered with the earth which was thrown up towards the rows of wheat. If the land does not want dunging, this deep furrow is filled up without it; and this should be done immediately after harvest, that there may be time to give the ground another stirring, which need only be a slight one, before the sowing of the rows, which are now to be in the middle of the former alleys; and the alleys of this year will be in the place of the last year's stubble.

"Though land, cultivated according to the principles of the New Husbandry, does not require so much dunging as that which is managed in the old way, yet this manure will always help to enrich the soil, especially if it be used in the manner here directed. By being thoroughly rotten when it is laid in the furrow, and there covered over immediately after harvest, it will have time to mellow and diffuse its influence, and not be apt afterwards to choke up the shares of the drill; an inconvenience which does not happen with pigeons dung, which therefore need not be strewed till the ground is ploughed for sowing.

"It is farther observed,

"1. That if dung be used for the second year's crop, very little of it will suffice, because it need only be laid in the bottom of the furrows.

"2. That there can hardly be any occasion for dung this second year, because, if the earth of the beds in which the wheat grew was good, that of the alleys, of the same soil must be still better, by reason of its having been fallowed and well tilled.

"3. That the second year's wheat is placed in a most advantageous situation, its roots having a depth of twelve or fifteen inches to extend themselves in, by means of the furrows which was in the middle of the alley. For this reason, corn ought to thrive best in those lands which have been longest cultivated according to the New Husbandry.

"The earth in the alleys is to be horse-hoed during the second year, in the same manner, and at the same seasons, as in the first.

"This frequency of hoeing ought not to be objected to; for the labour of the first hoeing, to make the furrows on each side of the rows, and lay the earth up in the middle of the alleys, cannot be great; and the second only returns that earth into those furrows: the third is only to stir the surface of the soil: the fourth and last is to make the deep furrow in the middle of the alleys, and bank up the rows of corn on each side, with the earth taken out

of it; so that neither of these operations ever extends to above a third part of the ground, at any one time.

"The whole field might indeed be ploughed up after harvest: but I would advise the husbandman not to touch the stubble then, because the rows of that will help him to guide the drill in straight lines, and the yet unrotten straw might be apt to clog the shares of the drill, so as prevent their working properly. However, if the stubble be very short, this caution becomes the less material, and the whole field may then be ploughed; though still it will be necessary to plough it again in October, in order to make drains to carry off the wet.

"It is almost needless to observe, that all the operations of which I have been speaking, must often be performed either a little earlier, or somewhat later, according as the year is more or less forward; and that it will always be necessary to wait till the ground is dry enough to be ploughed without danger of its clodding; a circumstance which varies greatly, according to the nature of the soil."

Mr. Young, in his *Annals of Agriculture*, observes, that "the common husbandry about Faversham is generally in the round tilth; that is to say, 1. barley; 2. beans; 3. wheat; which is the famous rotation of East Kent. They put in their beans with a drill-plough, of a very simple construction, on the rolling principle; ten rows in a rod, or between eighteen and twenty inches distant; keep them in a garden degree of cleanness, by horse and hand-hoeing, the latter generally twice or thrice, and two, three, and four horse-hoeings; they use a shim, which they call a horse-break, for cutting the weeds and loosing the surface of the intervals; earth them up twice, first with a moveable iron fixed to the break, and afterwards with a double mould-board plough, made on purpose, with a very long round share, finishing in a narrow point. They work the last tool with a horse among the beans, even when they are in full blossom, and find that they receive no damage from it. After harvest they cut the stubble with a shim two feet wide, which answers the purpose of the great stile of Thanet shim for preparing the land for ploughing. Their crops of beans are very considerable, rising to six quarters an acre; the wheat which follows is generally great; what I saw I should guess at four quarters; five are sometimes known, but not often; in general about three and a half or four quarters; the earliest sown, universally the best; they have an idea of barley which is very singular, that it is exceeding favourable to the land; they sow it late, which gives such an opportunity of tillage, that they are decidedly of opinion that it leaves the land cleaner than beans, yet they esteem beans the best preparation in the world that wheat can receive. The lateness of their barley season, I should apprehend, must be prejudicial to the crop; for, upon land of Mr. Firmstone's at the Abbey farm, the barley crops were not comparable to what I had seen in crossing Essex, nor even equal to what I had left upon my own farm, on soils not to be named in the same day with these. This rotation is in the teeth of a maxim, which the more I see the more I am convinced is just, that no two crops of white corn ought ever to come together; this round tilth, upon land inferior to the Kentish, would presently run it out of heart; for that barley exhausts infinitely more than beans, and that it fouls land more, would be proved by such an experiment as this; let one half of a field be under barley, and the other under beans, then sow the whole with wheat, which I may very safely pronounce would be twice as good after the beans as after the barley.

They put all their manure on beans, a most unexceptionable practice. They sometimes follow this course, 1. beans: 2. wheat; and continue it till the land is foul; but then, pursuant to the above ideas, throw in barley to clean it."

The editors of the last edition of Mr. Tull's *Horse-hoeing Husbandry*, give, in their preface to that work, the following comparative calculation of the expence and profit of the old method of culture and the new, drawn up by a gentleman who has practised both some years, and who has no attachment to the New Husbandry, farther than he has found it answer in his trials. They candidly appeal to experience, "whether every article in this calculation is not estimated in favour of the common husbandry; whether the expence be not rated lower than most farmers find it; and whether the crop be not such as they would rejoice to see, but seldom do.

"In the New Husbandry, every article is put at its full value,

value, and the crop of each year is computed four bushels short of the other, though, in several years experience, it has equalled, and generally exceeded, those of the neighbourhood in the old way.

An Estimate of the Expence and Profit of Ten Acres of Land, in Twenty Years.

I. In the Old Way.

First year for wheat cost 33l. 5s. viz.	1.	s.	d.	1.	s.	d.
First ploughing at 6s. per acre	3	0	0			
Second and third ditto, at 8s. per acre	4	0	0			
Manure, 30s. per acre	15	0	0	22	0	0
Two harrowings and sowings, at 2s. 6d. per acre	1	5	0			
Seed, three bushels per acre, at 4s. per bushel	6	0	0			
Weeding, at 2s. per acre	1	0	0			
Reaping, binding, and carrying in, at 6s. per acre	3	0	0	11	5	0
Second year for barley costs 11l. 6s. 8d.						
Once ploughing, at 6s. per acre	3	0	0			
Harrowing and sowing, at 1s. 6d. per acre	0	15	0			
Seed, four bushels per acre, at 2s.	4	0	0			
Weeding, at 1s. per acre	0	10	0			
Cutting, raking, and carrying, at 3s. 2d. per acre	1	11	8			
Grass-seeds, at 3s. per acre	1	10	0	11	6	8
				44	11	8
Third and fourth years lying in grass cost nothing. So that the expence of ten acres four years comes to 44l. 11s. 8d. and in in twenty years to				222	18	4
First year's produce is half a load of wheat per acre, at 7l. per acre	35	0	0			
Second year's produce is two quarters of barley per acre, at 1l. per acre	20	0	0			
Third and fourth year's grass is valued at 1l. 10s. per acre	15	0	0			
So that the produce of ten acres in four years is	70	0	0			
And in twenty years will be	350	0	0			
Deduct the expences	222	18	4			
And there remains clear profit on ten acres in twenty years by the old way	127	1	8			

II. In the New Way.

First year's extraordinary expence is	1.	s.	d.
For ploughing and manuring the land, the same as in the old way	22	0	0
Ploughing once more, at 4s per acre	2	0	0
Seed, nine gallons per acre, at 4s. per bushel	2	5	0
Drilling, at 7d. per acre	0	5	10
Hand-hoeing and weeding, at 2s. 6d. per acre	1	5	0
Horse-hoeing six times at 10s. per acre	5	0	0
Reaping binding, and carrying in, at 6s. per acre	3	0	0
The standing annual charge on ten acres is	13	15	10
Therefore the expence on ten acres in twenty years is	275	16	8
Add the extraordinaries of the first year and the sum is	297	16	8
The yearly produce is at least two quarters of wheat per acre, at 1s. 8d. per quarter, which on ten acres in twenty years amounts to	560	0	0
Therefore, all things paid, there remains clear profit on ten acres in twenty years, by the new way	262	3	4

"So that the profit on ten acres of land in twenty years, in the new way, exceeds that in the old by one hundred and thirty-five pounds one shilling and eight-pence, and consequently is considerably more than double thereof; an ample encouragement to practise a method whereby so great advantage will arise from so small a quantity of land, in the compass of twenty-one years lease; one year being allowed, both in the old and new way, of preparing the ground.

"It ought withal to be observed, that Mr. Tull's husbandry requires no manure at all, though we have here, to prevent objections, allowed the charge thereof for the first year; and moreover, that though the crop of wheat from the drill-plough is here put only at two quarters on an acre, yet Mr. Tull himself, by actual experiment and measure, found the produce of his drilled wheat-crop amount to almost four quarters on an acre; and, as he has delivered this fact upon his own knowledge, so there is no reason to doubt of his veracity, which has never yet been called in question. But that we might not be supposed to have any prejudice in favour of his scheme, we have chosen to take the calculations of others, rather than his, having no other view in what we have said, than to promote the cause of truth, and the public welfare."

A comparative Calculation of Expence and Profit between the Drill and the Common Husbandry, taken from Mr. Baker's Report to the Dublin Society of his Experiments in Agriculture, for the Year 1765. Published by Order of that Society.

*An Estimate of Expence upon a Plantation * Acre of Wheat, in the Common Husbandry.*

To the first ploughing, commonly called breaking for fallow, 8 horses, 8s. 2 ploughmen, 1s. 4d. 2 drivers, 1s.	1.	s.	d.
	0	10	4
To the first harrowing, 4 horses, 4s. a driver, 6d.	0	4	6
To the second ploughing, commonly called gaurowing	0	10	4
To the second harrowing	0	4	6
To the third ploughing, commonly called stretching	0	10	4
To sowing the seed, 8 horses, 8s. 2 ploughmen, 1s. 4d. 2 drivers, 1s. the seed-man, 8d.	0	11	0
To seed wheat, one barrel	1	0	0
To rent for the year of fallow	0	18	0
To ditto, the year the crop is growing	0	18	0
	5	7	0

In this account 40s. are charged for 40 horses, employed in the culture of one acre for wheat, in the common husbandry; a charge which ought to be considered by the farmer; for he actually buys and maintains his horses for this business.

The crop which follows wheat is generally oats; but sometimes pease are sown instead of oats; with some, the practice is to let the pease follow oats; in which case they fallow only every fourth year; but where land receives no other assistance than what arises from fallow, it is a bad practice not to fallow every third year. It is the general practice to plough but once for oats; and therefore it shall be stated so; but it is a much better practice to plough the wheat-stubble once before winter, and again in the spring.

An estimate of expence upon an acre or oats.

To ploughing once	1.	s.	d.
To seed oats, 2 barrels	0	10	4
To harrowing, 4s. 6d. seed-man, 4d.	0	12	0
To one year's rent	0	4	10
	0	18	0
	2	5	2

These two crops consume three years; after which the farmer is to begin again, and to incur every article of expence stated in the above accounts, in order to obtain two crops more.

* An Irish acre contains 7840 square yards.

An

An Estimate of Expence upon a Plantation Acre of Wheat in the Drill Husbandry, the first Year.

	l.	s.	d.
To ploughing 4 times, to prepare the fallow —	2	1	4
To harrowing twice for ditto —	0	9	0
To rent for the year of fallow —	0	18	0
To harrowing with the drill harrows —	0	0	6½
To sowing with the drill-plough —	0	1	1
To seed-wheat generally 5 stone, but suppose 6 —	0	6	0
To the first, or winter hoeing —	0	1	7
To the spring hoeing with the cultivator —	0	1	1
To the third sowing, i. e. to return the meliorated earth to the corn —	0	1	7
To the fourth and final hoeing —	0	1	1
To rent, the year the corn is growing —	0	18	0
	4	19	3½

This is the same charge as in preparing for the common husbandry.
 This is the same also.
 This charge is saved after the first year.
 Four acres a day may be harrowed with one horse.
 From three to five acres may be sown in a day.
 Two acres may be hoed in a day, two horses, ploughman and driver : the design of this hoeing is to leave the plants dry, and to meliorate the earth.
 To deepen the foil, one horse, plough-man, and driver.
 To make the corn-tiller, i. e. to increase its branches.
 To fill the grain, and render it large.

Although the drill culture for the first year is very near as expensive as the common ; yet after taking the crop, the expence and labour of fallow, and the loss of time, is not to be incurred again, as is unavoidable in the common husbandry.

An Estimate of Expence upon an Acre of Drilled Wheat after the first Crop.

	l.	s.	d.
To ploughing the land once —	0	10	4
To harrowing with the drill-harrow —	0	0	6½
To sowing with the drill-plough —	0	1	1
To seed-wheat —	0	6	0
	2	17	11½
To four times horse-hoeing, as before stated —	0	5	4
To one year's rent —	0	18	0
	2	1	3½

One ploughing is all that is necessary.

Be it remembered, five stone is enough.

Thus the land is sown again with wheat every year, and instead of 4l. 9s. which is the farmer's expence in the common husbandry, exclusive of one year's rent of the land : in the drill method is no more than 17s. 11½d. and the total expence, instead of 5l. 7s. is no more than 2l. 1s. 3½d. rent included ; whereby there is a saving of 3l. 5s. 8½d. an acre.

Before the account of profit and loss upon these different methods of culture be stated, it will be necessary to take notice of an objection, which may perhaps be made to the above charge of ploughing in the common husbandry.

It is pretended, that three quarters of an acre may be ploughed in a day, with one plough ; but can it be done effectually ? The land may indeed be scratched, but cannot really be ploughed as it ought to be.

The farmer ought to be cautioned against a trick too frequently practised in ploughing.

When a ploughman enters his plough and passes across the field, he turns a sod about a foot broad ; when he is to return, he enters his plough about four feet distant from the outside of the former furrow, and so turns another sod of the same breadth, which when turned, just meets the former sod ; thus four feet of the land appear to be ploughed, whereas the fact is, that the two feet lying under the fods is not touched with the plough at all.

This deception, added to the practice of just skimming the ground, enables hirelings to undertake ploughing at six and seven shillings an acre.

But if a plantation acre of land be well and effectually ploughed, ten shillings and four-pence, as charged above, will not appear too much ; and it is, in fact, supported by the common course of business.

When wheat is to be sown, it is the general custom to send a barrel of seed into the field with two ploughs, which is to sow an acre of land, and that is the usual day's work for two ploughs in the general course of business.

Let us see, then, what the expence will amount to : eight cattle will be eight shillings, two plough-men one shilling and four-pence ; two drivers one shilling, and the seed-man eight-pence, which in all makes eleven shillings, and corresponds with the above charge.

One Acre of Wheat and Oats in the Common Husbandry, for fifteen Years.

Dr.	l.	s.	d.
To the expence on a wheat crop, 2d year	5	7	0
To the expence on an oat crop, 3d year	2	5	2
To the expence on a wheat crop, 5th year	5	7	0
To the expence on an oat crop, 6th year	2	5	2
To the expence on a wheat crop, 8th year	5	7	0
To the expence on an oat crop, 9th year	2	5	2
To the expence on a wheat crop, 11th year	5	7	0
To the expence on an oat crop, 12th year	2	5	2
To the expence on a wheat crop, 14th year	5	7	0
To the expence on an oat crop, 15th year	2	5	2
	38	0	10
To clear profit in fifteen years —	27	19	2
	66	0	0

	l.	s.	d.	Per contra, Cr.	l.	s.	d.
By the produce of wheat, 9 barrels, at 20s.	9	0	0		9	0	0
By the produce of oats, 14 — at 6s.	4	4	0		4	4	0
By the produce of wheat, 9 — at 20s.	9	0	0		9	0	0
By the produce of oats, 14 — at 6s.	4	4	0		4	4	0
By the produce of wheat, 9 — at 20s.	9	0	0		9	0	0
By the produce of oats, 14 — at 6s.	4	4	0		4	4	0
By the produce of wheat, 9 — at 20s.	9	0	0		9	0	0
By the produce of oats, 14 — at 6s.	4	4	0		4	4	0
By the produce of wheat, 9 — at 20s.	9	9	0		9	9	0
By the produce of oats, 14 — at 6s.	4	4	0		4	4	0
	66	0	0		66	0	0

One Acre of Drilled-Wheat, for fifteen Years:

[illegible]

To clear profit arising upon an acre of land in fifteen years in the drill-husbandry	—	—	52	3	11
To clear profit arising upon an acre of land in fifteen years in the common husbandry		—	27	19	2
Greater profit on the drilled acre in fifteen years	—	—	24	4	9

Which amounts to 1l. 12s. 3 $\frac{1}{4}$ d. *per annum*, for fifteen years on the acre, more than by the common husbandry.

In the drill-husbandry the crops are stated at three barrels of wheat less upon an acre than in the common husbandry, that it may not be supposed to be over-rated; but in the common husbandry, the crops are rated at the highest; fourteen barrels of oats an acre are also allowed in the common husbandry, which every farmer must admit to be great allowance upon the general produce.

That the drill culture will produce six barrels an acre, is fully proved in Mr. Baker's report at large, which will shortly be published, where it will be shewn, that much more has been produced.

Doubtless it will be observed, that in fifteen years fourteen wheat crops are obtained in the drill-husbandry; in the common husbandry only five wheat and five oat crops; the other five years are not only lost, but are an heavy expence to the farmer.

A farmer having forty acres of tillage, supposing him to direct his attention to bringing it to the drill culture, would make in fifteen years 969l. 10s. more than he can in the common husbandry : which is such an advantage, that the greater profit in the drilled acre in fifteen years will purchase the fee simple of that in the common husbandry, at twenty-seven years purchase, valuing the land eighteen shillings an acre.

Thus it appears, that in every fifteen years the fee-simple of all the tillage lands of the kingdom is lost to the community by the common course of tillage.

In stating these accounts, no mention is made of fences, water, cutting the land, weeding and reaping, as these articles of expence depend upon a variety of circumstances : but will, in general, be more upon the common husbandry than the drill.

M. de Chateauvieux's Account of the Crops produced during Sixteen successive Years, by Fields cultivated and sown in the common Way, and of which Part was constantly dunged; compared with a crop of the same Fields cultivated without Dung, according to the New Husbandry.

“ The result of all our experiments in agriculture would be of little use, if it extended no further than our private instruction. To render it of more general service, we shall here give a comparison of the produce of lands cultivated according to the Old Husbandry, and according to the New, that every one may judge which of the two is most likely to answer best.

“ This parallel will shew how much the New Husbandry is superior in point of advantage to the Old. We are to suppose all the circumstances of the seasons to be like those of the years of which we have compared the products. But as the expence of culture is an object well worth considering, and as that expence may not be equal in both ways, I beg leave to lay down here as a fact, That the charge of the new culture is less than that of the old.

I have tried it, and find so; as I shall, hereafter, prove beyond dispute.

“ By the old culture, in the farm which I now cultivate in the new way, I should have had but two fields sown in 1752 ; to be reaped in 1753. These two fields contain together eighteen acres, two roods, and twenty-eight poles. I have calculated their produce during sixteen years, viz. from 1730, to 1745, inclusively. They have yielded, in that time, eight crops, the total produce of which has been 146863 pounds of wheat : deducting from which, 42130 pounds for the seed sown in the eight years, the neat produce will be reduced to 104733 pounds.

It is proper to observe that this wheat was measured every year in the barn, as soon as it was threshed, and before it was sifted : an operation which always occasions a considerable diminution, though we do not make any allowance for it here.

“ Let us now see what crops the preceding experiments give us room reasonably to expect from the same two fields in sixteen successive years of the new husbandry ; to judge only by that of this first year, 1753, unfavourable as it is.

“ The first field was sowed, half in beds, and half in equally distant rows. I am obliged to suppose it to have been sowed entirely in beds ; for it cannot be doubted but that the part which was sowed in rows, would have produced as much as the other : consequently the whole crop of the two halves, at 3370 pounds each, would have been 6740 pounds.

“ Besides the advantage of reaping a much greater quantity of corn, there are others which highly merit our attention. The corn is not mixed with any seeds of weeds, and its quality is greatly improved by the abundance of nourishment which the plants are supplied with by frequent stirrings of the earth in this husbandry, more than in the old.

“ But how fine a prospect does the following proposition afford us beyond all this! viz. “ That the crops of the second and following years, would be still more plentiful than the first. What some might then think only an object of hope and speculation, is already realized, and proved by experience. All this deserves the most serious attention. The New Husbandry will certainly, in time, acquire a superiority over the Old, greater than we can now imagine.

Proofs that the best Field in the Country, though the greatest Part of it was dunged, yielded less Wheat than those in which no Dung was used. By M. de Chateauvieux.

“ The proofs of the advantages of the New Husbandry cannot be too greatly multiplied; and all those which are the result of experience, deserve to be communicated to the public.

"The field we are going to speak of, is generally, and justly, reckoned the best in the country. Its soil is excellent, very deep, and extremely fertile. This field is dunged very often. Its nearness to the farm-yards renders the carriage of manure extremely easy, and is the cause of its getting perhaps more of it than may be necessary. Its situation too is excellent, rising on all sides above the neighbouring grounds, and the highways which surround it; by which means it is less exposed to be hurt by wet, the water finding an easy drain from off it.

"The extent of this field is 6087 fathoms (four acres and eight poles.) It was sowed in 1752, for the harvest of 1753, and the greatest part of it was well dunged.

"It is not the custom of the place I am speaking of, to describe the extent of a field by the number of acres contained in it, but by the number of measures of wheat with which it is sowed. Eight measures used generally to be employed to sow this: but the quantity of seed was lessened this last time, and only seven measures were sown. We have hitherto supposed the surface of this field to be equal to that of the other fields of the same country, in which eight measures of seed are sown.

"But as I was desirous to be more precisely exact, in order to form the comparison I purposed making, I had recourse to the geometrical plans of the lands, and found the contents of this field to be, as I said before, 6087 fathoms; now, the custom of the village to which it belongs is always to sow at least eleven measures in a space like this. One field, among others, very near to this, and which is but twenty-four fathoms and thirty-two feet larger, has always been sown with twelve measures.

"A new cause of the fruitfulness of this field, unknown before my observations, is, that the farmer wisely took care to sow it with a less quantity of seed. The plants thrive better, when the land was not overstocked with them. This field will therefore help to prove the truth of one of the first principles of the New Husbandry, viz. that the quantity of seed generally used ought to be diminished: a proposition which deserves our entire confidence, because the seed here has, from time immemorial, been reduced to eight measures, and they have been sufficient to produce very plentiful crops. The farther reduction made in 1752, to seven measures, must also be approved of, since the crop which these yielded was very fine.

"These preliminary observations seemed necessary, before we proceeded in our detail. This field was sowed with about 850 pounds of wheat. It was finer during the whole summer than any wheat in the common way. It was reaped at a proper time, and yielded about 6646 pounds, from which must be deducted, first, the 850 pounds of seed: and, secondly, the value of the dung, which is equal at least to 1260 pounds of wheat, together with 2110 pounds: which deducting from 6646 pounds, the total produce leaves for the neat produce 4536 pounds.

"The crop of 1753 was diminished by the hail on the third of June. The value of this loss is not known: but we may fairly compare it with the experiment Numb. II. which likewise suffered by the same hail. We confess that this comparison is not absolutely exact, with respect to this accident; but it must also be granted, that this circumstance cannot occasion any very great error. We must likewise premise, that we shall not reckon the produce of a small spot which is pretty commonly sowed in March, in the year of fallow, because it hardly equals the expence of dung and ploughing.

"The neat produce on a field sown in equally distant rows, was 2857 pounds eight ounces. But the extent of that field being only one acre, three roods, seven poles and two yards, we must calculate what the crop would have been in proportion, if that extent had been four acres and eight poles (6087 fathoms), supposing it of the same quality. We shall find, that the field on which our experiment was made, would have produced neat 8006 pounds of wheat; deducting from which 4536 pounds, for the neat produce of the field cultivated in the old way. The difference in favour of the New Husbandry, without dung, will be 3470 pounds of wheat.

"This field laid out in beds, yielded neat 1540 pounds of wheat. Its extent is but one acre, one rood, and eighteen poles; so that we are to see what crop it would have yielded if its extent had been four acres and eight poles, supposing the quality of the soil to be the same. The Rule of Three shews us again, that its neat produce would have

been 5681 pounds of wheat, which we are to double for the amount of the next year's crop, every year yielding a crop in the New Husbandry; whereas the field it is compared with would lie fallow this year. Thus two years will yield 11362 pounds of wheat; from which deducting 4536 pounds for the neat produce of the same field, cultivated in the old way, during the same space of time, the difference will be 6826 pounds of wheat in favour of the New Husbandry."

Reflexions and Observations on the Practice of the New Husbandry, by M. de Chateaucieux.

"The chief object of our reflection last year was, the effect which ploughing and culture have upon plants. They seem to us to be confirmed by the following observations:

"1. The productions were greatest in those places where the earth has been most loosened, and brought to the finest tilth.

"2. We have seen plainly, that, in order to improve our tillage, it is necessary to make the great furrow in the middle of the alleys very deep, because that furrow being afterwards filled up, and a new bed made over it, there is a greater depth of light well-loosened mould immediately under the roots of the plants.

"3. We can affirm, that we have this year, without much trouble, ploughed our beds from fifteen to eighteen inches deep, which is very considerable; but we must not flatter ourselves, that this depth can always be attained the first year; it is by continuing this same culture that we shall insensibly reach it.

"4. To have great success, requires proper care and judgment in performing every part of the New Husbandry. The culture which is well executed will be of very great use; but that, on the contrary, which is badly done, will be of no service to the plants, and may even prove very detrimental to the next year's crop.

"5. To perform this culture with advantage, it is therefore necessary to observe this important maxim of tillage, so little attended to by many farmers, "never to set the plough to work, when the earth is too moist." I have adhered to it strictly, and have never suffered my lands to be touched till they were dry. We have tilled when the weather has been very dry and very hot, and then it was that our culture had the best effect; the stiffest land having been broken by the preceding ploughings, was provided with the moisture necessary for plants, from its surface to the bottom of the furrows; and the plants were sensibly benefited by all our frequent stirrings.

"6. I was so struck with this, that I marked several stalks, to see how much they grew each day. From the time that the ears began to appear, till they had done blossoming, I found that they grew an inch in four and twenty hours. The hottest days were those in which the stalks grew most, whilst all vegetation seemed almost suspended in the wheat in the common way.

"7. This observation led me to another. I was greatly surprised one day to find my stalks just as I had left them the day before. The next day, and the day after, I found them still the same. In short, they grew no longer from that time.

"So sudden a change raised my curiosity greatly, and I resolved to find out the cause of it. The time when they ceased to grow, was immediately after they had done blossoming. I judged that from that time all the sap was conveyed to the ear, to form the grains, and that the rest of the plant had only what was necessary to prevent its drying too soon. This dispensation of the nutritive juices seemed to me very remarkable: all the forces seem then to unite, in order to form, fill, and ripen the grain, which is the most useful part. I was afterwards confirmed in this, by observing, that it was from that very time that the stalks and blades began insensibly to lose their deep green colour, and that this green grew lighter and lighter every day; a sure sign of a diminution of sap in those parts.

"8. It is likewise of very great importance to know which is the most proper time for sowing; for the growth of plants depends greatly on this circumstance. Late sowings have not answered; but the early ones have produced plants, whose vigour has enabled them the better to resist the winter's cold, and to branch out the more abundantly. By attending to this circumstance, the farmer will enjoy the desirable advantage of having his corn ripen early, and

of its being less exposed to the dangers of the summer season; for we have seen that the wheat which was sowed first in the new method, ripened thoroughly as soon as that which was sowed in the old way. It is proper to know this, in order to be sensible of the necessity of beginning to plough early, that the seed may be sowed in due time.

"9. I must beg leave again to make a few reflections relative to the quantity of seed most proper to be sown. It is of the utmost importance to know how to proportion the quantity of the seed to the strength and richness of the soil, so that each may have its due proportion. The experiments already made, help to direct us; but I think others still necessary, before we can trust absolutely to our knowledge in this point.

"At present, I shall only advise sowing the same quantity of seed as I did in 1752. I fancy that proportion will not differ greatly from what a longer practice will shew to be best. However, the same quantity of seed will not do for every soil. It must be varied with judgment, and regulated according to the circumstances of the season, and the better or worse condition of the land. I think, too, that in the first, and even the second year of the trials which may be made, it will be proper to sow a little thicker than I did in 1752. The farmer will easily perceive, that when his lands are well loosened and brought to a good tilth, they will require less seed; but till then he will do well not to be over-sparing of it.

"10. We cannot yet determine so exactly as we could wish, what breadth the beds, including the alleys, should be of, to make the ground produce the greatest quantity of corn; nor whether it would be best to sow more or less than three rows. We confess, that we should be glad to see a longer series of accurate experiments, and to have a greater knowledge of this matter before we pretend to fix it. Our beds have always been about six feet wide.

"M. Dunamel, who first introduced this New Husbandry in France, intends to make experiments by sowing only two rows. If they should yield more grain, the breadth of the beds may certainly be diminished: and as it is of consequence to multiply and vary experiments, in order to determine this point, we now have several beds sown, some in two and some in three rows. I have likewise tried what the multiplying the number of rows in some fields would do; and the result of this experiment promises an advantage in that way of sowing. The success of this first trial was as follows:

"When the field was sowed, I observed, among the rest, ten beds which the ploughman had made wider than the others. I was sorry at first that any part of the ground should be lost; but upon second thoughts, I determined to sow those beds with two turns of the drill-plough; and consequently to plant them with six rows of wheat. I did so; and when the first ploughing after winter was given, little regard was paid to the two outside rows, which were torn up by the plough in several parts; so that there remained but four or five rows in those places.

"The wheat of these beds, not excepting even the middle rows, grew as high, and branched as much as that of the others, in which there were but three rows. I examined them frequently with great care, and was assisted therein by several persons, very capable of judging and making good observations. The only difference we could distinguish, and that was scarcely perceptible, was in the ears, which we thought rather shorter in the middle rows than in the others: but as there was a greater quantity of them, we judged that these beds would yield the most grain.

"We were not mistaken; for their produce was as follows: the ten beds sown with six rows each, yielded ninety-one pounds of wheat more than ten beds sown with three rows each. But as this result does not set the matter in a sufficiently clear light, we must have recourse to the following calculation. The six-rowed beds took up more ground than those which had but three rows: two beds more might have been made out of the surplus of their breadth; so that there would, in that case, have been twelve instead of ten. The question therefore is, whether this ground, made into ten beds, produced more than it would have done if it had been made into twelve beds of three rows each? To which I answer, that it did produce thirty-eight pounds more; and that there was likewise a seventh part more straw.

"As this experiment deserved to be repeated, I have tried it in a larger way. I have laid several acres out in

beds of about seven feet wide: they are sown with six rows: the plants are very fine, and I impatiently wait the event.

"Though I have continued not to dung my fields, the plants still grow very tall, and produce fine long ears, well filled with plump grain.

"I am indebted to the New Husbandry for the recovery and improvement of worn-out meadows. They have already yielded me plenty of fodder, the value of which ought to be added to the produce of the fields, because the New Husbandry is the immediate cause that manure can be spared to enrich those meadows.

General Disposition of the Lands for the Crop of 1754.

"The more I have studied the principles of the New Husbandry, the more I have been convinced of the advantages attending it. My experiments have not only confirmed me in this opinion, but they have likewise shewed me, that my practice has been consistent with those principles. This made me determine to lay the whole of one of my farms out in the new way, as soon as I possibly could; its extent being no more than I can direct almost the whole culture of, myself.

"I have completed it this year. All the fields, of which only half used to be sowed every year in our old way, are now laid out in beds. I have sowed them all with a design to continue doing so for the future every year. They look exceedingly well hitherto: the plants are extremely fine, and promise a greater crop next year than that of the experiments of the foregoing years.

"These experiments have likewise made a strong impression on several persons in this country, each of whom judge of the New Husbandry, as his inclination, or prospect of advantage, directed. It is true, our farmers are more generally inclined to sow their lands in equally-distant rows, with the drill-plough, than to lay them out in beds; the proper management of which, say they, is attended with much more care and trouble. My drill-plough is preferred on account of its simplicity. It began to be used last year, and numbers of fields near this city (Geneva) have been sowed with it this year.

"Several of our peasants have likewise tried the drill-plough, and their example will be of consequence hereafter. Their unwillingness to come into any new practice is well known: but this seems to get the better of their prejudices; and the prospect they now have of greater crops than usual, makes them regret their not having sowed a larger extent of ground in this manner.

"We have about an hundred and fifty acres sowed in beds, and also near a thousand sowed in equally-distant rows. Such large experiments, and made on different soils, cannot but afford new instruction: the facts will be better ascertained, and people will be more thoroughly convinced that the greater product of the crops is owing to the New Husbandry, and not to favourable circumstances, to which they are too apt to impute it. These experiments, say they, have been made of the very best soils; it is much easier to prepare two or three roods of ground, than an extent of several acres; these little spots have been cultivated with vast care: it is almost impossible to bestow the same attention upon large tracts of land.—Luckily several lovers of agriculture are making large experiments, which already prove that the New Husbandry may easily be practised in any extent of ground whatever.

CONCLUSION.

"Any one may now judge, by the experiments which have been made these last four years, and by the success which has attended them, how far the principles of the New Husbandry are justly founded, and how far we are in the right road to give still farther demonstrations of its excellence.

"The lands on which it has been already practised leave no room to doubt that all its operations may be performed with ease: and at the same time they prove, to those who shall be inclined to cultivate any part of their farms in the same way, that they may do it with equal advantage.

"Convenient instruments for executing this culture are already invented and made. The use which has been, and still is, made of them, ought to increase our confidence in them. It is by their means that the two most essential articles

ticles towards securing success, are obtained: the first is the means of forming, ploughing, and cultivating the beds, with great ease and little expence: the second, that of sowing land more regularly, and of giving it the exact quantity of seed that may be thought most proper, by means of the drill-plough, which buries the seed at its proper depth in the furrows, covers it over, and, in short, performs the whole business of sowing with great dispatch, and a considerable saving of seed."

EXPERIMENTS made near Guignes, in the Province of Brie, under the Direction of M. Roussel, and communicated to M. Duhamel in 1755.

"M. Roussel prudently began; as we would advise every one to do, with small experiments. His first trial of the New Husbandry was upon a little spot: but being prevented from attending to it in person, many faults were committed during his absence. On his return, which was towards the end of November, 1754, he inquired after his crop, and learnt with pleasure, that some grains had produced upwards of fifty ears a-piece, and that many of these ears contained sixty-four grains. This was sufficient to shew him the excellence of the new culture, which he immediately determined to extend to larger objects.

He had no time to lose. Two contiguous pieces of ground, containing twenty-four acres, had been folded, and were just going to be ploughed for the last time, in order to be sown according to the usual practice of the country. These were chosen for the farther trial of the New Husbandry, and were accordingly sown with the drill-plough, between the ninth and twenty-first of October, with 571 pounds of wheat, including ten pounds and a half which were used to fill up some spaces where the seed had missed. This is after the rate of about twenty-four pounds to an acre.

At the same time an adjacent piece of ground, which had been folded like the former, and of which the soil was equal to the best part of the field sown in rows, was sown in the common way. This last contained four acres and a half, and took up 486 pounds of seed, which is 108 pounds to an acre.

The corn came up finely in both fields: but that which was sown in rows happened to be near a wood, from which numbers of rabbits came, and entirely destroyed the plants of near five acres: the roots which they left were eaten up by worms: and the dung of the sheep-folds produced a great quantity of weeds. This was not all: as the furrows did not run in the direction of the declivity of the ground, the water lodged in them, so that the first ploughing, which ought to have been given in March, could not be performed till April, when it left a great many clods.

These clods were grown hard by the time of the second ploughing, which was performed with a plough with two mould-boards, which instead of breaking and loosening the ground, and laying fresh earth to the roots, only turned those hard clods over upon the rows.

The third ploughing, which was given with a plough with two shares, and in more favourable weather, had a better effect.

Notwithstanding the accidents which had reduced this piece of wheat to so wretched a condition, that the husbandmen said they were sure it never would produce a crop worth reaping, and that all the labour bestowed upon it was thrown away; yet, reckoning upon the same footing of twenty-four acres, though it would be but just to deduct the five which were absolutely destroyed by the rabbits: and supposing too the crops of 1756 and 1757 to be no greater than that of 1755; M. Roussel's calculation proves, that even these three crops will still be better than what the same field would produce in the common way.

But, says M. Roussel, if we do the New Husbandry part the justice it deserves, and instead of including the five acres which the rabbits destroyed, we reckon only the produce of nineteen acres prepared in a hurry, and badly ploughed; and even suppose them to be no better managed in the following years, and the whole extent of the 24 acres to be only of the same quality as the four acres and a half with which it was intended to be compared, the produce of both, in three years, will be as follows:

The nineteen acres produced 11592 pounds of wheat, which was preferred to any other for feed, not only because it was finer, but likewise because it was quite free from all

seeds of weeds. This is after the rate of 610 pounds for every acre.

From this we are to deduct the feed, which is, for each acre, twenty-four pounds.

The neat produce of each acre will then be 586 pounds of wheat, free from all seeds of weeds.

Supposing the crops to be no greater in the following years, though what we shall say hereafter will shew that they certainly will, each acre will have produced neat, at the end of three years, 1758 pounds of wheat.

The other piece of ground, which was cultivated in the old way, in order to make the comparison, produced 1260 pounds an acre, from which we are to deduct 154 pounds for the feed.

The remaining neat produce is 1106 pounds.

The second year's produce of this same acre, sowed with spring corn, can be reckoned at only half the value of the first year's crop of wheat; and the third year produces nothing, being the year of fallow.

Thus the total neat produce of the acre cultivated in the common way will be, at the end of three years, only 1659 pounds; whilst that in the new way will be 1751 pounds."

M. Roussel gives the following Account of his Experiments in 1756, in a Letter to M. Duhamel.

"In October 1755, I chose in the middle of a fallow field which had been well ploughed, and was not exposed to any of the accidents I met with last year, a piece of ground, which, to make a fair comparison between the new method and the old, I divided into two equal parts, each containing twelve acres. One of these spots was set apart for the New Husbandry: and the other, exactly of the same quality, and quite contiguous, to be sowed broad-cast in the old way.

"This last ground had been extremely well dunged by the folding of the sheep. With regard to the other, which was to be cultivated in the new way, and which composed ninety-three beds five feet wide, including the alleys; only eight of these beds were dunged by sheep, and that at the same time, and to the same degree as the ground by which the comparison was intended to be made: of the other beds, seventy-six had no sort of dung or amendment whatever; and nine were dunged more or less, in the manner and proportion hereafter mentioned.

"Most of those who practise the New Husbandry use no dung at all. I supposed that their reason for rejecting this manure was, the difficulty of finding a proper time to apply it; for whilst their alleys receive their several stirrings, no wheel-carriage can be admitted with dung, without hurting the beds which are sown, and hardening the loose mould of the alleys: to carry it on the backs of cattle would be at best a very difficult, tedious, and expensive way, where any considerable space is to be dunged: to spread it upon the earth only the moment the seed is sown, is a sure way to clog up the drill plough, and hinder its operation, if the dung be not thoroughly rotten; and to breed weeds, which by no means suit this culture. To remedy these inconveniencies, I contrived the following method: I opened in each of the alleys, one of those large furrows which must always be every year at the concluding of the summer hoeings, in the place where the three rows of seed are afterwards to be sown; and by drawing the plough with two mould-boards once through it, I made it fourteen or fifteen inches wide; which is the breadth that the three rows of seed require. The space between two of these deep furrows is exactly the breadth of a cart, the wheels of which going in them, hurt no part that has been ploughed, and do not press down or harden the loose mould; nor do the horses do any damage, because they necessarily tread upon the stubble of the late-reaped beds, in the middle between these two furrows. This was the method I used to dung the nine beds in question. The dung was well rotted: it was spread at the bottom of the furrows, and immediately covered over by the same ploughing that made the beds which were sown some days after. Perhaps this manure may be of more service to my lands than to many others, because the soil is naturally cold and backward. The grain is by this means sown upon a kind of gentle hot-bed, the warmth of which promotes the branching and vegetation of the plants. The winter rains and frosts raise a fermentation. The first spring ploughing, by giving it a little air, revives that fermentation at the very time when the sap

is most active, and the plant begins to branch. As the dung rots, a kind of motion is caused in the earth, which in some measure answers the end of a slight ploughing, and brings fresh nourishment to the roots. The same heat as consumes the straw likewise consumes the little seeds that are in the dung, which might otherwise produce numbers of weeds. When this dung is brought up again to the surface of the earth, by the next year's ploughings, it will no longer have those hurtful seeds. It will indeed have lost its heat, but it will still have retained all its fatness, which will mix with the earth; and land, thus constantly dunged, will in time become a perfectly fine mould. But if these layers of dung should be spread too thick, or the dung itself be of too hot a nature, the roots of the corn might perhaps be endangered thereby. It was to determine this that I tried the following experiments, to know the effects of different dungs, and what quantity it is proper to employ.

Three beds were dunged, in the above manner, with horse-dung; the first, which was 1165 feet long, had three loads of dung; the second, of 1171 feet, had but two and a half; and the third, 1183 feet, had but two. Three other beds were dunged with cow-dung: one of 868 feet, with two loads and a half; and the second of the same length, with two loads; and the third, of 874 feet, with only one load and a half. The three remaining beds had sheep's-dung: the first of 842 feet, two loads; the second, of 838 feet, one load and a half; and the third, which was of the same length, one load.

These beds were distributed in such a manner, that each of them was in the middle of two other beds which were not dunged. The field, thus laid out, was sown on the thirteenth, fourteenth, fifteenth, and sixteenth of October, with the drill-plough, which plants three rows in each bed. I used 378 pounds of seed; and afterwards ten pounds to fill up the chasms; which is after the rate of thirty-two pounds six ounces to an acre, and consequently a little too much. Accordingly, when the corn came up, I saw it was too thick sown. The reason was, that the grain was too small in proportion to the outlets of the drill-plough. At the end of ten days this corn rose well. On the eighteenth of December, I observed that most of these plants had branched into four stalks, whilst those in the common way had but three. I perceived no sensible difference then between the dunged and the undunged bed. It was not till the twenty-fourth of January that I saw plainly that the plants of the dunged beds were of a deeper green, and had made longer and more vigorous shoots than those of the undunged beds. By the twentieth of February, five smaller stalks issued out of the five great ones, which was not the case with the wheat in the common way. The alleys did not receive their first ploughing till the 10th of March. Eleven of the main stalks grew an inch and a half in five days; and I observed that the moles were rather more busy in the dunged beds than in the others. As the earth was yet somewhat too soft, I thought it needless to continue a ploughing which could not do any good, and therefore postponed it to the 28th of March, and following days. On the 9th of April, I found a plant with eighteen stalks in one of the dunged beds: the greatest number of branches that any of the plants in the undunged beds had, was twelve: but, on the other hand, I likewise found some which had eighteen in the field of comparison, sown in the common way.

On the 9th of May, this same plant had twenty stalks; and from that time it branched no more. The second ploughing was not given till three weeks after, viz. the 28th of May; which, I think, was somewhat too late after the corn had ceased to branch. By the 23d of June there were three sorts of wheat to all the beds: there were ears in blossom, others just going out of bloom, and others not yet out of their hoods. The finest ears were those which came up and blossomed first. The most forward beds were those which had been dunged under furrow with sheep's-dung: the next to them were the eight beds which had been folded, the plants of which were a little greener than those of the undunged beds.—The last ploughing was given on the tenth of July. The grain had then begun to fill: but that in the common way was the most forward, though it was sowed three weeks later than the other. I know not for what reason, the wheat of the New Husbandry began to be reaped on the 4th of August, and that in the old way was let stand till the thirteenth. The produce of both cultures was as follows:

In the twelve Acres cultivated in the new Way, the three Beds dunged with Horse-Dung, yielded,

The first, 1165 feet long, dunged with three loads	19
The fellow to it, not dunged,	15
The second, 1171 feet long, dunged with two loads and a half,	18
The fellow to it, not dunged,	14
The third, 1183 feet long, dunged with two loads	16
The fellow to it, not dunged,	13

The three Beds dunged with Cow-Dung yielded,

The first, 868 feet long, and dunged with two loads and a half,	16
The fellow to it, not dunged,	11
The second, likewise 868 feet long, and dunged with two loads,	15
The fellow to it, not dunged,	12
The third, 874 feet long, and dunged with one load and a half	14
The fellow to it, not dunged,	12

The three Beds dunged with Sheep's-Dung, yielded,

The first, 842 feet long, and dunged with two loads	17
The fellow to it, not dunged,	10
The second, 838 feet long, and dunged with one load and a half	15
The fellow to it, not dunged,	11
The third also 838 feet long, and dunged with one load	14
The fellow to it, not dunged,	10

The eight Beds which had been folded, two of which were

1171 feet long, three 1177 feet, and three 1183, produced in all	142
This is near 18 sheaves a-piece.	
The 67 other beds which had not been dunged, produced in all	814
This is somewhat more than 12 sheaves a-piece.	
Total produce of the 12 acres cultivated in the new way,	1208
The twelve acres sown in the common broad-cast way, after having been well folded all over, produced	1820

These facts shew the advantage of dunging in this manner. It is plain that the best dung is that of sheep, and that it is more profitable when laid under furrow, than when it is spread upon the surface of the ground by folding.

In proportion to the produce of the bed, 842 feet long, which was dunged with two loads of sheep's dung, and produced seventeen sheaves; the bed 1165 feet long, which was dunged with three loads of horse-dung, and produced only nineteen sheaves, would, if dunged with sheep's-dung, have produced $23 + \frac{16}{3}$; and the bed dunged with cow-dung, which yielded but sixteen sheaves, would have yielded $17 + \frac{16}{3}$.

The eight folded beds, whose whole length was 9412 feet, would have yielded 190 sheaves $+ \frac{16}{3}$, instead of only 142 sheaves, which was the amount of their product.

It is likewise plain, that if the whole of my twelve acres in the new way had been dunged with sheep's-dung, as the bed 842 feet long was, I should, in the same proportion, have reaped 1700 sheaves, which would be but 120 sheaves less than the whole produce of the twelve acres folded all over, and sown in the broad-cast way. But even then, I say that those 120 sheaves would not be equivalent to the quantity of grain which I saved by sowing according to the New Husbandry. An hundred of our sheaves yielded, in general, little more than 378 pounds of wheat. The 120 sheaves which the twelve acres sown in the broad-cast way produced more than the twelve acres in beds, would therefore yield but 453 pounds. Deduct this from 871 pounds, which I saved in the seed of these last twelve acres sown in the new way, and I shall still be a gainer: for I sowed only 388 pounds in this ground; whereas 1260 pounds were used to sow the other twelve acres in the common way. This would have been the produce of this first year's crop, supposing that the whole

of my twelve acres in beds had been dunged in the same manner as the bed 842 feet long. For want of that, I reaped but 1208 sheaves. They have just been threshed, and have yielded only 5040 pounds of grain."

M. Du Hamel makes the following remarks on this account of M. Roussel:

"The 1208 sheaves yielded but 5040 pounds of grain, from which we are to deduct 388 pounds for the seed.—The neat produce is therefore 4652 pounds, which would make in three years 13956 pounds. The other field in the common way produced 8757 pounds, from which we are to deduct 1260 pounds for the seed: the neat produce is consequently 7497 pounds; the half of which is 3748 pounds and an half: for the value of the next year's crop. This is all that the twelve acres in the common way would produce in three years, and amounts to no more than 11245 pounds and a half: consequently the balance in favour of the New Husbandry in three years, is 2710 pounds and a half, or one fourth part of the whole: and that from a field which was sown in rows for the first time, and of which three-fourths were not dunged at all: whilst the other, with which it is compared, had been solded all over, and for the year, produced a very plentiful crop."

Extract of a Letter from a Gentleman in Poitou.

"Being convinced of the advantages of the new method of cultivating land, I resolved to make a trial of it, by comparing the produce of a field cultivated in the common way, with that of another field cultivated according to the New Husbandry: and M. Du Hamel has desired all lovers of agriculture to try by experiments made with care, whether it be most profitable to sow beds with two or with three rows of corn; or, which is the same thing, to find at what distance the rows ought to be sown; I divided a spot of ground into ten equal parts, which I made into as many beds, each six feet wide.

"In the middle of five of these beds, I sowed three rows, seven inches asunder; so that they took up fourteen inches of ground, and there remained four feet ten inches for the breadth of the alleys, which is very sufficient for the horse-hoeing husbandry.

"I sowed three other beds with only two rows, a foot distant from each other; consequently the alleys were five feet wide.

"The two remaining beds were sown with two rows each, three feet asunder. The alleys were therefore but three feet wide: or rather the whole of this last spot may be looked upon as sown in single rows, with alleys three feet wide, which is too narrow a space to admit of horse-hoeing them conveniently.

"Before I speak of the produce of these beds, it will be proper to observe—

"1. That this trial was made with rye. My fear that birds might eat up the wheat, made me prefer rye, which I advise every one to do, when only small experiments are made. This escaped without the least damage; whereas I have observed, that when experiments have been made with wheat, the birds, preferring that to any other grain, have always destroyed a considerable part of the crop.

"2. The beds sown with three rows were near a hedge, which greatly damaged two of them, either by its roots exhausting the ground, or by its shadow keeping that part harder frozen than the rest.

"3. The intervals were not hoed at all, between either the double or the triple rows; only the alleys were horse-hoed; and consequently none but the single rows were hoed on both sides.

"4. On the 25th of February, the alleys were ploughed. I visited them on the second of March, and found, upon examining the plants, that, in these five days, they had shot out roots four inches long into the new stirred mould. I repeated the hoeings at proper times, and the rye continued in good condition till it was reaped. The last hoeing was given after the blossoming was past.

"5. I then examined the roots, and found they had extended eighteen inches into the loose mould. This may seem strange; but I am certain it is true; for I took every precaution not to be deceived.

"6. The alleys between the single rows were hoed but twice, being too narrow to admit the plough after the plants had begun to branch. However, I had not reason to complain of the produce of these single rows.

"Having now given an account of my operations, it is time to speak of the products.

"The ears in my rows were four to seven inches long, and the stalks from four to six feet high, which was one third taller than in the neighbouring fields, cultivated in the old way.

"This spot of ground, in the best years never produced more than five bushels, including the bushel of seed corn; for that was the quantity generally used: in common years, it has not yielded above four bushels, and frequently much less. We therefore cannot reckon its produce, one year with another, at more than four bushels, including all faulty grains, and seeds or weeds, which fall through the sieve, and remain mixed with the good grain. This year it has yielded me seven bushels of fine clean rye, considerably larger than the common sort. I make no account of the seed, the quantity was so small.—To prevent this grain's being mixed with any other, and at the same time to judge more exactly of the produce of my ground, I had the sheaves threshed out close by the field; but it was in the middle of a road, where all the grains scattered by the flail could not be gathered up; by which I reckon I lost more than the amount of the seed that was sown in the rows. The produce of my little field was therefore this year, compared to other years, as seven is to four; to which must be added, that it is capable of bearing as great a crop every year, which is not the case of the common husbandry.

"Let us now examine the produce of the rows, and compare them with one another, in order to judge whether it be most profitable to sow in single, double, or triple rows.

"Two beds, the most distant from the hedge, sown with triple rows, yielded each three quarters of a bushel.

"Two beds with double rows, yielded each two thirds of a bushel; consequently the three beds with double rows yielded two bushels, and the six rows sown two and two, in three beds, yielded one quarter more than the six rows sown three and three in two rows; but two beds of three rows a-piece, yielded one ninth more than two beds of only two rows a-piece; whence we may conclude, that the distance of the rows increases the product of an equal number of plants; or which comes to the same, that an equal quantity of seed will produce more grain when the rows are more distant, than when they are sown closer together. But this is not a real profit; because the six double rows take up one third more ground than the six triple rows.

"Each of the single rows yielded seven-eighths of a bushel, which is one seventh more than the triple rows, though they took up no more ground; and their produce would probably have been greater, if they had been hoed two or three times more.

"It appears by this account, that the profit would probably have been on the side of the double rows, if the alleys had been made only four feet wide, instead of five; for by this means I should have gained one fifth more ground; and four feet are a sufficient breadth for the operations of the horse-hoe. Where the single rows are so near, as in this experiment, the same ground would scarcely bear another crop the next year, for want of having been sufficiently stirred. To clear up this point by a new experiment, I have sown single rows in the middle of four beds, two of which are four feet wide, and the two others only three. The winter hoeings have been given them with ease, and I hope the others will not be more difficult, at least till all the corn is spindled. What I fear most is the earth's being carried off the narrow space on which the rows stand, when a thaw comes on, or by the heavy rains which are frequent with us.

"The rest of my field is sowed in two rows, in beds four feet two inches wide. I have done this, because, as it is the general custom here to make our ridges about that breadth, I am in hopes that if I obtain a plentiful crop, I shall be able the more easily to prevail on the farmers of this country to adopt a method, the advantages of which I am sensible before I tried the above experiments."

As it will doubtless be expected by our readers, that the advantages resulting from both the Old and New Husbandry should be set in the clearest and most conspicuous point of light under this article, we shall add here two calculations that lately appeared in the *Museum Rusticum*, and seem to be made with great accuracy and candor.

The Profit attending Arable and a Pasture Land compared, as found by Experience, near Bury, in Suffolk.

"The following calculation of the different profit attending arable and pasture land in my neighbourhood, is drawn up not merely from fancy, but from the exact accounts I have kept of my own crops, and the information I have gained from several sensible farmers.

"I take twenty acres, and suppose them an addition to a farm; but I should premise such an one as will require some additional cattle to be kept for it, perhaps two horses; but a farm of fifty pounds per annum may be so circumstanced as to require no material standing expences extraordinary for such an addition; in which case the ploughings, &c. will not cost near what I have laid them at; but the fairest way is the supposition I have made. We reckon that nothing is either got or lost by four shillings per acre for a clear earth.

Calculation of the Expences and Profit of farming a ploughed or pasture Field of twenty Acres for nine Years, on a Supposition that it is not a Farm by itself, but an Addition to another of fifty Pounds per Annum, the Soil wet, and a loose Woodcock, Brick Earth, on the Surface, for eighteen Inches deep, and under that a very good stiff Clay, improved by Land draining.

First Year, Fallow.		1.	s.	d.
Rent charges	-	15	0	0
First ploughing, a clean earth	-	4	0	0
Second ditto, ribbling it close overwart	-	4	0	0
Harrowing it overwart	-	0	5	0
Rolling	-	0	3	0
Third ploughing, a roving	-	2	10	0
Fourth ditto, a clean earth	-	4	0	0
		29	18	0
Second Year, Barley.				
Rent, &c.	-	15	0	0
First ploughing, a clean earth	-	4	0	0
Harrowing down the ridges	-	0	5	0
Expences of mucking, at twenty loads per acre, and spreading the muck, supposed to be at the farmer's house	-	10	0	0
Second ploughing, the sowing earth, as it may be done with a double-breasted plough, to shut up the barks; that and the harrowing	-	4	0	0
Seventeen coomb and two bushels of seed-barley, at eight shillings and six-pence per coomb	-	7	8	4
Two bushels and a half of clover-seed, at twenty-five shillings per bushel	-	3	2	6
Harrowing and water furrowing	-	0	10	0
Weeding	-	1	0	0
Harvesting, two shillings and six-pence per acre	-	1	10	0
Threshing one hundred and sixty coombs, at six-pence per coomb	-	4	0	0
Carrying out one hundred and sixty coomb, at eight times, eight pounds; but as back carriage may sometimes be got, say	-	5	0	0
Expences eight times at market	-	1	10	0
		58	6	3
Third Year, Clover.				
Rent, &c.	-	15	0	0
Cutting twenty acres, and harvesting it	-	3	0	0
Threshing thirty-two bushels of clover-seed, at four shillings per bushel	-	6	8	0
Expences of carrying the seed out, and at market	-	1	15	0
Weeding the clover	-	0	10	0
		26	13	0
Fourth Year, Wheat.				
Rent, &c.	-	15	0	0
Ploughing, harrowing, and water furrowing the clover-land, and sowing the wheat, five shillings and six-pence per acre	-	5	1	0
Ten coomb of seed	-	8	0	0
Weeding	-	1	10	0
		29	11	0

Brought over		1.	s.	d.
Harvesting, including all expences, five shillings per acre	-	29	11	0
Threshing one hundred coomb	-	5	0	0
Carrying out ditto, at five goings, back carriage three of them, and at market	-	5	0	0
Haulming, at one shilling and six-pence	-	3	0	0
		1	10	0
		44	1	0
Fifth Year, Fallow.				
Rent, &c.	-	15	0	0
Expences the same as the first year	-	14	18	0
		29	18	0
Sixth Year, Wheat.				
Rent, &c.	-	15	0	0
Mucking, the materials supposed to be in the farmer's yard	-	10	0	0
Ten coomb of seed blew-chaff wheat	-	7	0	0
Sowing the seed	-	4	0	0
Weeding	-	2	0	0
Harvesting	-	5	0	0
Threshing one hundred and twenty coomb, at one shilling and two-pence per coomb	-	7	0	0
Carrying out ditto, at six times as before	-	5	0	0
		55	0	0
Seventh Year, White Oats.				
Rent, &c.	-	15	0	0
First ploughing, a clean earth	-	4	0	0
Water-furrowing	-	0	5	0
Second ploughing, a clean earth	-	4	0	0
Water-furrowing	-	0	3	0
Third ploughing, sowing earth, and harrowing	-	5	0	0
Twenty coomb of seed	-	8	0	0
Weeding	-	0	10	0
Harvesting, two shillings and six-pence per acre	-	2	10	0
Threshing one hundred and twenty coomb	-	3	0	0
Carrying out six times, and marketing	-	3	18	0
		46	16	0
Eighth Year, Tares and Turnips.				
Rent, &c.	-	15	0	0
One clean earth, and harrowing ten acres for tares, and water-furrowing, and rolling	-	2	10	0
Five coomb of seed-trees	-	2	10	0
Cutting, making, loading, and stacking of fifteen loads of tare fodder	-	2	0	0
Ploughing up the tare land, a clean earth	-	2	0	0
Overwarting another clean earth	-	2	0	0
Roving it	-	1	5	0
First ploughing for turnips, ten acres, a clean earth	-	2	0	0
Second ploughing, drawing the ridges into barks	-	1	0	0
Third ploughing, ribbling it overwart	-	1	10	0
Harrowing it flat	-	0	2	6
Fourth ploughing, a clean earth; draw it on to the steach	-	2	0	0
Fifth ploughing, sowing earth, up set it, and harrowing	-	2	5	0
Turnip seed	-	0	5	0
First hoeing, at four shillings per acre	-	2	0	0
Second ditto, at two shillings and six-pence	-	1	5	0
		39	12	6
Ninth Year, Wheat and Barley.				
Rent, &c.	-	15	0	0
Ploughing and sowing the tare land with wheat, water-furrowing, &c.	-	2	10	0
Five coomb of seed red-stalked wheat	-	4	0	0
Weeding	-	0	15	0
Harvesting	-	2	10	0
Haulming	-	0	15	0
Threshing sixty coomb	-	3	0	0
Carrying out ditto, &c.	-	2	10	0
Ploughing and sowing the turnip land with barley, harrowing, rolling, and water-furrowing	-	2	10	0
		33	10	0
Carried over		33	10	0

	Brought over	l. s. d.
Eight coomb of seed patney barley		33 10 0
Weeding		3 4 0
Harvesting		0 2 6
Threshing seventy coomb		1 5 0
Carrying out seventy coomb		1 15 0
		1 10 0

P R O D U C E.

First Year.		
Sheep-feed worth		1 10 0
Second Year.		
One hundred and sixty coomb of barley, at eight shillings per coomb		64 0 0
Shack for cattle		2 0 0
		66 0 0

Third Year.		
Feed of clover before it is seeded		20 0 0
Thirty-two bushels of clover-feed, at one pound five shillings per bushel		40 0 0
Feed after feed		2 0 0
		62 0 0

Fourth Year.		
One hundred coomb of wheat, at fifteen shillings per coomb		75 0 0
Shack for cattle		1 10 0
		76 10 0

Fifth Year.		
Sheep-feed		1 10 0
Sixth Year.		
One hundred and twenty coomb of wheat, at fourteen shillings per coomb		84 0 0
Shack for cattle		1 10 0
		85 10 0

Seventh Year.		
One hundred and twenty coomb of white oats, at eight shillings per coomb		48 0 0
Shack for cattle		2 0 0
		50 0 0

Eighth Year.		
Fifteen loads of tares		15 0 0
Ten acres of turnips to buy cattle in, and fatten on them, to sell off in the spring, worth three pounds per acre		30 0 0
		45 0 0

Ninth Year.		
Sixty coomb of wheat, at fourteen shillings and six-pence per acre		87 0 0
Shack		0 15 0
Seventy coomb of barley, at seven shillings and six-pence per coomb		26 5 0
Shack		1 0 0
		115 0 0

First Year.	l. s. d.	Fifth Year.	l. s. d.
Expences	29 18 0	Expences	29 18 0
Produce	1 10 0	Produce	1 10 0
Lois	28 8 0	Lois	28 8 0
Second Year.		Sixth Year.	l. s. d.
Produce	66 0 0	Produce	85 10 0
Expences	58 6 3	Expences	45 0 0
Profit	7 13 9	Profit	40 10 0
Third Year.		Seventh Year.	
Produce	62 0 0	Produce	50 0 0
Expences	26 13 0	Expences	46 6 0
Profit	35 7 0	Profit	3 14 0
Fourth Year.		Eighth Year.	
Produce	76 10 0	Produce	45 0 0
Expences	44 10 0	Expences	39 12 6
Profit	32 0 0	Profit	5 7 6

Ninth Year.		
Produce	115 0 0	
Expences	41 6 6	
Profit	73 13 6	

Profit.	l. s. d.	Lois.	l. s. d.
2d Year	7 13 9	1st Year	28 8 0
3d Year	35 7 0	5th Year	28 8 0
4th Year	32 0 0		
6th Year	40 10 0	Lois of 2 years	56 16 0
7th Year	3 14 0		
8th Year	5 7 6		
9th Year	73 13 6		
Profit of 7 Years	198 5 9		
Lois	56 16 0		

141 9 9 Total profit in nine years.

Which is fifteen pounds, fourteen shillings, and eight-pence per annum, or rather better than fifteen shillings per acre.

But I should observe, that as a crop of clover-feed is the most uncertain and various of any that is grown, I have reckoned less for it by far than multitudes produce, though at the same time many bring nothing at all.

I know a field of twenty acres, which I have been often told by several who knew the crop, once produced the farmer five bushels per acre. It was all down on a Friday, and the farmer suspecting a change of weather, by great rewards to his workmen, and bringing casks of ale into the field, and feeding them well, tempted them to work in an extraordinary manner all the Saturday, and cleared the whole into barn. It began raining in the night, and so much succeeding bad weather came, that the crops were, in general, greatly damaged. His produced, as I said, one hundred bushels, all which he sold at three pounds ten shillings per bushel, arising to three hundred and fifty pounds. And a few years ago I saw the same field with a crop of clover, which did not produce twenty pecks, and that so wretched as to fetch nothing.

I read this calculation to a farmer, and he observed, that I should reckon eighty bushels for the crop; and as it is often grown, I will give you another total, with that alteration, that your readers may adopt either, according to their idea of the chance.

Profit	l. s. d.
Lois	248 13 9
	56 16 0
	191 17 9

which is twenty-one pounds, six shillings and five pence per annum, or better than a guinea per acre.

As I mention back-carriage in this calculation, I will explain my meaning. We generally carry our corn to Ipswich, Manningtree, or Thetford, from which places we load home with coals for blacksmiths, or any persons that want them, who pay us eighteen shillings for the carriage of a loading, twelve shillings per chaldron, and we generally bring one and a half. But as we may accidentally carry our corn where none is to be had, I make such allowance as to bring it near the truth.

Calculation of nine Years Expences and Profit of twenty Acres of Grass-Land, the Soil supposed to be the same as the above Arable-Land, with no other Difference than being Grass or ploughed.

First Year's Expences.	l. s. d.
Rent, &c.	15 0 0
Mowing, making and cocking ten acres of grass to hay, at three shillings per acre, with beer	1 10 0
Stacking, loading, &c. of ten loads of hay	1 10 0
Expences on four goings of hay when it is fold, weighing, and market	0 16 0
	18 16 0

N. B. Nothing is reckoned for carriage, as manure is brought back
Fifteen old crones, bought in August
Expences in buying sheep
Three cows at five pounds each
A fow, and ten pigs, three weeks old
Supposing two acres to be manured each year with twenty-six loads per acre
Forty loads of clay, at two-pence halfpenny per load
Twelve ditto of ashes, mortar, or rotten dung, brought from Bury; six waggon loads; at eleven shillings and six-pence per load
Expences of carrying it on, and spreading, &c.
Turning and mixing manure

l.	s.	d.
18	16	0
3	15	0
0	4	0
15	0	0
2	12	6
0	8	4
3	9	0
1	8	0
0	4	0
45	16	10

Second Year.

Rent, &c.
Mowing, making, &c. of six acres of grafs
Stacking, &c. six loads of hay
Weighing, marketing, &c.
Expences of buying sheep
A score of old crones
Manuring two acres as above

15	0	0
0	18	0
0	18	0
0	10	0
0	1	6
6	0	0
5	9	4
28	16	10

Third Year.

Rent, &c.
Mowing and making &c. eight acres of grafs, at three shillings per acre
Stacking, &c.
Weighing and marketing, &c.
Expences on cattle,
Fifteen crones
Manuring two acres as above

l.	s.	d.
15	0	0
1	4	0
1	4	0
0	12	0
0	2	0
3	15	0
5	9	4
27	6	4

Fourth Year.

Rent, &c.
Mowing and making twelve acres at three shillings per acre
Stacking, &c.
Weighing and marketing
Expences on cattle
Fifteen crones
Manuring two acres as above

15	0	0
1	16	0
1	16	0
0	18	0
0	5	0
4	0	0
5	9	4
29	4	4

Fifth Year.

Rent, &c.
Mowing and making ten acres
Stacking, &c.
Weighing and marketing
Expences on cattle
Fifteen crones
Manuring two acres as above

15	0	0
1	10	0
1	10	0
0	16	0
0	3	6
3	7	0
5	9	4
27	15	10

Sixth Year.

Rent, &c.
Mowing and making nine acres
Stacking, &c.
Weighing, &c.
Expences on cattle
Fifteen crones
Manuring two acres as above

15	0	0
1	7	0
1	7	0
0	14	0
0	4	0
4	5	0
5	9	4
28	6	4

Seventh Year.

Rent, &c.
Mowing and making twelve acres
Stacking, &c.
Weighing, &c.
Twenty crones
Expences on cattle
Manuring as above

15	0	0
1	16	0
1	16	0
0	18	0
5	0	0
0	5	0
5	9	4
30	4	4

Eighth Year.

Rent, &c.
Mowing and making eight acres
Stacking, &c.
Weighing, &c.
Twenty crones
Expences
Manuring two acres as above

15	0	0
1	4	0
1	4	0
0	10	0
5	10	0
0	7	0
5	9	4
29	4	4

Ninth Year.

Rent, &c.
Mowing and making ten acres
Stacking, &c.
Weighing, &c.
Twenty crones
Expences on cattle

15	0	0
1	10	0
1	10	0
0	8	0
3	15	0
0	10	0
22	13	0

PRODUCE.

First Year.

Ten loads of hay, wasted to eight, and sold in the winter at two pounds per load
Fifteen old crones sold fat, with their lambs at fifteen shillings per couple
As no expences are calculatd for the dairy, such as wood, utensils, &c. I shall lay the clear profit of three cows at four pounds each, which is what I have generally made of mine, every thing paid, and yet kept a calf now and then for stock; one I reckon this year
I shall not explain all the methods of managing the hogs, but lay the clear profit of a fow at different sums, such as I have generally found my own produce

16	0	0
11	5	0
12	0	0
6	0	0
45	5	0

Second Year.

Eight loads of hay wasted to seven, and sold at two pounds per load
Twenty crones, sold fat at seventeen shillings per couple
Three cows at four pounds each
One fow

14	0	0
17	0	0
12	0	0
6	5	0
49	5	0

Third Year.

Ten loads of hay, wasted to eight, sold at two pounds per load
Fifteen crones, sold at fifteen shillings per couple
Four cows, the new one at three pounds (the calf is now a cow)
One fow

16	0	0
11	5	0
15	0	0
6	10	0
48	15	0

Fourth Year.

Fourteen loads of hay wasted to twelve
Fifteen crones, sold per couple at fifteen shillings
Four cows, the new one three pounds five shillings
One fow

24	0	0
11	5	0
15	5	0
7	0	0
57	10	0

Fifth Year.

Twelve loads of hay wasted to ten
Fifteen crones, sold per couple at sixteen shillings
Four cows, the new one at three pounds ten shillings
One fow

20	0	0
12	0	0
15	10	0
5	0	0
52	10	0

Sixth Year.

Ten loads of hay wasted to eight
Fifteen crones, sold per couple at 16 shillings
Four cows
One fow

16	0	0
12	0	0
16	0	0
7	10	0
51	10	0

Seventh Year,		
Fourteen loads of hay waited to twelve	-	24 0 0
Twenty crones, sold per couple at seventeen		
shillings	—	17 0 0
Four cows	—	16 0 0
One sow	—	5 0 0
		62 0 0

Eighth Year.		
Twelve loads of hay waited to ten		20 0 0
Twenty crones, sold per couple at sixteen		
shillings	—	16 0 0
Four cows	—	16 0 0
One sow	—	5 15 0
		57 15 0

Ninth Year.		
Twelve loads of hay waited to ten		20 0 0
Twenty crones, sold per couple at fourteen		
shillings	—	14 0 0
Four cows	—	16 0 0
One sow	—	7 0 0
		57 0 0

Expences.			Produce.		
1st Year	-	45 16 10	1st Year	-	45 5 0
2d Year	-	28 16 10	2d Year	-	49 5 0
3d Year	-	27 6 4	3d Year	-	48 15 0
4th Year	-	29 4 4	4th Year	-	57 10 0
5th Year	-	27 15 10	5th Year	-	52 10 0
6th Year	-	28 6 4	6th Year	-	51 10 0
7th Year	-	30 4 4	7th Year	-	62 0 0
8th Year	-	29 4 4	8th Year	-	57 15 0
9th Year	-	22 13 0	9th Year	-	57 0 0
		269 8 2			481 10 0
					269 8 2
					212 1 10

Which is twenty three pounds eleven shillings and two-pence per annum, or one pound three shillings per acre profit.

The above account displays the vastly superior advantages of grafs, with us, to arable land.

You will certainly remark, that nothing in the above account is reckoned for losses of stock; but in answer to that, I should observe, that nothing is calculated in the arable account for some bad years, when in such land not a quarter of a crop is produced: and I do not mean this calculation as perfect (that is impossible) but only to discover the proportion between the one method and the other; and from what I have observed, and gathered from the information which the most intelligent farmers can give me, I am clear of opinion, that the chances, on the whole are much in favour of the grafs-land, the crop of hay and seed being much more regular than those of corn, clover, or turneps; and supposing the eighty bushels of clover-seed, yet the grafs profit far exceeds the arable, even then; but, as I observed, the probability lies against the latter, supposing the profit to be only fifteen pounds fourteen shillings and eight pence per annum.

I may remind you, that I supposed this twenty acres to be an addition to a farm, not one by itself, and so compared the respective profits; therefore I have not allowed any thing for the seed which the above-mentioned cattle may accidentally have on the arable land, or turneps which they may expend in the winter; and for this reason, because although it appears to me that grafs is the most profitable husbandry, yet a certain quantity of ploughed land should undoubtedly be a part of every grafs-farm, for the raising turneps, some artificial grafs, and clover enough for the winter's food.

I hope your readers will peruse this calculation with candour, and believe me, when I assure them it is the nearest truth of any I can make, either from my own experience, or best information. *Museum Rusticum*, vol. III. p. 317.

State of the Expence of a hoed Crop of Wheat, and the Profit of it compared with that of the common Husbandry.

I propose here to state the expence of a hoed wheat-crop. If this is done in any place where the price of labour is

known, it will be easy from thence to calculate the expence of such crops in any other places.

When wheat is to be horse-hoed, it is planted upon three-bout ridges, about four feet and eight or nine inches broad. If the soil is poor, they may be made broader, but should not be much narrower, otherwise there will not be room enough to plough the intervals. Two rows of wheat, about ten inches asunder, are drilled upon the top of each ridge, and then the intervals or spaces between the double rows will be about three feet and ten inches wide.

For the first crop the land should be well prepared, and very clean: it will therefore cost more than the following crops; and if the land is not in good heart, the first crops will be the smallest, for hoeing greatly improves it. The following estimate is of the succeeding crops.

The necessary culture for these is, once ploughing in autumn, to form the new ridges for the next crop. This may be done with three horses: for the intervals, by frequent hoeing, are kept in fine tilth, and are ploughed at one bout; and in the middle of the ridges where the crop stood, being only the breadth of two narrow furrows, are easily ploughed at another bout: so that these ridges, which in common ploughing required three bouts with four horses, are now ploughed at two with three horses.

The intervals, after the corn is planted, are hoe-ploughed at one bout, to or from the rows. They are usually thus ploughed four times, once in the beginning of winter, and three times afterwards in the spring and summer.

The ten inch partitions, or spaces, between the rows of wheat, are hand-hoed about the end of March: once is generally sufficient, because the wheat soon afterwards spreads, covers the partitions, and keeps down the weeds. The rows are also to be weeded. This is all the ploughing and hoeing that is commonly necessary till harvest. But as in some years it may be proper to plough the ridges in autumn at five or six furrows, or plough them twice, sometimes to hoe-plough the intervals more than four times, or to give them a trench-ploughing, where the staple is deep enough to admit of it, I shall make a full allowance for these, and charge two ploughings and six horse-hoeings every year.

The hiring price in some parts of Middlesex for ploughing a strong loam the first time, in the common way, is seven or eight shillings an acre; I shall say eight shillings. They work about eight hours, and plough about an acre a day with four horses. The price of the labour may be thus distinguished: to the ploughman twenty-pence, and the boy eight-pence a day, including their beer; and then the horses and harness, &c. will come to seventeen-pence a day each. Twice ploughing therefore in autumn, with three horses, comes to eight shillings and nine-pence.

The tops of the ridges are to be rolled with a light roller, or harrowed once or twice with two very light harrows, to break the clods, and lay the tops of the ridges smooth for drilling. The harrows are fastened together by a pole; and a horse, walking in the furrow, draws the two harrows, one upon each ridge. A rolling in the same manner is also useful in the spring, when the earth is pretty dry, and before the partitions are hoed. These rollings and harrowings, of two ridges at once by one horse, are done at a small expence; and not being necessary every year, may cost about four-pence: but to make the total an even sum, I shall charge for them (and uncovering the plants, if any clods happen to fall upon them at the first hoe-ploughing) seven-pence half-penny per acre.

The usual quantity of seed is three pecks, and if it costs five shillings and six-pence per bushel, is four shillings and three half-pence per acre. The drilling is performed by a man and boy, and one horse. They may drill six acres a day: I shall say but five, which is nine-pence per acre.

The intervals should be kept in fine tilth: they are hoe-ploughed at one bout: three horses are sufficient for the first two hoeings, and two for the rest. I shall reckon three for each hoeing, and then six hoeings come to thirteen shillings and two-pence.

The price for hand-hoeing of beans the first time is five shillings per acre; I shall call it six; and as the ten inch partitions, and about two inches on each outside of the rows, is the whole to be hand-hoed (for the hoe-plough does the rest) these are about one fourth part of the ridge, and should be done for eighteen-pence an acre: but it is a good way to agree with the hoers to cleanse the rows also of weeds, and as these ought to be well done, they expect something more than for common work, and they will cost near half a crown per acre.

For reaping, the prices are various; from five or six, to ten

ten shillings per acre; at a medium, eight shillings is a high price. The drilled wheat, having scarcely any weeds in it, and standing upon only about a fourth part of the ridge, is easier and much quicker reaped than sown wheat, and not really worth above half the common price; but, for the above reason, I shall allow, for reaping and carrying, six shillings per acre.

Wheat-straw is a valuable article in the neighbourhood of London; and the straw, chaff, &c. might be reckoned here to pay for threshing and carrying the corn to market: where it is otherwise, an allowance is to be made. And as the distance from the market is uncertain, I shall charge the carrying out, and at market, a shilling per quarter, besides the value of the straw.

Some estates are tythe-free; others pay in kind, or a modus. I shall reckon the tythe at four shillings per acre.

Suppose the rent is sixteen shillings per acre, there remains to be added the taxes, or rates payable by the tenant, which at two shillings in the pound-rent, come to nineteen-pence per acre.

I reckon nothing for dung or manure; for land that is proper for wheat, allowing sufficient intervals and hoeing, requires none. If the wheat of the first crops is weak in the spring, a top-dressing of the rows will be of service, or afterwards, if the proper hoeings have not been given the preceding year; but this seldom happens; for hoeing makes the plants strong, and then also top-dressed, they would be in danger of lodging.

The whole expence, at these prices, of horse-hoed wheat, is, per acre, as follows:

	l.	s.	d.
Two ploughings in autumn, with three horses	0	8	9
Harrowing, seed, and drilling	0	5	6
Six hoe-ploughings of the intervals, with three horses	0	13	2
Hand-hoeing, weeding, and harvesting	0	8	6
Carrying out twenty bushels, and at market, (besides the value of the straw and chaff) at one shilling per quarter	0	2	6
Tythe, rent, and taxes	1	1	7
	3	0	0

This is the whole expence, supposing the soil to be a strong loam, the wages high, and the horses hired; but when done by the farmer's own horses, or the soil lighter, and they work more hours in a day, the expence will be a great deal less, as we shall see below: in some places it will not much exceed half this sum.

It has been already shewn, that one hundred acres of horse-hoed wheat, much of it a light, poor soil, produced near twenty bushels per acre; and that a strong soil, by a medium of twenty hoed crops, produced about twenty-four bushels per acre, both nine gallon measure; and therefore we might reckon here a middling crop about twenty-four bushels: but to avoid all suspicion of partiality, I shall suppose, that a good loam may, one year with another, produce only the least of these, or twenty bushels per acre.

The mean price of wheat at Windsor market, for the last twenty years ending at Michaelmas, 1762, is nearly four shillings and eight-pence three-farthings per bushel, and twenty bushels, at this rate, come to four pounds fourteen shillings and seven pence; so the profit of the horse-hoed wheat is one pound fourteen shillings and seven-pence per acre, or above two rents.

Your ingenious correspondent has above stated the produce and expence of twenty acres of arable land for nine years, according to the course of husbandry practised in his neighbourhood, I shall, by way of comparison, calculate the profit of these twenty acres, supposing they had been under crops of hoed wheat during these nine years.

I reckon, from your correspondent's account, the wages of his ploughmen to be about fourteen pence, and a boy four-pence a day (if not allowed beer) and the horses a shilling a day each; in all, five shillings and six-pence, besides repairs: and if they work more than eight hours, his land being lighter than the above, they may plough about an acre and half a day, which brings the price for ploughing to near his reckoning of four shillings per acre. If this is not exact he will rectify it. I shall state the plough-

ings and horse-hoeings in this proportion, and allow three horses, though fewer will do in this land. The rent-charges, I suppose, include the tenant's taxes; if not, they are to be added to the expence. As the tythe is not mentioned in his account, I do not charge it here. The other items are computed in proportion to his, and the above state of the expence: and as I abated four bushels in the above crop per acre, I shall do the same here, and reckon a middling crop of hoed wheat at only eighteen bushels; his producing, by a medium of three crops, twenty-two bushels and two fifths per acre. The expence of a horse-hoed acre of this land will be nearly as follows:

	l.	s.	d.
Twice ploughing in autumn, with three horses, and harrowing	0	3	0½
Seed three pecks (fifteen shillings and four pence per coomb at a medium) and drilling five acres a day	0	3	4½
Six hoe-ploughings with three horses	0	4	0
Hand-hoeing (at four shillings per acre, reckoned for turneps in the account) and weeding	0	1	8
Harvesting, three shillings and nine-pence: threshing four coomb and a half, four shillings and ten-pence	0	8	7
Carrying out four coomb and a half, and at market	0	4	1½
Rent charges	0	15	0
Total expence per acre	1	19	9½

The three crops of wheat were sold, at a medium, for fourteen shillings and five-pence and four sevenths per coomb, which, for eighteen bushels, comes to

3 5 0½

Profit per acre 1 5 3

The twenty acres, in nine years, produced seven crops, valued at five hundred and three pounds; but in the ninth year, the crop of sixty coomb is cast by mistake at eighty-seven pounds, which should be but half that sum; deducting therefore forty-three pounds ten shillings, the produce amounts to

459 10 9

The expence of these twenty acres in nine years, as charged

361 10 3

To which is to be added for four hundred loads of dung

20 0 0

381 19 3

Remains the profit in nine years

77 19 9

Which is, per acre per annum, near

8 8 8

There were eight hundred loads of dung laid upon these twenty acres; but it is hardly to be supposed, that half that quantity could be made from the seven crops; so that at least four hundred loads must be had elsewhere; and the dung is at a high price in that neighbourhood. I have charged but a shilling a load for it.

But if it should be supposed, that more than four hundred loads could be made from these seven crops, it must also be admitted, that a quantity in proportion would be made from the nine crops of wheat, which not being necessary in the hoeing culture, is worth, to be sold, more per load than I have reckoned above; and the value of it should then be added to the profit of the hoed crops.

Let us next compare the whole profit of these twenty acres in nine years, in both these methods of husbandry.

	l.	s.	d.
The profit, in nine years, of the hoed crops, amounts to	227	5	0
The profit in that time by the common husbandry	77	19	9
Balance in favour of the New Husbandry	149	5	3

Hence appear the great superiority of the hoeing culture; and even allowing the clover had produced four bushels of seed per acre, the New Husbandry is still by far most profitable.

JACK

J.

JACK, an instrument for turning the spit; also a contrivance for supplying the place of a boy in pulling boots off. It also signifies a support for sawing wood upon.

JAMOCK, or *jannock*, oaten bread made into large loaves.

JARDON, a name given by farriers to a swelling on the out-side of the back of a horse.

It generally proceeds from blows and kicks of other horses; but frequently happens to managed horses, by setting them on their haunches: it is seldom attended with much lameness, unless it has been neglected, or some little process of the bone broken. It should be first treated with coolers and repellents, such as hot vinegar, verjuice, &c. but if any swelling continues hard and insensible, the best way is to blister or fire; but mild blisters alone generally succeed. *Bartlet's Farriery, p. 263.*

JAUNDICE, a distemper incident to horses, and generally called, by farriers, the yellows.

Horses are frequently subject to this distemper, which is known by a dusky yellowness of the eyes; the inside of the mouth and lips, the tongue and bars of the roof of the mouth looking also yellow. The creature is dull, and refuses all manner of food; the fever is slow, yet both that and the yellowness increase together. The dung is often hard and dry, of a pale yellow, or light pale green. His urine is commonly of a dark dirty brown colour; and, when it has settled some time on the pavement, it looks red like blood. He stales with some pain and difficulty, and if the distemper is not checked, soon grows delirious and frantic. The off-side of the belly is sometimes hard and distended; and in old horses, when the liver has been long diseased, the cure is scarce practicable, and ends fatally with a wasting diarrhoea: but when the distemper is recent, and in young horses, there is no fear of a recovery, if the following directions are observed:

First of all bleed plentifully; and give the laxative clyster, as horses are apt to be very costive in this distemper; and the next day give him this purge:

Take of Indian rhubarb, powdered, one ounce and a half; saffron two drams; succotrine aloes six drams; syrup of buckthorn a sufficient quantity.

If the rhubarb should be found too expensive, omit it, and add the same quantity of tartar, and half an ounce of Castile soap, with four drams more of aloes. This may be repeated two or three times, giving intermediately the following balls and drink:

Take of Æthiops mineral half an ounce; millepedes the same quantity; Castile soap one ounce: make into a ball, and give one every day, and wash it down with a pint of this decoction:

Take madder root and turmeric of each four ounces; burdock roots sliced, half a pound; Monk's rhubarb four ounces; liquorice sliced two ounces; boil in a gallon of forge water to three quarts; strain off, and sweeten with honey.

Balls of Castile soap and turmeric may be given also for this purpose, to the quantity of three or four ounces a day, and will in most recent cases succeed.

By these means the distemper generally abates in a week, which may be discovered by an alteration in the horse's eyes and mouth; but the medicines must be continued till the yellowness is entirely removed. Should the distemper prove obstinate, and not submit to this treatment,

you must try more potent remedies, viz. mercurial physic, repeated two or three times at proper intervals; and then the following balls:

Take salt of tartar two ounces; cinnabar of antimony four ounces; live millepedes and filings of steel, of each four ounces; Castile or Venice soap half a pound: make into balls of the size of pullets eggs, and give one night and morning, with a pint of the above drink.

It will be proper, on his recovery, to give him two or three mild purges, and, if a full fat horse, to put in a rowel. *Bartlet's Farriery, p. 156.*

ILES, or *oiles*, the beards or the ears of barley, wheat, &c.

INCLOSURE, the separation of common grounds into distinct possessions.

The inclosing lands, and dividing them into different fields, pastures, &c. is a most essential part of their real improvement, and attended with many very considerable advantages, of which we shall here mention only the following:

Inclosures ascertain to every man his just and due property, and thereby prevent infinity of trespasses, injuries, and other sources of ruinous litigation. They keep the land warm, and add to its fertility, by screening it from violent and nipping winds, which otherwise frequently destroy whole crops; and they also defend it from those drying and scorching winds, which so often blast at once the husbandman's, till then well grounded, expectations. They afford shade in the summer, and shelter in the winter, for cattle, which would otherwise destroy more with their feet than they eat with their mouths, and which, for want of these, might, as Mr. Worlidge observes, lose more of their fat or flesh in one sultry day, than they gain in three cold ones. Their cuttings afford fuel to the industrious husbandman, and, if carefully planted and preserved, they will here and there furnish him with timber for his carts, ploughs, and other utensils, besides sometimes useful fruits. They are an excellent encouragement to good husbandry, and a great remedy against beggary, by employing many poor people in the labour which either the making, or the mending of them constantly requires, and which is amply repaid by the increase of crops: for it hath been remarked, not only that well inclosed countries generally maintain treble the number of inhabitants, or more, than the champaign; but also, that those inhabitants are much better fed and clad, than the common run of people in uninclosed lands. To be convinced of this, let any one but examine our vast downs, commons, heaths, wastes, and unimproved forests, badges yet remaining, as Mr. Worlidge properly terms them, of poverty and idleness; but at the same time, thoroughly susceptible of being converted, with proper care, into corn and pasture fields, meadows, garden, orchards, and pleasant groves, the marks of industry and good husbandry. Let him but compare the naked parts of Wiltshire, Gloucestershire, Surry, &c. with the delightful parts of Kent, Herefordshire, and other counties, and he cannot but be struck with a demonstration of the immensely valuable improvements which may yet be made in very many parts of this kingdom. The now unimproved, unoccupied crown-lands, might alone, or even only a part of them, be rendered an inexhaustible source of unequalled wealth to the sovereign, of a vast increase of his subjects, and of happiness to all.

The common objection against inclosures have been so well refuted by many very able writers, and are daily invalidated by that most unerring test, experience, that it would be needless for us to recapitulate them here: we therefore shall only point out one farther essential advantage

tage attending this great improvement, which is, that it enables the farmer to act as is most agreeable to him in sowing when, and what, he pleases.

Every gentleman, whose estate is not yet inclosed, and who is consequently at liberty to choose the manner and means of doing it, will rationally begin with having a map of it drawn, that he may thereby be enabled to divide and portion it out, with the greater propriety and precision, so as to render it most pleasing to the eye, and most convenient to each farmer. If he has a place of residence upon it, he may make the whole become ornamental to that residence, by a judicious disposition of his hedges and plantations, as has been nobly done at Boughton, in Northamptonshire, by the late duke of Montagu, who, with a most refined taste, and truly benevolent mind, disdaining all the little and confined ornaments of a park, executed his fine improvements there in such a manner, as to render them pleasingly beneficial to all his neighbours, as well as to every person settled upon his land. Gubbins, in Hertfordshire, the seat of the late sir Jeremy Sambrook, is another charming example of elegance, though less extensive than the former.

Ha-ha walls, and pieces of water, with rails running across them, are an easy means of preserving a fenced level.

The farms should be so divided, that the dwelling of each tenant may be as contiguous to his land as convenience will admit of, to prevent length of carriage, and to facilitate his due attendance.

Small farms have always been observed to yield the greatest proportional rent, and small inclosures constantly produce the most plentiful crops.

Inclosures for arable lands should be larger than for pastures, that the soil may be kept dry, and the corn be well aired. For the manner of making inclosures, *see the article FENCE*.

ING, a common pasture or meadow.

INOCULATION, a very curious operation in gardening, otherwise called budding.

It is a kind of grafting practised in the summer months on several kinds of stone fruits, as peaches, nectarines, cherries, plumbs, apricots, &c. also upon oranges, jasmynes, and various other sorts of plants, which succeed better by this practice, than by the common method of grafting. The operation is performed in the following manner:

Being provided with a sharp knife, with a flat haft made for this purpose, as also with the cuttings of the tree intended to be propagated, make choice of a smooth part of the stock intended to be inoculated; if designed to be dwarf, five or six inches from the ground: but if a standard, it should be budded at the height of five and a half, or six feet; then, with your knife, make an horizontal cut across the rind of the stock, and from the middle of that cut make a slit downwards about two inches in length, being careful not to cut deeper than the thickness of the bark, lest the stock be wounded: then having the cutting ready, cut off the leaf from the bud, leaving the foot stalk remaining; cut the bud off lengthways, somewhat longer than the slit in the stock, with part of the wood to it; this done, with your knife slip the wood from the bark with a sudden jirk, and observe whether the eye of the bud is left or not, for those buds which lose their eyes in stripping are useless: then with the handle of the knife gently raise the bark on each side of the slit in the stock, and insert the bud therein, observing to place it smooth between the rind and the wood of the stock, cutting off that part of the rind of the bud which may happen to be too long for the slit made in the stock; so having exactly fitted the bud to the stock, tie them closely round with wetted strong bafs, taking care not to bind round the eye of the bud, which should be left open. In about three weeks or a month, the buds will require to be loosened of the bandage, which, if not done in time, will be very injurious to them, but not to be entirely divested of the binding, as it is not amiss to slightly tie them again, which will prevent the bark of the stock from flying open, as sometimes happens, whereby the bud is much injured, if not entirely destroyed.

The March following, the stock should be cut off about three inches above the place of inoculation, sloping it the contrary way to the bud; this length is of use to sustain the shoot to which proceeds from the bud, which otherwise might be blown out by strong winds; but the autumn following, it should be cut close just above the bud, that

the place of amputation may the more readily be barked over.

The time for inoculation, is from the middle of June to the latter end of August, according to the season and the forwardness of the different sorts of trees intended to be budded, which must be known by trying if the buds will separate from the wood easily. The first sort of fruit commonly inoculated, is the apricot, and the last the orange; although the orange is commonly budded in August, it is very proper to try the operation in July, and those stocks which miscarry may be budded the succeeding month, or even in September; but let it be done when it will, it is proper to place them in a gentle heat, giving them plenty of water, by which means there will be no reason to doubt of their success.

In performing this operation, it will be necessary to take the opportunity of moist cloudy weather, as the bud and stock will more readily unite, being more replete with juices than in hot dry weather, when the stock will perspire so fast, as to leave the buds destitute of moisture.

INOM, or *Innum Barley*, such barley as is sown the second crop after the ground is fallowed.

INSECT, a general name for the smaller kinds of animals.

With regard to the generation of insects, the world is now in general convinced, that they are not bred from corruption, but from eggs, though the contrary was believed by the ancients.

Malpighi, Swammerdam, and Redi, have abundantly confuted the doctrine of equivocal generation, as well as the chimerical transformation of the caterpillar into the butterfly, and have shewn, that all the members of the butterfly where inclosed under the nympha or skin of the caterpillar, as the parts of a plant are in the seed.

Insects take particular care to deposit their eggs or semen in such places where they may have a sufficient incubation, and where the young, when hatched, may have proper food till they can shift for themselves. Those whose food is in the water, lay their eggs there; those to whom flesh is a proper food, in flesh; and those to whom the fruits or leaves of vegetables are food, are accordingly deposited there, but constantly the same kind in the same tree. As for others that require a greater degree of warmth, they are provided by the parent with some place in or about the body of other animals, as the feathers of birds, hair of beasts, scales of fish, in the nose, in the flesh, nay some in the bowels of man, and other creatures. As for others, they make them nests, by digging into the earth, wood, &c. carrying in and sealing up provisions that serve for the production of their young, and for their food when produced.

There is observed in flies, butterflies, &c. a kind of glue of which the female fastens her eggs to the bearing buds of trees, &c. so as not to be hurt by rain or frost.

Mr. Andry, in his *Treatise De la Generation des Vers dans le Corps de l'Homme*, takes notice, that the ancients were mistaken in denying that insects breathed, on account of their wanting lungs; for modern observations convince us, that insects have a greater number of lungs than any other animals. They also thought that they had no blood, as many of them had no red liquor like ours; but it is not the colour, but the use of the liquor, that is to be regarded. They also believed that they had no hearts; whereas our microscopes now discover that, when insects have several lungs, they have also several hearts; and this in particular is observable in silk-worms, who have a continued chain of hearts from the head almost to the extremity of the tail; and, as is apparent from several insects, who give signs of life, long after they are divided into several parts.

Insects want no parts that are either necessary or convenient for their use, or to render them complete, in their kind. Some affirm that earth-worms, and those round-tailed worms, which are found in the intestines of men, horses, &c. as also snails, and horse-leeches, are hermaphrodites; but that such worms as become flies, and that silk-worms are not so, being of no sex, but nests full of real animals, which in time come out with wings.

Several sorts of insects do irreparable injury to the husbandman, though so very minute as hardly to be discovered.

Among others, a small kind of worm gets into the roots, chiefly of oats, and, working upwards, destroys all the inside of the plant, which perishes soon after. M. Duhamel suspects it to have been an insect of this kind that destroyed

vast quantities of wheat in the neighbourhood of Geneva, and of which M. de Chateaufieux sent him the following account: "Our wheat, says that illustrious husbandman, in the month of May 1755, sustained a loss which even that cultivated according to the New Husbandry did not escape. We found in it many little white worms, which afterwards became a chestnut colour. They pos't themselves between the blades, and eat the stems. They are usually found between the first joint and the roots. Every stalk which they attacked, grew no more, but became yellow and withered. The same misfortune befel us in the year 1732. These insects appeared about the middle of May, and made such havock that the crop was almost destroyed."

Mr. Lisle mentions, that on the 13th and 14th of June, in pulling up wheat in ear, and sow-thistles, he observed among the upper parts of the root of most of these plants, knots or clusters of grass-lice, or green locusts, as he calls them, which appeared whitish when they were but just come to their shape, and as yet under ground; and among most of these clusters he observed a fly at her incubation, very turgid, of a whitish matter; she then being blowing these insects. Her wings were black, and he thought her plainly the same as the locusts, excepting that it had wings. He did not find more than one fly at any one root.

We too often find, in our kitchen-gardens, a sort of vermin called vine-fretters. They fix upon the roots of leguminous plants, which afterwards gradually turn yellow and die. M. Tillet says he has observed the same insect in the roots of wheat.

The cuckow-spit, or spring-forth, as it is commonly termed, lodges itself principally in the joints of plants, seldom appears before the latter end of May, and is most common when rain has fallen after a series of dry weather. M. Poupert, in his account of this little creature, says, that as soon as it is out of its egg, it goes to a plant, which it touches with its fundament, and fastens there a white drop of liquor full of air; that it drops a second near the first, then a third, and so on till it covers itself all over with a scum or froth, which keeps it from the heat of the sun, or spiders that would suck it. But Mr. Lisle takes this liquid to be nothing but the nightly dew, which falls on the fork or joint of the plant, where the little insect works it into froth with its proboscis, as with a bellows. *See the article BUTTERFLY.*

INSTEP, a name given to that part of a horse's leg, which reaches from the ham to the pastern-joint.

INUNDATION, a flood, or the overflowing of lands by a large collection of water. For the manner of guarding against the bad effects of inundations, *see the article BANKS.*

JOBING, a term made use of by the farmers in the Midland counties, for buying and selling unnecessarily. Mr. Marshall, says "If a Midland farmer goes to a fair, he is ashamed to return without having done some "business:" he must either buy or sell, or he loses his credit as a marketman. Hence, probably, the quantity of business done at the Midland fairs, compared with those of other districts; where one third, or perhaps half, the stock is frequently driven out unsold: while, here, the whole fair may be said to be generally transferred."

JOURNEY. To travel by land, properly as much ground as might be passed over in a day; also a tract or extent of ground, way, or march.

Directions for preserving a Horse sound upon a Journey.

See that his shoes be not too strait, or press his feet, but be exactly shaped; and let him be shod some days before you begin a journey, that they may be settled to his feet.

Observe that he is furnished with a bitt proper for him, and by no means too heavy, which may incline him to carry low, or to rest upon the hand when he grows weary, which horsemen call, making use of his fifth leg.

The mouth of the bitt should rest upon his bars, about half a finger's breadth from his tusks, so as not to make him frumple his lips; the curb should rest in the hollow of his beard, a little above the chin; and if it gall him, you must defend the place with a piece of buff, or other soft leather.

Take notice that the saddle does not rest upon his withers, reins, or back-bone, and that one part of it does not press his back more than another.

Some riders gall a horse's sides below the saddle with

their stirrup-leathers, especially if he be lean; to hinder it you should fix a leather strap between the points of the fore and hind bows of the saddle, and make the stirrup-leather pass over them.

Begin your journey with short marches, especially if your horse has not been exercised for a long time; suffer him to stale as often as you find him inclined, and not only so, but invite him to it; but do not excite your mares to stale, because their vigour will be thereby diminished.

It is advisable to ride very softly, for a quarter or half an hour before you arrive at the inn, that the horse not being too warm, nor out of breath, when put into the stable, you may unbridle him; but if your business obliges you to put on sharply, you must then (the weather being warm) let him be walked in a man's hand, that he may cool by degrees; otherwise, if it be very cold, let him be covered with cloths, and walked up and down in some place free from wind; but in case you have not the convenience of a sheltered walk, stable him forthwith, and let his whole body be rubbed and dried with straw.

Although some people will have their horse's legs rubbed down with straw as soon as they are brought into the stable, thinking to supple them by that means; yet it is one of the greatest errors that can be committed, and produces no other effects than to draw down into the legs those humours that are always stirred up by the fatigue of the journey: not that the rubbing of horses legs is to be disallowed. on the contrary, we highly approve of it, only would not have it done at their first arrival, but when they are perfectly cooled.

Being come to your inn, as soon as your horse is partly dried, and ceases to beat in the flanks, let him be unbridled, his bitt washed, cleaned and wiped, and let him eat his hay at pleasure.

If your horse be very dry, and you have not given him water on the road, give him oats washed in good mild ale.

The dust and sand will sometimes so dry the tongues and mouths of horses, that they lose their appetites: in such case give them bran well moistened with water, to cool and refresh their mouths; or wash their mouths and tongues with a wet sponge, to oblige them to eat.

The foregoing directions are to be observed after moderate riding, but if you have rode excessive hard, unsaddle your horse, and scrape off the sweat with a sweating-knife, or scraper, holding it with both hands, and going always with the hair; then rub his head and ears with a large hair-cloth, wipe him also between the fore-legs and hind-legs; in the mean while, his body should be rubbed all over with straw, especially under his belly and beneath the saddle, till he is thoroughly dry.

That done, set on the saddle again, cover him, and if you have a warm place, let him be gently led up and down in it, for a quarter of an hour, but if not, let him dry where he stands.

Or you may unsaddle him immediately; scrape off the sweat; let the ostler take a little vinegar in his mouth and squirt it into the horse's; then rub his head, between the fore and hind-legs, and his whole body, till he is pretty dry; let him not drink till thoroughly cool and has eat a few oats; for many, by drinking too soon, have been spoiled. Set the saddle in the sun or by a fire in order to dry the pannels.

When horses are arrived in an inn, a man should, before they are unbridled, lift up their feet, to see whether they want any of their shoes, or if those they have, do not rest upon their sides, afterwards he should pick and clear them of the earth and gravel, which may be got betwixt their shoes and soles.

If you water them abroad, upon their return from the river, cause their feet to be stopped with cow-dung, which will ease the pain therein; and if it be in the evening, let the dung continue in their feet all night, to keep them soft and in good condition; but if your horse have brittle feet, it will be requisite to anoint the fore-feet, at the on-setting of the hoofs, with butter, oil, or hog's-grease, before you water him in the morning, and in dry weather they should be also greased at noon.

Many horses, as soon as unbridled, instead of eating, lay themselves down to rest, by the reason of the great pain they have in their feet, so that a man is apt to think them sick, but if he looks to their eyes, he will see they are lively and good, and if he offers them meat as they are lying,

lying, they will eat it very willingly; yet if he handles their feet he will find them extremely hot, which discovers their sufferings in that part.

You must therefore see if their shoes do not rest upon their soles, which is somewhat difficult to be known, without unshoeing them, but if you take off their shoes, then look to the inside of them, and you may perceive that those parts which rest upon the sole, are more smooth and shining than the others: in this case you are to pare their feet in those parts, and fix on their shoes again, anointing the hoofs, and stopping the soles with scalding hot black pitch or tar.

After a long day's journey, at night feel your horse's back, if it be pinched, galled or swelled, (if you do not immediately discover it, perhaps you may after supper) there is nothing better than to rub it with good brandy and the white of an egg. If the galls are between the legs, use the same remedy; but if the ostler rubs him well between the legs he will seldom be galled in that part.

In order to preserve horses after travel, take these few useful instructions. When you are arrived from a journey, immediately draw the two heel nails of the fore-feet; and, if it be a large shoe, then four: two or three days after you may bleed him in the neck, and feed him for ten or twelve days only with wet bran, without giving him any oats; but keep him well littered.

The reason why you are to draw the heel-nails is, because the heels are apt to swell, and if they are not thus eased, the shoes would press and straiten them too much: it is also adviseable to stop them with cow-dung for a-while, but do not take the shoes off, nor pare the feet, because the humours are drawn down by such means.

The following bath will be very serviceable for preserving your horse's legs: Take the dung of a cow or ox, and make it thin with vinegar, so as to be of the consistence of thick broth, and having added a handful of small salt, rub his fore-legs from the knees, and the hind-legs from the gambrels, chafing them well with and against the hair, that the remedy may sink in and stick to those parts, that they may be all covered over with it. Thus leave the horse till morning, not wetting his legs, but giving him his water that evening in a pail: next morning lead him to the river, or wash his legs in well-water, which is very good, and will keep them from swelling.

Those persons, who, to recover their horses feet, make a hole in them, which they fill with moistened cow-dung, and keep it in their fore-feet during the space of a month, do very ill, because, though the continual moisture that

issues from the dung, occasions the growing of the hoof, yet it dries and shrinks it so excessively when out of that place, that it splits and breaks like glass, and the foot immediately straitens.

For it is certain that cow-dung (contrary to the opinion of many people) spoils a horse's hoof; it does indeed moisten the sole, but dries up the hoof, which is of a different nature from it.

In order therefore to recover a horse's feet, instead of cow-dung, fill a hole with blue wet clay, and make him keep his fore-feet in it for a month.

For a horse that has been rid extremely hard, that there is danger of foundering, see an excellent remedy under the head *Foundering in the Feet*.

Most horses that are fatigued, or over-rid, and made lean by long journies, have their flanks altered without being purfy, especially vigorous horses that have worked too violently.

There is no better method to recover them, than to give each of them in the morning, half a pound of honey very well mingled with scalded bran, and when they readily eat the half pound, give them the next a whole one, and afterwards two pounds, every day continuing this course till your horses are empty, and purge kindly with it; but as soon as you perceive that their purging ceases, forbear to give them any more honey.

You may administer powder of liquorice in the scalded bran for a considerable time; and to cool their blood, it will not be improper to let them have three or four glisters: if their flanks do not recover, give them powder for purfing horses.

In case the horse be very lean, it is expedient to give him some wet bran, over and above his proportion of oats; and grafs is also extraordinarily beneficial if he be not purfing.

If it be a mare, put her to a horse, and if she never had a foal before it will enlarge her belly.

Sometimes excessive feeding may do horses more harm than good, by rendering them subject to the farcy.

You should therefore be cautious in giving them too great a quantity at a time, and take a little blood from him now and then.

When a horse begins to drink heartily, it is a certain sign that he will recover in a short time: but as to the method of giving him water during a journey, see HORSES.

JUG, a large drinking vessel, with a gibbous or swelling belly.

JUNET, earth-nut.

K.

KEEVE, a fat in which beer is worked or fermented.

KELL, a web, or kind of bag, in which insects are bred.

KID, a small faggot of under or brush-wood.

KIDDEROW, a place for keeping a sucking calf.

KIDNEYS, two pretty large glandulous bodies situated in the cavity of a horse's loins upon the two lowermost ribs.

Their use is to separate the urine, which is of great importance to the health and preservation of horses, they being liable to many diseases, which either take their origin from faulty kidneys, or have at least such symptoms, as plainly shew the kidneys to be more or less affected.

The signs of the kidneys being hurt or affected, are a

weakness of the back and loins, difficulty of staling, faintness, loss of appetite, and deadness in the eyes; the urine is thick, foul, and sometimes bloody, especially after a violent strain. A horse diseased in his kidneys can seldom back, that is, move strait backwards, without pain, which is visible as often as he is put to the trial: the same thing is observable indeed in horses, whose backs have been wrung and wrenched, but with this difference, that in the latter there is seldom any defect or alteration in the urine except that it is higher coloured.

Bleeding is the prime remedy, and that plentifully, in order to prevent inflammation; and the more so, if a fever attends a difficulty in staling, for then we may suspect the kidneys already inflamed. A rowel in the belly has been found useful, and the following balls may be given twice

twice or thrice a day, with a pint of marshmallow decoction, in which half an ounce of gum-arabic is dissolved, with an ounce of honey.

Take Lucatelli's balsam one ounce; spermaceti six drams; sal prunellæ half an ounce; mix into a ball with honey; if the urine is bloody, add half an ounce of Japan earth.

Should the fever continue, bleed largely, give emollient clysters, and the cooling, opening drink, till it abates.

If the urine passes with difficulty and pain, notwithstanding these means, give this ball, and repeat it twice or thrice a day, till the horse stales freer and without pain, his urine becomes of a right consistence, and is free from any purulent settlement.

Take balsam of capivi, or Strasbourg turpentine and Venice soap, of each one ounce; nitre six drams; myrrh powdered two drams: make into a ball with honey, and wash it down with the marshmallow decoction.

But if this method should not be successful, and the urine continues turbid, grows coffee-coloured or foetid, the horse losing his appetite and flesh, it is a sure sign of ulceration in the kidney; which if the above remedies do not soon remove, you may depend on it the horse will go into a consumption, and is incurable.

As a suppression of urine arises sometimes from an inflammation of the kidney; so at others, from a paralytic disorder, disabling them in their office of separating the urine from the blood: in this latter case the bladder is usually empty, so that a horse will make no motions to stale, and if he continues a few days in this condition, his body will swell to a great degree, breaking out in blotches all over, and death will soon close the scene.

If it arises from inflammation, bleed largely and treat the horse as above recommended; but if not, give stimulating clysters, and strong diuretics, such as the following balls, once in four hours; for if a horse stales not in thirty hours, his danger must be great.

Take juniper-berries powdered one ounce; sal prunellæ six drams; ætherial oil of turpentine half an ounce; camphor one dram; oil of juniper two drams: make into a ball with honey, and give after it three or four horns-full of the marshmallow decoction and honey.

Or,

Take squills powdered two or three drams; nitre half an ounce; or six drams: make into a ball with honey.

Or,

The following, which is more forcing, and should be given with caution.

Take cantharides well dried, from one scruple to half a dram; camphor dissolved in oil of almonds, from one dram to two; nitre and Venice soap, of each an ounce: mix into a ball with syrup of marshmallows.

When this last ball is given, the horse should be made to drink plenty of water, with gum-arabic dissolved in it; the following clyster may also be given at the same time:

Take of Barbadoes aloes two ounces; the same quantity of Venice turpentine, beat up with the yolks of two eggs; jallop powdered two drams; juniper and bay-berries, each a handful, bruised and boiled in two quarts of a decoction of mallows; strain off and mix by degrees with the above, to which add a pint of linseed-oil.

If the complaint is not recovered by these means, rub the horse's reins well with two parts of oil of turpentine, and one of oil of amber; and apply a poultice of garlic, horse-radish, mustard-seed, camphor, and green soap, spread on thick cloth, over them. Give the horse also two drams of calomel over night, and a moderate purge the next morning. These, perhaps, are the chief and

best remedies that can be given in this generally fatal disorder.

When the strangury in a horse does not arise from wind, or dung pressing on the neck of the bladder, the cause is from inflammation, or too long a retention of the urine. Such horses make frequent motions to stale, stand wide and straddling, are full, and have their flanks distended. In this case bleed largely; give the following drink, and repeat it every two hours for two or three times till the horse is relieved.

Take Venice turpentine broke with the yolk of an egg one ounce; nitre or sal prunellæ six drams; half a pint of sweet oil, and a pint of white wine.

If the drink should not have the desired effect, the diuretic ball above-mentioned may be given in the same manner, omitting the myrrh.

Give the horse plenty of the marshmallow decoction, in a quart of which dissolve an ounce of nitre and gum-arabic, and two of honey.

Horses subject to a diabetes, or profuse staling, if old, or of weak constitution, are seldom cured; they soon lose their flesh and appetite, grow feeble, their coat staling, and they die rotten. Of a young horse there are more hopes; but he must not be indulged with too much water, or moist food. Give him the following:

Take jesuits-bark four ounces; bistort and tormentil-root, of each two ounces: boil in two gallons of lime-water to the consumption of half, and give a pint three times a day.

Let the horse drink two or three quarts a day of lime-water; and if these medicines should not succeed, give a quart of strong allum posset, three or four times a day.

This method is proper also for a horse who stales blood; or the following balls may be given for that purpose, if the bleeding is profuse.

Take bole-armoniac one ounce; Japan earth half an ounce; roch allum two drams; elixir of vitriol one dram: make into a ball with conserve of roses, and give it every six hours.

As this disorder generally proceeds from too violent exercise, over-straining, &c. repeated bleedings in small quantities are absolutely necessary, till the mouths of the vessels close up. *Bartlett's Farriery, p. 159.*

KILN, a kind of stove for admitting heat, in order to dry any substance, as malt, hops, &c. See the articles MALT and HOPS.

KILN also signifies a fabric constructed for burning lime-stone, chalk, &c. into lime.

The kiln commonly used for this purpose is a large pit, generally round, and of a size proportioned to the quantities intended to be burnt. It is widest at the top, and narrower, by degrees, as it comes nearer the bottom. The inside of this pit is sometimes lined with a wall built of lime-stone; but more commonly, and more properly with brick: at the outside, near the bottom, is a hole, or door, by which the ashes are taken out; and above that, some have an iron-grate, which comes close to the wall round about: but others make an arch with stone, or large pieces of chalk; and upon this they lay a layer of stone, or of whatever else they burn in the kiln; upon this they place a layer of fuel, and so on, layer over layer, till the kiln is full; only observing that the outermost layer be always of the fuel, and not of chalk or stone. When the kiln is thus filled, fire is given at the hole underneath; and the lime is finished in a different time, according to the nature of the substance. That made of chalk is generally burnt in twenty-four hours; but stone often requires sixty hours. Ten bushels of sea-coal, or one hundred of faggots three feet long, will burn forty bushels of chalk, which will yield thirty bushels of unslacked lime. Where chalk is scarce, the chalk rubbish is often worked up into a kind of paste, with water, and made into a sort of bricks, which are dried in the air, and then burnt into lime in the common way: but this is not quite so good as that which is burnt from the chalk-stone.

The experience of late years has shown that it is more profitable

profitable to burn lime in kilns shaped like a hoghead; that is, small in circumference at the bottom, gradually wider towards the middle, and then contracting again upwards to the top. This kiln, as Mr. Lummis observes in his letter to the Edinburgh Society, published by Mr. Maxwell, should be made entirely within the surface of the ground, on the declivity of a little hill, where that situation can be had, so as to allow free access to the air-hole or surface. At the bottom, about a foot from the ground, are iron bars, placed horizontally across, to give the kiln a good draught, and upon these bars are laid, first small wood or furze, then small coals, then stones about the bigness of an egg, then another layer of fuel, and so on, increasing the size of the stones towards the middle of the kiln, where they may be as big as half a peck, and decreasing their size gradually up to the top, observing to lay the smallest nearest to the sides. The stones need not be broken so small for this kiln, as for those above ground; they will be burnt more truly without raw stones, or running into cinders; and not above half the quantity of fuel consumed in the common way, will be used in this.

The following method of constructing another kiln is thus particularly described in Mr. Maxwell's Collection:

"At bottom, the kiln must be three feet four inches wide; and at the height of two feet four inches, three feet six inches. At the depth of four feet and a half, it must be four feet and a half wide. A second slope is then made five feet and a half higher, at the end of which, the kiln, then ten feet deep, should be exactly ten feet wide within the walls. A third slope should heighten it to 14 feet, where it should be exactly 12 feet and a half wide, likewise, within the walls. From thence it is run up to the height of nineteen feet, when it should be rather less than fifteen feet wide. The slopes must be made as gradual as possible, and the inner surface of the kiln must be quite smooth, that its contents may fall down equally when the burnt stones are drawn out below. By extending a line from a pole fixed in the centre of the bottom or floor of the kiln to the sides, workmen will easily be guided in making the above-mentioned slopes. This kiln has four vents, opposite to one another, and no cross-irons whereupon to lay the coals and stones, they being supported by old timber, furze, broom, &c. above which the coals are laid: but if the kiln be built on the side of a hill, it can have but three vents. The first layer of stones above the vents should be closely jammed in, and rest against the sides of the wall. A kiln of the above dimensions will burn eighty bushels of lime-stones in a day; but it may be made larger, without altering these dimensions, by only adding two or three feet to the height, which will require strong walls. This addition to the height need not be sloped, but may be made perpendicular.

The late earl of Stair had a kiln at New Liston, and others in Galloway, built in the shape of an egg, opened a little at both ends, and set upon the smallest. This kiln answered exceedingly well, and besides lime-stone, burnt any kind of earth that was thrown into it.

Kilns thus built, swelling at or about the middle, and contracting again at the top, reverberate more strongly, and make a more intense heat, than those which grow wider and wider, and are not contracted.

When the kiln is filled, or finished as it is commonly termed, it should be covered over with sods of strong turf, to keep the heat as intense as possible, and hinder the wind from blowing the fire at the top, or rain from abating or

extinguishing it. The stones must be broke in pieces before they are thrown into the kiln; otherwise the air contained in their cavities, being expanded by the heat, will often make them fly with such violence as to damage the kiln. For this reason they should be broken smaller for kilns that are above ground, than for those which are underneath. The saving of this labour, and of near half the quantity of fuel, renders these last greatly preferable.

Lime is made of chalk, or of any stone that is not too cold, or sandy, as freestone and the like. All the soft stones that are of a tolerably close texture, will burn to good lime, as will also marble, slate, sea-shells, corals, and flints; but this last kind of stone is more difficult to be burnt into lime than the others, except in a reverberatory kiln, because it is apt to run to glass. The hardest, firmest, and whitest stones make the best lime; and when it is made of chalk, that which is formed of the hardest, stony kind, is much better than that which is made from the soft; but the harder the stones are, the more fire it requires to burn them. Both sorts may be burnt with wood, coals, turf, furze, or fern, which make a very fierce fire.

These kilns seem to be intended for burning only one kiln full at a time; but where large quantities of lime are wanted, perpetual kilns, that is, kilns where the fire is kept constantly burning, are constructed on nearly the same principles. Here the iron bars at the bottom are absolutely necessary, in order to take out the lime as soon as it is burnt. When stone-lime, which requires the most violent fire, is burnt in these kilns, vents are made near the bottom to be opened occasionally, according as the wind fits, that a stronger current of air may quicken the fire, and thereby give it the more power. *See the article LIME.*

KILN-ASHES, the ashes made in kilns where wood, straw, furz, &c. are burnt. These ashes are a good manure for almost any kind of soil. In the west of England, the farmers sift them over their corn and grass; but this must not be done in windy weather, because they are so very light, that they would easily be blown away. They succeed best when laid on just before rain or snow.

KINNEL, a powdering tub.

KIT, a milking-pail, in the form of a churn, with two ears and a cover.

KITES, hawks, and other birds of prey, wait for chickens, pigeons, pheasants; and upon which account it is necessary that the countryman be constantly furnished with a good fowling-piece to destroy them; or steep the entrails of pigs, fowls, or rabbits in the lees of wine, into which you have infused a quantity of nux vomica, and throw a bait where the kites come in the evening, or early in the morning. This will intoxicate them so, that a person waiting near the spot, may easily take them.

To recover them so as to tame them.

When they are caught during the fit of intoxication, pour a little salad oil down their throats, and rub their heads with strong white wine vinegar; and the cure will be speedily effected.

KNAPWEED, the same with blue-bottle. *See BLUE-BOTTLE.*

KNOT-GRASS, the same with couch-grass. *See COUCH-GRASS.*

KNOLL, a little round hill.

KNOLLS, a term used in some counties of England to signify turneps.

L.

LABOURER. See SERVANTS.

LACTARY, a milk-house.

LADIES-SMOCK, *Cuckoo flower*, or *Canterbury-bells*, a perennial weed, and common in pasture grounds. The stalk is upright, round, and smooth. The leaves are winged, with the lobes of the lower ones roundish, and of those on the stalk oblong. The flowers are large, handsome, and white, or purplish, consisting of four obtuse veined petals. The seeds are contained in erect compressed pods, about an inch in length, divided into two cells, which, when ripe, burst with a touch, and throw out their seeds to a considerable distance.

LAIRE. See LAYER.

LAMB, the young of the sheep-kind. See the article SHEEP.

LAMENESS, in horses. See the article STRAINS.

LAMPAS, an excrescence in the roof of a horse's mouth, which is sometimes so luxuriant, that it grows about the teeth, and hinders his feeding.

The cure consists in lightly cauterizing the flesh with a hot iron, taking care that it does not penetrate too deep, so as to scale off the thin bone that lies under the upper bars: the part may then be anointed with burnt allum and honey, which is proper for most sores in the mouth. *Bartley's Farriery*, p. 282.

LAND. See the article GROUND and SOIL.

LARCH-TREE, a genus of trees, whose leaves, which are long and narrow, are produced out of little tubercles, in form of a painter's pencil: the cones are produced at remote distances from the male flowers on the same tree: the male flowers are very like small cones at their first appearance, but afterwards stretched out in length.

These trees are propagated by seeds, which should be sown in the beginning of March, upon a bed of light soil, exposed only to the morning sun: or otherwise they may be sown in pots or boxes of light earth, and placed near a hedge, where they may have the morning sun only. The seed should be covered about half an inch thick with fine light earth, and in very dry weather should be gently refreshed with water. In about six weeks, if your seeds were good, your plants will come up, at which time you should carefully guard them against the rapacious birds, which would otherwise pull off the heads of the plants, as they thrust themselves out of the ground with their covers on them: and observe to refresh them with water in dry weather, especially if they are sown in pots or boxes; also to keep them clear from weeds, which, if suffered to grow among the young plants, will soon destroy them: nor should they be too much exposed to the sun, or strong winds, both which are very injurious to these plants while they are young: but in October you should, if they are in boxes or pots, remove them into a situation where they may be defended from sharp winds, which are sometimes hurtful to them, while young; but afterwards they will endure the severest weather of our climate.

These trees are very proper for the sides of barren hills, where few other sorts will thrive so well: nor is this tree very delicate in its soil, but will grow much better on poor, strong, stony land, than in rich ground; and, during the summer, they appear very beautiful; but in autumn they cast their leaves, whereby some people have been deceived, by supposing them dead, and have destroyed them.

From the wounded bark of this tree exudes the purest Venice turpentine; and on the body and branches of it grows the agaric, which is a drug used in medicine.

Mr. Young, in his *Annals of Agriculture*, vol. V. speaks of the larch tree to the following effect. "Larixwood is possessed of so many valuable qualities, that to enumerate the whole would appear an extravagant hyperbole. It is known to resist water, without rotting, almost for ever. The piles of larix timber on which the houses of Venice

were built many hundred years ago, when examined, are still found as fresh as when first put in. And I have been told, stakes of it have been tried in the decoys of Lincolnshire, which, between wind and water, have already outworn two or three sets of oak stakes, and do not yet discover any symptoms of decay. It is also known to possess the valuable quality of neither shrinking nor warping, when put into work; nor is it liable to be pierced by worms in our climate, as many of the paintings of Raphael Urban, which are done on this wood, and are still perfectly entire, sufficiently prove.

"Experiments have not yet ascertained whether it will resist the sea-worm in tropical climates, like Bermuda cedar; but there is reason to think it would, as in many of its other properties, it resembles that wood very much. Along with these valuable properties, it is known to be one of the quickest growing trees in this climate, remarkably hardy, and extremely beautiful when growing. It is, besides, much more easily reared than the oak, and could be spread over a great extent of mountains, if sufficiently bare of herbage, at next to no expence, by the natural shedding of its seeds, like birch or fir in soils that favour them, merely by keeping out cattle from those fields in which small clumps of this kind of wood had been planted some years before. In this way very extensive tracts in the condition described might be entirely filled with this valuable timber. The uses to which it might be applied are innumerable. It would be valuable not only for ship-plank; but even crooked timbers might be obtained by using a little art when young to bend it, as the Bermudians do their cedar; for flood-gates in navigable canals and wet-docks, it would exceed every thing that can be obtained in this climate. For barrel staves it would be inimitable, and would enable us to furnish that article as cheap as in any other nation whatever: and in building it would answer all the purposes to which fir is now applied, being much stronger and more durable than that wood. And when it is also adverted to, that it is next to incombustible, the reader will not think it strange that I in this manner so strongly recommend it to the attention of my countrymen, particularly those in the most rugged and barren districts: for, in such situations, it would be easy to shew, that at a very trifling charge, they might, in a short period of years, bring their estates to a hundred times the value they bear at present, or ever can be made to bear by any other kind of improvement. This would be a much more eligible plan of bettering their fortune than that of trying to squeeze, with difficulty, from a poor people, a raised rent for a subject that does not admit of proportionable improvement."

LASK, LAX, or LOOSENESS, [*in Horses*] is a distemper occasioned by such a weakness of the stomach, that their food passes through their guts without any alteration, which is a very dangerous case, and frequently fatal to them. It also sometimes proceeds from the corruption of humours, either collected in the stomach, or thrown upon it from other parts.

The external causes are, eating too much provender, feeding upon mouldy or rotten hay, frozen grass, rye, straw, and other unwholesome fodder, drinking very cold water, or immediately after the eating of a great quantity of oats, immoderate fatigue, excessive fatness, and sometimes want of exercise.

If the excrements voided, boil and work upon the ground, it is a sign that the distemper proceeds from overheated choler, which is seldom dangerous; nay it is sometimes profitable.

Again, if the ordure be white, it is a sign of crude, cold humours; if watery, it betokens a great weakness in the stomach.

Lasks occasioned by drinking cold water in summer, or melted

melted snow, or by eating tender grafs, or other loosening things, are not to be regarded; but such as proceed without any manifest outward cause, are not by any means to be neglected.

For the cure. If the excrements appear mixed with small pieces or scrapings of the guts, you ought immediately to endeavour to prevent a deadly ulcer in those parts, by giving him two or three times a day a pint of cooling softening decoction, made as follows: viz. two ounces of barley, two ounces of marsh-mallow roots, and one ounce of the powder of sal prunella, boiled in three quarts of water to one quart.

If the distemper is caused by phlegm, you may make use of cordial powders or pills, and other hot medicines proper for strengthening the stomach and relaxed parts.

Sometimes a lax is a reasonable effort of nature, to free itself from a troublesome load of humours; but if it continues longer than three days, with loss of appetite, it ought to be checked, for horses are sometimes foundered by its long continuance.

In this case, give the horse for his food, bran moistened with claret, or barley parched and ground, and the best hay; but oats are in no wise proper.

A horse is in the best order that only dungs once, or at the most twice, in ten miles riding. Young and fiery horses are often very lax; but this weakness generally leaves them by the time they are seven or eight years old, if they have been properly fed and but gently exercised. The fiery sort sometimes continue to purge after any extraordinary exercise, for their digestive powers are, for the most part, but weak; and also eat so speedily, that they swallow their oats almost whole, and eject them in the same state.

When a purging is habitual, or happens by accident, until the horse seems to lose strength or flesh, or both, it is not necessary to give him any astringent medicines, as the discharge may be only a salutary effort of nature to throw off what is either redundant or offensive; a gentle purge may be given, and a few mashies of bran; which, perhaps, by assisting nature, may perfect a cure: but if the disease continues, and the horse loses flesh, grows dispirited and feeble, recourse must be had to astringents, when the dung is like that of a cow, but the vigour of the horse not impaired, he is said to have a lax: but when the strength and flesh fails he is said to have a scouring or purging.

When a scouring comes on at the latter end of any obstinate and tedious disease, as low, putrid fevers, farcy, &c. they are usually the forerunners of death, particularly if they are accompanied with a disagreeable discharge at the same time from the nose.

If the scouring proceeds from cold, and there is some degree of fever, according to the strength of the horse and the violence of the heat, bleed; then give the following:

Take of rhubarb, half an ounce, or six drachms; lenitive electuary, two ounces: mix, and make a ball.

Repeat this, every two or three days, until the fever abates: and betwixt the days of giving the rhubarb, give the following astringent medicine once a day.

Astringent Decoction.

Take oak bark, grossly powdered; boil it in a pint of water to the consumption of one third; then pour off the liquor for one dose.

Except the fever and purging increase together, great care should be taken not to check the purging, lest the fever be increased thereby.

If little or no fever attends, after bleeding, give the following solutive ball:

Take of aloes half an ounce; diapente, one ounce; treacle enough to make a ball: repeat this once a week, and if there is much griping and distention from wind, the restringent glyster will be necessary.

It may be proper to remind the reader, that in these complaints, glysters should be small in quantity; and if the disease is violent, they should be repeated as often as they come away. If there is great pain, forty drops of liquid laudanum may be added to one of the glysters, and repeated as the urgency thereof requires.

If the scouring still continues without relief, give two drachms of cerated glass of antimony, mixed with one ounce of diacodium, or two ounces of cordial balls.

Alum, Armenian bole, or other astringent and absorbent medicines, are given to one ounce, once or twice a day, but usually one or two doses will answer the end.

If the cause is a weak digestion, which is known by the food passing nearly in the same state in which the stomach received it; the dung being very soft and pale; the appetite small, and the horse very lean: beside gentle exercise and dry food, such as the best hay, beans in larger quantities than are usually given, and those so moistened that the horse need not drink much, give the following stomach purge, and repeat it as occasion may require:

Take of aloes, half an ounce: cream of tartar and myrrh, each half an ounce; treacle, enough to make a ball; and on the days in which this purge is not operating, give the following:

Stomach Drink.

Take of oak-bark, bruised, half a pound; Gentian root sliced, one pound; ginger, bruised, two ounces; infuse them in a gallon of ale three or four days; and give half or three quarters of a pint every night and morning.

When a viscid matter, obstructing the mouths of the lacteals, gives rise to this disorder, a summer's grafs, or, which is still better, the salt marsh, will effect a cure: where these cannot be obtained, the stomach purge before directed may be given once a week.

In any of the above cases, where there is a discharge of sharp, slimy matter, with severe griping, avoid oily and greasy things, but give the following in glysters, viz. Tripe-liquor, or very thin starch; either of these may be given to three or four pints at a time, and liquid laudanum, to the quantity of forty or sixty drops, may be added to one of the glysters, to moderate the pains, and repeated as may seem needful.

When blood appears with the excrement, it is called the bloody-flux: in which case, if there is great pain, and frequent motions for discharge, there is also a great danger. In this case give frequent glysters of tripe-broth, or thin starch, with thirty or forty drops of liquid laudanum in each, until the pain is abated in some measure; and give the same medicines as above directed for the more obstinate scourings, particularly the ball made with cerated glass of antimony, and cordial ball. For common drink give the following:

Boil a pound of burnt hartshorn in ten pints of water to a gallon; at the latter end of the boiling, add to it four ounces of gum arabic; continually stirring until the gum is dissolved: then remove the whole from the fire.

LASSITUDE, or weariness in horses, may proceed either from heat or cold; either when he has a retention of urine, has drank after being heated, or has been put to his utmost at once after long rest; the remedy for which is, rest. You may also give him hog's suet mixed with wine.

If the lassitude proceeds from cold, or be in cold weather, make use of fomentations, and anoint his head and back-bone with ointment, in hot water or warm wine.

If he has retained his urine, use the same medicines, or rub his head and reins with hot oil, mixed with hog's grease or hog's blood, and give it him to drink with wine.

LATH, a long, thin, and narrow slip of wood, nailed to the rafters of a roof or ceiling, in order to sustain the covering.

These are distinguished into three kinds, according to the different kinds of wood of which they are made, viz. heart of oak, sap laths, and deal lath; of which the two last are used for ceilings and partitions, and the first for tiling only.

Laths are also distinguished according to their length; into five feet, four feet, and three feet laths; though the statute allows but of two lengths, those of five, and those of three feet, each of which ought to be an inch and a half in breadth, and half an inch in thickness; but they are commonly less.

LATH-BRICKS, bricks much longer than ordinary, used instead

instead of laths, for drying malt; for which purpose they are extremely proper, as not being liable to catch fire, and retaining the heat much longer than those of wood; so that a very small fire will serve after they are once heated.

LATHE, a word used in some counties in England, to signify a barn.

LEAF, a part of a plant, commonly very thin and flat, growing in the spring, and falling off in the autumn.

Leaves are the ornament of the twigs, and consist of a very glutinous matter, being furnished every where with veins and nerves. Their office is to subtilize the nourishing sap, and convey it to the little buds; and likewise they serve to cover the flowers and fruits with their shade, and keep them from other inconveniences; they are to trees what hair is to the human body.

Dr. Grew observes, that the fibres of leaves consist of two general kinds of vessels, namely, for sap, and for air; and are ramified out of greater into less, as veins and arteries are in animals.

Mr. Frederick, of Augsbourg, a celebrated gardener, took from the tree a leaf of the opuntia or Indian fig-tree; and setting it in the earth, it immediately took root, and produced blossoms and fruit.

The distinction of leaves, made by those who have written on botany, are the following:

A simple leaf is that which is not divided to the middle.

A compound leaf is divided into several parts, each resembling a simple leaf, as in liquorice, &c.

A digitated leaf is a compound leaf divided into several parts, all of which meet together at the tail, as in the hemp, black hellebore, &c.

A trifoliated leaf is a digitated leaf, consisting of three fingers, as the trefoil, &c.

A quinquelfoliated leaf is a digitated leaf, consisting of five fingers, as in the quinquelfolium.

A pennated leaf is a compound leaf divided into several parts, each of which is called a lobe, placed along the middle rib, either alternately, or by pairs. When the middle rib is terminated by an odd lobe, it is said to be unequally pennated, as in the goats rue, &c. and equally pennated, when it is not terminated by an odd lobe, as in the cassia; when the lobes are all nearly of the same form and bigness, it is called an uniform pennated leaf, as in the liquorice; when they are not so, it is said to be difform, as in the agrimonia.

A winged leaf is, as it were, divided into several pennated leaves, as in the orobus, &c.

A ramose leaf is that which is still farther divided than the winged leaf, as in the osmund royal, female fern, &c.

An entire leaf or lobe is that which has no division on its edges, as in the apple-tree, &c.

A sinuated leaf is that which is cut about the edges into several long segments, as in common mallows.

A serrated leaf is that which is cut about the edges into several acute segments, resembling the teeth of a saw, as in the nettle, &c.

A crenated leaf is that which is cut about the edges into several obtuse segments, as in the betony, &c.

A lacinated or jagged leaf is that which is cut about the edges into several pretty deep portions, in an irregular manner, as in the horned poppy, &c.

If the surface of the leaves are altered, by reversing the branches of trees on which they grow, the plants are stopped in their growth, until the footstalks are turned, and the leaves recover their former position. This shews how necessary it is to support all those weak shoots of plants, which are naturally disposed for upright growth, which either twine about the neighbouring trees for support, or that put out clasps, by which they take hold of whatever trees or plants grow near them, and are thereby supported; and, on the contrary, how absurd is that practice of tying up the shoots of those plants which are naturally disposed to trail upon the ground; for in both these cases nature is reversed, and consequently the growth of both sorts of plants is greatly retarded.

This is one of the great functions for which the leaves of trees and plants are designed; but besides this, there are others of equal importance to the well-being of plants and fruits: the first is, that of the footstalks and leaves nourishing and preparing the buds of the future shoots, which are always formed at the base of those footstalks, and during the continuance of the leaves in perfect health, these buds increase in their magnitude; and, in the deci-

duous trees, are brought to maturity before the footstalks separate from the buds in autumn; but if by accident the leaves are blighted, or if the entire surface of the leaves are cut off, and the footstalks are left remaining, the buds will decay for want of that proper nourishment which is conveyed to them from the leaves; so that whenever trees are divested of their leaves, or those leaves are cut, or otherwise impaired, though it may in either case happen when the buds may be nearly formed, yet if it is before the footstalks separate naturally from their branches, the future shoots will be weakened in proportion to the time when this is done; therefore from all the experiments which have been made in order to know how serviceable the leaves of trees and plants are to their well-being, it has been found, that when the plants have been divested of their leaves, or their leaves have been eaten or cut, during their growth, the plants have been remarkably weakened thereby. This should teach us not to pull or cut off the leaves of trees, or plants, on any account, while they retain their verdure, and are in health; and this shews how absurd that common practice is, of feeding down wheat in the winter and spring with sheep; for by so doing, the stalks are rendered very weak, and the ears are in proportion shorter; nor are the grains of corn so plump and well nourished, as that which is not fed down upon the same ground: this is a fact which we can assert from many years experience. It is very evident, that grass which is often mowed, the blades will be rendered finer in proportion to the frequency of mowing it, yet the species of grass is the same with that on the richest pastures; so that although this may be a desirable thing for lawns, &c. in gardens, yet where regard is had to the produce, this should be avoided.

Another principal use of the leaves, is to throw off by transpiration what is unnecessary to the growth of the plants, answering to the discharge made by sweat in animal bodies; for as plants receive and transpire much more, in equal time, than large animals, so it appears how necessary the leaves are to preserve the plants in perfect health; for it has been found by the most exact calculation, made from repeated experiments, that a plant of the sun-flower receives and perspires, in twenty-four hours, seventeen times more than a man.

Mr. Young, in his *Annals of Agriculture*, vol. VII. recommends the leaves of trees as food for sheep. He says, that at Languedoc, "These animals have scarcely any other food from November to April, than the leaves of trees, preserved for that purpose; the broom is therefore the only fresh food they have; they eat it with great avidity, and prefer it to all other plants: they are, however, subject in consequence of living entirely upon it, to an inflammation in the urinary passage, by which sometimes the fifth of a flock is destroyed, but this is very easily prevented by a proper change of food."

We shall beg leave to mention a few, out of the many experiments which have been made by M. Bonnet, of Geneva, to prove that most leaves imbibed the moisture of the air on their under surface, and not from their upper; they are as follow:

He gathered the leaves of sixteen sorts of herbaceous plants when fully grown: of each he put several leaves upon the surface of water in glass vases; some were posited with their upper surface, and others with their under surface upon the water; these were adjusted exactly to the surface of the water, with great care not to let any moisture reach their opposite surfaces, and the same care was taken to prevent their footstalks from receiving any moisture. The glasses in which these leaves were thus placed, were kept in a closet, where the air was very temperate; and as the water in the glasses evaporated, there was, from time to time, a supply of fresh, which was added with a syringe, so that the leaves were not disturbed. The leaves were taken from the following plants: the plaintain, the mullein, the wake-robin, the great mallow, the nettle, the marvel of Peru, the kidney-bean, the sun-flower, the cabbage, the baum, the cock's-comb, the purple leaved amaranth, spinach, and the smaller mallow.

Six of these sorts he found continued green a long time, and these were with different surfaces upon the water: they were of the following sorts: the wake-robin, the kidney-bean, the sun-flower, the cabbage, spinach, and the small mallow; among the others the following sorts were found to draw the moisture better with their upper than with their under surface: the plaintain, the mullein, the great

great mallow, the nettle, the cock's-comb, and the purple amaranth.

The leaves of the nettle, whose under surfaces were placed upon the water, were decayed in three weeks; whereas those whose upper surfaces touched the water, lasted three weeks.

The leaves of the mullein, whose under surfaces were next the water, did not continue fresh more than five or six days, whereas those whose upper surfaces were next the water, lasted five weeks.

The leaves of the purple amaranth, whose upper surfaces were next the water, continued fresh three months; whereas those whose under surfaces touched the fluid, were decayed in a week.

The leaves of the marvel of Peru and the baum appeared to have the advantage, whose under surfaces were next the water.

The leaves of the wake-robin, and of the cock's-comb, whose footstalks only were put in the water, continued fresh a longer time than those which were placed with either surface upon the water.

The leaves of the great mallow, the nettle, the sun-flower, the marvel of Peru, and the spinach, whose footstalks were plunged into the water, continued fresh a shorter time than those which had either of their surfaces upon the water.

The leaves of the mullein, plaintain, and amaranth, which received the water at their footstalks, continued fresh much longer than those whose under surfaces touched the water.

It is not difficult to explain the reason of this fact; for the orifices of the sap-vessels in the footstalks are much larger than those of either surface, so that the water insinuates itself in greater quantities, and with more ease in the first than by the second way.

After this the same gentleman made experiments on the leaves of sixteen sorts of trees and shrubs, of the following sorts: the lilac, the pear-tree, the vine, the aspin, the laurel, the cherry-tree, the plum-tree, the horse-chestnut, the white mulberry, the lime-tree, the poplar, the apricot, the walnut, the filbert, the oak, and the creeper.

Among these species he found, that the lilac, and the aspin, imbibed the water equally with either their upper or under surface; but in all the other sorts, the under surfaces imbibed it in much greater quantities than the upper. The difference was very remarkable in the leaves of the white mulberry, for those whose upper surfaces were laid upon the water, faded in five days; whereas the others, whose under surfaces were next the water, preserved their verdure near six months.

The vine, the poplar, and the walnut afforded very remarkable instances, how little disposed the upper surfaces of the leaves of ligneous plants are to imbibe the moisture: for the leaves of these three sorts, whose upper surfaces were applied to the water, decayed almost as soon as those which had no nourishment.

In all the experiments made by this curious gentleman upon the various leaves of trees and herbs, it is remarkable that all those leaves, which imbibed their moisture by their upper surface, were such as had that surface covered over with hairs or down: and, on the contrary, where the under surface was garnished with either hairs or down, the nourishment was imbibed by that surface. He also mentions many experiments made by himself, and also by M. Duhamel de Monceau, of the Royal Academy of Sciences at Paris, in rubbing the leaves over with varnish, oil, wax, and honey, to see the effect of these upon various leaves, some of which were rubbed over on both surfaces, others only upon one; some only a part of the surfaces, others the edges of the leaves were rubbed over, and in some only the footstalks of the leaves. They likewise anointed the trunks of some trees and shrubs, leaving the leaves and branches in their natural state.

The result of these experiments was, that where the leaves were covered with varnish on both sides, they presently decayed; and where they were anointed with other things, the leaves continued a shorter time than others, in proportion as the things were more penetrating; and where one surface only was anointed, they continued much longer than those which were anointed on both: and where the pedicle alone was anointed, they continued still longer: but the anointing of the trunks made no sensible alteration, except in very hot weather; when they were both of opi-

nion the anointing them were of service, by hindering the too great transpiration, which tend to weaken the trees: for they observed, that those trees which were varnished, suffered less from the violent heats, than the trees which were left in their natural state.

M. Bonnet also observed, that the tender parts of the leaves which were varnished were destroyed by it, and the tough fibres only left remaining.

We may therefore reasonably conclude, that one great use of leaves is what has been long suspected by many, viz. to perform, in some measure, the same office for the support of vegetable life, as the lungs of animals do for the support of animal life: plants, very probably, drawing through their leaves, some part of their nourishment from the air. *Miller's Gard. Diet.*

LEAP, or *Lip*, half a bushel.

LEASE, *Ley*, *Lay*, or *Ley*, implies grassy ground, meadow ground or unploughed ground, kept for cattle.

LEASE also signifies the letting of lands, tenements, &c. unto another for life; a term of years, under a reserved rent.

LEES, the more gross and ponderous parts of liquors, which, being separated by fermentation, fall to the bottom.

The lees of wine, beer, ale, and oil, are excellent manures.

LEET, a little court held within a manor, and called the king's court, on account that its authority to punish offences originally belonged to the crown, and from thence descended to inferior persons.

LEGS OF A HORSE should have a due proportion of their length to that of the body: the fore-legs are subject to many infirmities, as being the parts that suffer most, and are also commonly the smallest and weakest.

There are several marks of bad legs, viz. if they appear altogether straight, or as if they were all of one piece.

A horse is said to be straight upon his members, when from the knee to the fore part of the coronet, the knees, shank and coronet, descend in a straight or plumb-line, and that the pastern-joint appears more, or at least as much advanced as the rest of the leg; such legs are like those of a goat, making a horse apt to stumble and fall; so that in time the pastern is thrust quite forward, out of its place, and the horse becomes lame.

Horses which are straight upon their members, are quite contrary to those that are long jointed; that is, whose pasterns are so long and flexible, that the horse in walking almost touches the ground with them.

This is a greater imperfection than the former, because some remedy may be applied to them, but there can be none for this; besides, it is a sign of little or no strength, and such horses are not fit for much fatigue or toil.

Some horses, though they be long-jointed, yet do not bend their pasterns in walking, being somewhat long; yet if they are not too flexible, such a horse will gallop and run with a great deal more ease to his rider, than if he were short jointed.

These are the only horses for persons of quality, who seek after their own ease and pleasure; and indeed those horses may be compared to coaches with springs, which render them infinitely more easy than those without them.

LEGS in a straight line is an imperfection in a horse, where his legs from the knee to the coronet, appear in a straight line as the horse stands with them in their natural position.

The remedy is shoeing; in doing which the heels must be taken down almost to the quick, without hollowing the quarters; and if, when this has been done, the leg does not fall back enough, but that the horse still carries his pastern-joint too far forward, then the shoe must be so made as to go beyond or exceed the toe, about the breadth of half a finger; and also it must be thicker in that than in any other part: and in the mean time, anoint the back sinews of his legs with the ointment of Montpellier; and these things will reduce them to their proper position.

Of the four legs, the two before have several parts, each of which has a peculiar name; so that by the name of fore-leg, we commonly understand that part of the fore-quarters that extends from the hough to the pastern-joint, and call it the shank. The part that corresponds with it in the hinder quarters we call the inflep.

But in common discourse, we confound the fore and hind quarters, and without any distinction, say, the fore leg of a horse.

A horse is said to want the fifth leg, when he is tired, and, bearing upon the bridle, lies heavy on the horseman's hand.

LENTIL, or *bitter Vetch*, the name of a plant of the vetch or tare kind, cultivated in some parts of England as fodder for cattle.

Lentils grow to a foot and a half high, with stalks and leaves like those of tares, but smaller; and like them they bear their seeds, generally three or four in little pods. These seeds are round, hard, smooth, and flat, but thicker at the sides. There are two sorts of lentils, the white and yellow; but the latter affords the greater quantity of fodder.

The seeds of this plant are commonly sown in March, where the land is dry, but in moist ground the time is in April. The usual quantity of seed allowed to an acre of land is from one bushel and a half to two bushels. If these are sown in drills in the same manner as pease, they will succeed better, than when they are sown broad-cast. The drills should be a foot and a half asunder, to allow room for the hoe to clean the ground between them; for if the weeds are permitted to grow among them, they will get above the lentils, and starve them. *Miller's Gard. Dict.*

LIGS, in a horse, are little pushes, wheals or bladders, within the lips of a horse, and are cured by bruising wormwood and skirwort in a mortar, with a little honey, to anoint the sores with.

LIME, a soft friable substance, obtained by calcining or burning stones, shells, and the like.

The most certain way to know whether any sort of stone be fit for making lime, is to drop upon it a little aquafortis, spirit of sea-salt, or oil of vitriol. All stones on which the above, or any other strong acid effervesces or rises in bubbles, are lime stones, or will burn to lime; and the stronger the effervescence is, the fitter they are for that purpose. All country gentlemen should keep some such spirit by them, to try the nature of the stones that may be found on their estates.

All lime is a very good manure, but that made of stone is much better than what is made of chalk. It makes the greatest improvement upon light sandy soils, or upon a dry gravel; wet and cold gravel is less benefited by it, and cold clay the least of all. The common allowance is a bushel to a pole square, or a hundred and sixty bushels to an acre. Mr. Lummis laid after the rate of three hundred bushels on an acre, and found it answer extremely well: but that was upon a strong clay. His method of using it, as communicated to the Edinburgh Society, and the result, he says, of what he had experienced to be best, is as follows:

"In the month of October, he lays together three or four of the largest stones (burnt into lime) on the sward or turf of a strong clay ground: or as many of the small stones as are equal to the large ones, so that seventy or eighty bolls (two hundred and eighty, or three hundred and twenty bushels) may complete an acre. If rain falls, it melts immediately; if not, it will melt and flake in forty-eight hours, or less, according to the moisture of the air. He then spreads it directly, leaving no part of it upon the spot where the stones were laid. This done, he lets it lie twelve months, or till the month of November after the October twelve months, when he ploughs it in, and lets it remain in that state all the winter, during which frosts and rains mellow and prepare the ground for the next spring ploughing, and render it fit for barley. He prefers this method to laying the lime on in powder, because, in this last way, it is apt to be blown about with the wind, to the great detriment of both men and horses, such as spoiling the men's eyes, hair, and cloaths, and the eyes and hair of the horses, making their coats look dry and ugly, besides losing much of the lime.

"The lime laid in the month of October, as above directed, on a strong arable land, which has been some years under grass, and continuing spread for about twelve months before it be ploughed in, has been found so to alter the grass to a fine natural clover, that, by feeding of sheep or black cattle upon it, it has paid the whole charge the first year by the grass, and cattle will choose rather to feed on this ground than any other, and grow fatter. If the ground be loose and open, it may be ploughed in the ensuing March, if limed in October. In either way, it so far melliorates the sward, and the soil, that the best of crops may

be expected for three or four years; and by laying some dung upon it the 4th or 5th year, two or three crops more may be obtained; after which the ground will be in excellent order to lay down with grass seeds."

Notwithstanding that lime is so very good a manure, Mr. Lummis prefers marle, if it can be had within the ground, or near the place where it is to be used; for though it be more chargeable at first, yet, lasting five times as long, it is in the end much cheaper. He generally lays near two hundred loads of it upon an acre, at about seven or eight bushels to the load.

Mr. Evelyn advises mixing the lime with the turf or sward, laying them alternately, turf on lime, and lime on turf, in heaps for six months; by which means it will become so rich and mellow, as to dissolve and run like ashes, and carry a much more cherishing vigour, than if used alone in a greater quantity, and without danger of burning out and exhausting the vegetative virtue which it should preserve. It is likewise greatly bettered by being mixed with dung, or with mud drawn from the bottom of ponds or rivers. In Westmoreland, they reap fine crops of barley from their sandy lands, by manuring them with lime and cow-dung mixed together.

The nature of lime on land is like that of chalk: it works downwards, as the farmers express it, and is therefore best treated in the same manner, laying it upon a lay the year before it is to be ploughed up. When used on land which lies upon a descent, it should by all means be mixed with dung, and laid principally on the higher part of the land; the consequence of which will be, that the rain will wash out the virtues of the lime and dung together, and carry them to the lower parts as it runs down. In fact, it does better on any land, when mixed with dung, than either of them alone. This is particularly observed in Shropshire, where they lay dung and lime together, about twenty loads of the former, and only twenty bushels of the latter, on an acre of ground. In Leicestershire, they sow or scatter the lime on wheat land when they sow the wheat; but on barley-land, the last earth but one, left it should burn the barley if sowed with it in spring. They allow five quarters to an acre of each, reckoning by the measure in which it comes from the kiln; for after it is flaked, those five quarters will make near ten.

Lime is thought to make corn grow with a thin husk. It is a great destroyer of moss and rushes, even after it has been flaked; as quicklime is of the remnants of furzes, after the old bushes have been grubbed up. Its hot quality renders it apt to over-burn dry soils. It certainly is most efficacious when spread directly from the kiln.

Mr. Marshall, in his *Rural Economy of Norfolk*, says, "1781, in May last I made an experiment with lime for turneps, by spreading a chaldron of lime (at the rate of three chaldrons an acre) across each of two pieces of turnep fallow, and marked the stripes with flumps.

"No apparent benefit arose from the lime until the late heavy rains fell; since which the plants have flourished, and the good effect of the lime is become evident.

"In March last I also made a similar experiment with lime for barley; but the crop did not, in any stage, receive apparent benefit from it. The summer, until after the barley had finished its growth, was dry.

"In the experiment with lime for wheat (see Min. 18.) the crop received no apparent benefit from the lime until the soil had been moistened with summer rains.

"From these and other observations I am of opinion, that lime does not act as a manure until it has been thoroughly flaked in the soil; and, from the last mentioned incident, it seems as if the rains of summer were necessary to promote its operation."

Mr. Lisle, whose account of lime is almost unintelligibly perplexed and confused, thinks it is best, especially on lands that work mellow, to spread and plough in this manure as soon as it is flaked, rather than to let it lie long in heaps covered with earth. He very properly gives it as a rule to all husbandmen, to be cautious of liming ground, and then ploughing out the heart of it; the bad consequences of which he himself experienced.

"I limed, says he, some years ago, in Wiltshire, seven acres for an experiment, and laid down one acre to its own natural grass. In two years time this grass was, and still is, worth forty shillings an acre. The third year, I laid down another acre, which is still worth thirty shillings a year.

year. The rest, which I ploughed five or six years longer, is not worth fifteen groats an acre. I have experienced the like in burn-baking ground."

The practice of Lower Normandy, where lime is chiefly used on lands newly broken up, is thus related by M. Duhamel:

"After giving these lands a shallow ploughing, they carry on the lime as it comes from the kiln, and lay about an hundred weight of it in a heap on every square perch; so that the heaps lie at a perch distant from one another; they then raise the earth all round the heaps, like so many basons: the earth which forms the sides of these basons should be a foot thick: and, lastly, they arch the heaps over with earth, six inches thick. The lime flakes under this covering, and is reduced to powder; but at the same time it increases in bulk, and thereby cracks the earth. If these cracks be not carefully stopped, rain will get through them, and reduce the lime into a paste, or kind of mortar, which will not mix with the earth, or answer the end proposed. Farmers are therefore very careful to examine the heaps from time to time, and stop the cracks. Some only press down the top of the heap with the back of a shovel: but this method is liable to a considerable inconvenience; for if the lime be in a paste within the heap, it is by this means beat together in such manner, that it becomes still more difficult to mix it with the earth: for which reason it is better to stop the crevices, by throwing a little fresh earth over the heap.

When the lime is thoroughly flaked, and reduced to powder, the heaps are cut with a shovel, and the lime is mixed as well as possible with the earth that covered it. This mixture is then thrown up in heaps again, and left exposed to the air for six weeks or two months: for then the rain will not hurt it.

About the beginning of June, this compost of lime and earth is spread upon land: but not by throwing it about unequally, or at random: on the contrary, it is taken up by shovels, and distributed in little heaps, at equal distances, on each perch of ground, it having been observed, that these little heaps promote vegetation, more than if the manure was spread uniformly all over the field; nor is it at all needed, if small intervals remain unlimed between each shovelful. The field is afterwards ploughed, for the last time, very deep: then, towards the end of June, it is sown with buck-wheat, which is covered with a harrow; and if any clods remain, they are broken with a hoe.

Buck-wheat occupies the land a hundred days; so that this grain, sown about the end of June, is gathered about the end of September. When the stalks and roots of this plant are dead and dried, the ground is ploughed up, and immediately sowed with wheat, which is harrowed in. After the wheat has been reaped, the land is ploughed as soon as possible. It is ploughed for the last time, in February or March, in order to sow oats; or in April for barley: but in this case it is turned up two or three times, to make it fine. All these different grains are harrowed in. A roller is passed over the oats when they are come up; and if any clods remain in the barley, they are broken with a hoe.

In the next February or March the land is ploughed again, in order to sow it with grey peas or vetches: and after these pulses have been reaped, one or two ploughings are given, to prepare it for wheat in the ensuing autumn.

The next year oats are sowed, sometimes mixed with a little clover; and then the ground is laid down to pasture for three or four years.

Sometimes no buck-wheat is sowed on land newly broken; but it lies fallow, from the month of March, with it was first ploughed, till October, when it is sowed with wheat, after receiving several ploughings during the intermediate time. These lands being, by this means, brought to a tolerable tilth, not above three quarters of the quantity of lime above mentioned is used on them, and they generally bear a better crop than those which are first sowed with buck-wheat.

Some farmers think a perch too great a distance for conveniently spreading the lime. They therefore make the heaps less, and increase their number in proportion. Others lay their lime in ridges, from one end of the field to the other; which facilitates the spreading of it. Being persuaded that lime is most efficacious when it lies shallow in the ground, they first plough it in, and then give a second ploughing before they sow, which brings it again near the surface."

Mr. Young, in his *Annals of Agriculture*, vol. XIV. in a

review of Mr. Marshall's *Rural Economy*, says, "Another economical practice in the management of lime, is equally entitled to notice. If a quantity of lime be fetched in autumn, or the early part of winter, to be used in the spring, when team labour is more valuable, it is thrown up into a regular roof-like heap or mound, and thatched as a flack, a small trench being cut round the skirts to catch, with an outlet to convey away rain water. By this admirable precaution the surface of the heap perhaps to a considerable depth, is prevented from being run to a mortar-like consistence by the snows and rains of winter, and thereby rendered in a manner useless."

Mr. Young, in his *Annals of Agriculture*, vol. IV. recommends the mixing of lime with dung for manure in the following manner:

"Cart the dung out of the farm-yard, some in December, and continue to do it as made, in the following months, till the heap amounts to about 120 loads, each 40 bushels; if made larger, the dung does not rot so well. When finished leave it about two months, and then add 200 bushels of lime, which is sold at the pit at 5d. per bushel; mix the whole together immediately. But it is to be observed, that the dung must not be dry; if it is, it will fire by being mixed with lime. Let it lie three months, and then stir it over again. The expence of the first stirring is 1d. a load, and of the second 1d. Carry it on to the pea stubble as soon as harvest is over, and plough it in for barley; if the season does not suit for carting, take the opportunity of a frost. This management has answered so well, that upon an average of 12 years, my barley crops have amounted to 4 qrs. 6 bushels per acre. I have at different times laid some dung on without lime being mixed, and the difference was very perceptible; so that from many experiments I find it necessary to spread 12 loads an acre instead of 10, which, with the lime, is the usual quantity.

"The benefit resulting from the lime is to be attributed to two circumstances. First, it destroys the seeds of weeds, so that I have always found the land cleanest where the lime mixture is laid; and second, it brings the dung forwarder, by raising the fermentation higher."

Lime is commonly said to enrich land greatly at first; but afterwards, when its efficacy is exhausted, to leave the ground more barren than it was before. Lime readily unites with every unctuous substance, and renders it more soluble in water. By this means, all such particles mixed with the soil may be more speedily converted to the nourishment of vegetables, than they might otherwise be. Indeed, if the farmer's avarice, or want of judgment, tempt him to over-crop the ground, it may be left without matter fit to nourish plants, till a fresh supply is brought; but if it be judiciously cropped, and left in good heart under grass, or any other produce which does not impoverish the soil, the effect of the lime will be more durable, and more advantageous than is generally imagined.

Mr. Marshall, in his *Rural Economy of Yorkshire*, says, "Lime is a sheet-anchor in the Vale husbandry. It is used invariably, I believe, on every species of soil, and in most cases with great success. It seems to be at present a received idea that the business of aration could not be carried on, or at least that the present rents of land could not be paid, without the assistance of lime.

"It is not my intention to attempt to prove or disprove the truth of this opinion. Suffice it for me to say, in this place, that I am not acquainted with any country in which lime is held in such high repute, nor where the manufacturing of it is so common a practice among farmers, as it is in this. Almost every principal farmer upon the margin burns his own lime.

"There are, besides, great number of sale kilns for smaller farmers, and for the centre of the Vale, where no materials for burning are to be had. There is an instance of one man occupying eight or ten kilns; burning two or three thousand chaldrons yearly.

"But beneficial as lime undoubtedly is in some cases to corn, its benefit to grass is a matter in dispute, even among the farmers of Yorkshire. Incidents are authenticated in which, to general appearance, it has been detrimental.

"But without the assistance of comparison, the judgment is at a loss to ascertain with any degree of precision the effects of manures. Nevertheless, general appearances to those who have a knowledge of the nature of the soil, have their weight.

"It seems, however, to be a generally received idea, that lime which is laid on for grafs is not thrown away; for whenever the land is again turned up, its benefit to corn will have full effect.

"Long as lime has been in common use as a manure, the proper method of applying it to the soil is far from being universally practised.

"The methods of liming are various.

"The worst is that of laying it in large heaps, and suffering it to run to a jelly before it be spread upon the land.

"Next to this is setting it about the land in small hillocks; for although these hillocks be spread before they approach to a state of mortar, this method is injudicious.

"Lime which falls in the open air does not fall to powder, but breaks into checquers, or small cubical masses; which being once buried in the soil, may remain in it for ages without being mixt intimately with it.

"As far as experience and theory have yet reached, lime ought to be spread in a state of perfect powder, thereby lodging it in the pores of the soil; and thus, by assimilating the two ingredients, form with them one homogeneous calcareous mass.

"A single stone exposed to a moist atmosphere falls entirely into granules, not into powder. It is observable, however, that much depends upon the nature of the stone from which the lime has been burnt. Stones of a uniform texture, as most marbles, are less liable to fall in granules than stones which are naturally composed of grains, or are divided by fissures into natural fragments.

"The smaller the heaps, the nearer they approach to single stones; there is a greater proportion of surface, and consequently a greater proportion of granules.

"It is therefore the practice of judicious husbandmen to set lime upon the land in load-heaps, and spread it over the soil out of carts, as soon as it is sufficiently fallen.

"There is an instance of practice in this neighbourhood, and, I believe, only one, which is still superior to that last-mentioned. In this instance, the load-heaps are turned over, not so much to finish the falling, as to gain an opportunity of burying the granulous surface of the heap; by which means the fragments are at least lessened, if not reduced to powder.

"In the Morelands a still better practice is said to prevail. There the heaps are interlayed and covered up with moist turf-mould, (the rubbish from peat and turf fuel), which bringing on a rapid fall, the whole is set on fire, and the surface kept free from granules by a covering of dry ashes.

"This leads to a general improvement in the method of slaking lime; cover up the heaps, whether large or small, with soil either of the field they are set in, or that of lanes or ditches carted to them for the purpose; and if a speedy fall be required, throw water over this covering.

"If lime be used on fallow for wheat, it is generally spread on in July; good farmers making a point of harrowing it in as fast as it is spread, and plowing it under with a shallow furrow, as soon as convenient.

"The usual quantity set on is three to four chaldrons an acre." In his Minutes of Agriculture, in the Midland Counties, Mr. Marshall says that "The lime produced from Breedon Hill is of a singular quality.

"Five or six quarters an acre are found to be a beneficial dressing for the lands of this neighbourhood. But it is an opinion, universally admitted, that if much more than that quantity be laid on, it is poison to the land: it having been observed, that where, by accident, a greater quantity has been scattered, no grafs will grow: and that where load-heaps have stood, no corn will thrive; but, instead of it a bed of couch and thistles appears: a circumstance which has set many men against it, under an idea that it breeds these two pests of cultivated land."

LIME-KILN. See the article **KILN**, and **BURNING LIME**.

LIME-STONE, a species of stone which will burn into lime. See the article **LIME**.

LIME-TREE, or *Linden-Tree*, a beautiful tree for walks, and other decorations, in parks &c. and of which Mr. Miller has enumerated four species.

All the species of the lime-tree are easily propagated by layers, which will, in one year, take good root, and may then be taken off, and planted in a nursery, at four feet

distant row from row, and two feet asunder in the rows. The best time to lay them down, and to remove them, is, when their leaves begin to fall, that they may take root before the frost comes on, though they may be transplanted any time from September to March, in open weather; but if the soil be dry, it is much the better way to remove them in autumn, because it will save a great expence in watering, especially if the spring should prove dry. In this nursery they may remain four or five years, during which time the ground should be dug every spring, and constantly kept clear from weeds, and the large side shoots pruned off, to cause them to advance in height; but the small twigs must not be pruned off from the stems, because these are absolutely necessary to detain the sap, for the augmentation of their trunks, which are apt to shoot up too slender, when they are entirely divested of all their lateral twigs. If the soil in which they are planted be a fat loam, they will make a prodigious progress in their growth, so that in three years time they will be fit to transplant out, where they are to remain.

They may also be propagated by cuttings; but as this method is not so certain as by layers, the other is generally practised. In order to obtain proper shoots for laying down, a lime-tree is cut down close to the ground, from the roots of which a great number of strong shoots are produced the following year; these will be large enough to lay down the succeeding autumn, especially if the smallest of them are cut off close early in the spring; for when too many shoots are suffered to grow during the summer, they will be much weaker, than if only a sufficient quantity be left. For the manner of laying down these shoots, see the article **LAYER**.

The timber of the lime-tree is used by carvers, it being a soft light wood; as also by architects for framing the models of their buildings; the turners likewise use it for making light bowls, dishes &c. but it is too soft for any strong purposes. *Miller's Gard. Dict.*

LINDEN-TREE. See the preceding article.

LING, heath.

LINSEED. See **FLAX-SEED**.

LIPPITUDE, in a horse, is a defluxion of a salt, sharp humour from the eyes, attended with a violent itching, pains, and redness; the eye-lid swelling, so as to turn the inside as it were outward; the sight grows dull, and the eyes frequently closed up: it usually attacks young horses at about five or six years of age; it comes and goes once in three months, or oftener, and continues each time, more or less, from a week to a month; thus it goes on, perhaps, two years or more, when all the symptoms cease, but end in a cataract.

The sharp humour abovementioned runs down the cheek in greater or less quantities, and is so hot as to scald and destroy the hair there: the veins in all the parts about the eyes are very turgid, sometimes the eye appears dull, at others cloudy, then again clearer: but it is rarely sprightly: the humour that distils from the eyes is sometimes so thick as to close up the eye-lids for some time.

The seat of this disease is in the glands on the inside of the eye-lids; and it may be observed, that if they are of a good size, and well shaped, if they are clear, and the sight is good, as soon as the sharp humours abate, if the returns are less violent and more rare, some hope of recovery, without ending in a cataract, may be indulged; but if the eye shrinks and grows less, a cataract will certainly ensue.

In order to the cure, if the eye is not in a perishing state, and the horse in low condition, bleed; then, once in eight days give a cooling purge; and, on the days free from purging, give diuretics, particularly nitre, to the quantity of two ounces in a day: and, in order to strengthen the relaxed glands and membrane of the eye-lid, many light scarifications may be made, with a lancet, on the inside of the eye-lid, which turns out; then the whole eye may be washed two or three times a day with the following lotion:

Take of white vitriol, two drachms; camphire, one drachm; rub them well together, then gradually mix them with a pint of water.

When by these means the sharp humour decreases, give the following alterative powder, every morning, for two or three months; then, after an interval of the same time, repeat it as before:

Alterative

Alterative Powder.

Take of crude antimony, half an ounce; gum guaiacum, two drams; mix them for one dose.

When the blood vessels about the eyes and parts adjacent are extremely turgid, they may be well bathed, two or three times a day, with strong vinegar. It is the practice of some, on these occasions, to take up the principal branches of veins; and in some other cases, to tie up arteries; but this method is rather hurtful than otherwise, by checking the circulation and depriving the parts of nourishment.

If the eye seems to shrink, wash it with the following, two or three times a day:

The Collyrium.

Take of crude sal armoniac, two drams; brandy, four ounces; lime-water, one pint, mixt.

With this collyrium, try also what a better diet will do; allow him a moderate quantity of oats: good nourishment and moderate exercise may give a favourable turn; indeed, in disorders of the eyes, hard labour should be universally avoided. It is worthy of remark, that low keeping, after good and plentiful feeding, greatly hurts the sight; and hard labour, added to the sparing diet, aggravates the disadvantage considerably. Colts are often made to go blind, by full feeding, and early hard working.

These means not succeeding, the last resource is mercurials; and, perhaps, the most proper will be the turbith mineral, which may be given as directed for the farcy.

LIPS in a horse. If these be thin and little, they contribute to a good mouth, but the contrary if they be large and thick.

LIQUORICE, a plant propagated for medicinal uses. It grows to about four or five feet high; its stalks are hard and woody; its leaves small and roundish, standing together on the two sides of a rib, and making what botanists call a winged leaf.

A correspondent of the editors of the *Museum Rusticum* has given the following directions for cultivating this plant, founded on a long series of experience:

"The common culture of liquorice is not difficult to be learned; and this with proper attention, will enable any thinking farmer, that knows his business, to cultivate it to advantage.

"This plant thrives best on a deep, loose, rich mould; and if it is fresh land, that has not for many years borne corn, the profit will be the greater, as the crop will be larger, and the roots of a finer quality.

"A rich sandy soil, provided it is deep, will do well for this plant; and it must always be remembered, that too much moisture is its greatest enemy; let no one therefore attempt to plant it on a damp clay, lest the whole crop be cankered.

"Land cannot be made too fine, nor dug too deep, for liquorice; it should be, at least, moved with the spade to the depth of two feet and a half, and if a little deeper, so much the better.

"If the land, on which the liquorice sets are to be planted is fresh, rich, and in good heart, it needs no manure for the first crop; but if it has been for some years in tillage, the planter will do well to give it, in the summer time, a good dressing of very rotten dung, lime, and coal-ashes or soot, mixed together, some months before, in a compost; the quantity must be regulated by the state of the land, always remembering that this plant requires a great deal of nourishment, and is a great impoverisher of land, though it extracts much of its nourishment, or food, from a considerable depth, at a distance from the surface; some of the roots running five or six feet, at least, into the ground.

"When the ground is properly prepared, reduced to a very fine tilth, and laid level, some liquorice runners, or sets, are to be procured. These must be cut into pieces, about eight or nine inches long each, and planted in rows, with dibbers armed with iron points. I make my rows two feet asunder, put my sets fifteen inches from each other, and when three rows are planted on a six-foot bed, I allow two feet more of interval betwixt bed and bed.

"When I put in my sets with the dibber, I leave the upper end of each set just level with the surface of the ground; I should have observed, that I have all my sets care-

fully inspected before they are carried into the field, to see that each of them has one, if not two eyes, or buds, without which they would make no shoots.

"When the whole spot of ground is planted, I make my labourers dig up the intervals one spit deep, and spread the earth on the beds; this raises them about two inches above the head of the sets, and by lowering the intervals, serves in wet seasons to drain the beds. I generally contrive to get this work done by the last week in September; but in favourable years, the middle of October is not too late.

"If the weather proves mild, I have no farther trouble with them during the winter; but if it is likely to freeze hard, I cover the beds with pease-haulm, or long dung, or some such matter, to forward the growth of the roots in the spring, and protect them during the winter, from the frosts.

"Early in the spring, on the first appearance of the weeds, I allow my liquorice a thorough hoeing; and this is several times repeated in the dry weather of the summer.

"The winter following, I again cover them with long dung, and in the spring, before the roots begin to shoot, I have the spaces betwixt the rows on the beds loosened with a spade, and the intervals are well dug; immediately after which, I give the land a slight dressing of coal-soot, sown by hand: it should be thick enough to make the land look black: this the first rains wash in, and it greatly warms and invigorates the plants.

"The second and third summers, all I have to do, is to keep my crop clear of weeds: this indeed, is very necessary, and the hoeings for this purpose must be more or less frequent, according to the season; generally, three times in the summer are quite sufficient, especially if the land was well prepared before the sets were planted.

Many good sensible farmers, whom I have known to cultivate this plant in autumn, have a practice of cutting down the stalks, whilst they are in full sap, thinking thereby to strengthen the roots. I differ from them, however, in opinion, and am rather apt to imagine that this cutting of the stalks, whilst the sap is in motion, must be prejudicial to the roots. It is, therefore, my custom, always to defer cutting off the stalks, till they are withered, and begin to decay; nature then indicating, that an abstraction will be of service.

"These roots should have three summers growth before they are fit to take up: it is very seldom that they have attained a proper size at two years end; and if you leave them longer than three years in the ground, the roots are apt to grow sticky, and lose a part of their saccharine quality.

"I never take them up till the sap is entirely at rest, and the leaves and stalks are withered: they are then in prime order, and fittest for sale.

"If these roots are taken up while the sap is in motion, either early in the autumn, or late in the spring, they are apt to shrivel, and lose much of their weight, and are, besides, more disposed to ferment and perish.

"The best way of taking them up is, to dig the ground over as deep as the principal roots run, having pickers ready to gather up the roots as fast as they are thrown up by the spade.

"My general practice is to get rid of my roots as soon as I conveniently can: and I find it better so to do, than to wait for the rising of the markets. I have had, from one acre of fine, fresh, rich land, above 3000 pounds of saleable root, which has produced me above sixty pounds; but this was many years ago, my crops not being generally now so large.

"When I have taken up a crop of this root, if it was planted on fresh land, I generally prepare the same ground to yield me another crop; and this takes me near a year.

"I, in the first place, give it, during the winter frosts, a thorough good dressing of well-rotted dung, mixed with lime; of this I lay on large quantities, still having regard to the condition of the soil, and ploughing it well in the ensuing summer.

"In such loose soils, as are proper for this plant, there is no occasion to dig the land for this crop, the taking up the roots having stirred it to a great depth: this, with three or four summers ploughings, is sufficient.

"As to the rest, I manage the same as I did for the preceding crop.

"If the land, which has borne me a crop of liquorice-

root, was not fresh land when it was planted, but has been any time in tillage, I scarcely ever chuse to plant it again with the same crop, without allowing several years of interval, at least seven; but in this case, I frequently sow oats in the spring, to abate the rankness of the soil; and it will then, with a very slight dressing, give me a good crop of wheat.

"In my method of cultivating this plant, I always allow space enough for the roots to extend in search of food; and this is my reason for planting my rows at two feet distance; I am, besides, very careful of keeping them clear of weeds, and that, particularly, during the first summer; being very sensible that, without this precaution, they would be in great danger of being choked up, and robbed of their proper share of nourishment; particularly, they would receive no benefit from the dews, which are so friendly to vegetation; and even the sun's warmth would be, in a great measure, kept from the roots by the shade of the weeds.

"Many, who plant liquorice, allow much less space than I do betwixt the rows, and will yet, the first summer, take off a crop of onions, or spinage, or young carrots, and think it so much clear profit; but the question is, whether these crops may not, during the time they are on the ground, be, to all intents and purposes, deemed weeds, having nearly, if not altogether, as bad effects as weeds would, if permitted to grow with the crop.

"Some, worse farmers, continue this practice two years of its growth; but it is quite needless to condemn this method of culture, as it cannot but stand self-condemned.

"In the dressings I give my land, for preparing it to receive this plant, experience has convinced me that lime is a much sweeter manure than stable-dung: in fact, this last is not, on any account, to be used till it is quite rotten, and then lime is very properly added to it as a corrector.

"Some friends of mine, who live very near London, have attempted to cultivate this plant on their lands; but they find it does not answer; and this, on account of the great richness of the soil, owing to the great quantity of London dung laid on it. It is true, the roots were at three years end larger than mine; but they were not so bright, had a blacker coat, and were deemed greatly inferior in quality.

"Should any of your readers be inclined to cultivate this plant, by following these directions, not implicitly, but according to their discretion, the circumstances of their soil, &c. considered, they cannot well fail succeeding." *Museum Rusticum, vol. I. p. 252.*

Liquorice loses greatly in weight, if kept in a dry place. In order to discover how much it wasted, I made choice of a piece of a single root 13 inches long, and full $\frac{1}{2}$ inch diameter throughout, which weighed five ounces; and nine small roots, 13 inches long each, and from $\frac{1}{4}$ to $\frac{3}{8}$ of an inch in diameter; they weighed also five ounces. All these were put into a drawer in a dry room, the beginning of February, and were weighed the beginning of August following, and then the largest single root weighed two ounces and three quarters, and the nine small roots also weighed full 2 $\frac{3}{4}$ ounces; so that in six months these roots lost almost half their weight. They were green and juicy when put into the drawer, and were now pretty dry and hard, but not quite so dry and hard as some of the same liquorice that had lain all that time in the open room.

But liquorice may be kept in moist sand, or laid in the earth as long, with very little waste or loss of weight.

As liquorice is an upright growing plant, and not apt to lodge, and its roots descending deep, it is very proper for the horse-hoeing culture, in which it will arrive to greater perfection than in the usual method of cultivating it, as described above.

In Yorkshire, where liquorice is cultivated in a rich sandy soil, its roots penetrate to the depth of three or four feet, sometimes more; and the digging the ground all over to that depth, when the liquorice is taken up, is very expensive. As a saving in this article, the planters in digging up the ground, lay it in a proper form and replant it, making one digging serve for both purposes, which is a very good way; but they set the plants much too close; whereas if they planted it in rows, at about four feet distance, or more, and horse-hoed it, the weeds might be destroyed, and the land greatly improved, especially if trench-hoed; and the produce would be very great, after

so fine a preparation of the land by digging. Add to this, that the method of cultivation by the hoe-plough is much cheaper than by hand-work.

LITTER, the straw laid under horses, &c. Straw at 15s. per load, is a more eligible litter, and cheaper than fern at 5s.

LIVE HEDGES. See FENCES.

LIZENED Corn, lessened, shrunk, or lank corn.

LOBBY. Mr. Marshall, in his Minutes of Agriculture, in the Midland Counties, says, that "Every farmery ought to have a lobby, and a croft, appending to it; serving as a double fence: thereby preventing stock from running over, poaching and injuring the farm: the latter for calves, a saddle horse, and invalids.

I found the conveniency of a lobby in Surry; and the want of one in Norfolk, and in this place; where I can foresee the use of that which I am now forming, with a skreen of planting;—embosoming the entire farmery, in such a manner as to shelter it, effectually, from the north and east winds."

LOAM, an earth composed of dissimilar particles, hard, stiff, dense, and rough to the touch, and composed of sand and a tough viscid clay.

LOE, a little round hill, or heap of stones.

LOG, a large, shapeless piece of wood.

LOOP, a hinge of a door.

LOP, a flea.

LOPPED Milk, such as stands till it fours and curdles itself.

LOPPING, the cutting off the side branches of trees.

It is very observable that most old trees are hollow within; which does not proceed from the nature of the trees, but is the fault of those who have the management of them, who suffer the tops to grow large before they lop them; as the ash, elm, hornbeam, &c. and persuade themselves, that they may have the more great wood; but in the mean time, do not consider that the cutting off great tops endangers the life of a tree; or, at best, wounds it so, that many trees yearly decay more in their bodies than the yearly tops come to; and at the same time that they furnish themselves with more great wood, they do it at the loss of the owner. And indeed, though the hornbeam and elm will bear great tops, when the body is little more than a shell; yet the ash, if it comes to take wet at the head, very rarely bears more top after the body of the tree decays. Therefore, if once these trees decay much in the middle, they will be worth little but the fire; so that if you find a timber-tree decay, it should be cut down in time, that the timber be not lost.

The lopping of young trees, that is, at ten or twelve years old at most, will preserve them much longer, and will occasion the shoots to grow more into wood in one year, than they do in old tops at two or three. Great boughs, ill taken off, spoil many a tree; for which reason they should always be taken off close and smooth, and not parallel to the horizon; and cover the wound with loam and horse-dung mixed, to prevent the wet from entering into the body of the tree.

When trees are at full growth, there are several signs of their decay; as the withering or dying of many of their top branches: or if the wet enters at any knot; or they are anywise hollow or discoloured: if they make but poor shoots; or if woodpeckers make any holes in them.

This lopping of trees is only to be understood for pollard-trees; because nothing is more injurious to the growth of timber-trees, than that of lopping or cutting off great branches from them. Whoever will be at the trouble of trying the experiment upon two trees of equal age and size, growing near each other, to lop or cut off the side branches from one of them, and suffer all the branches to grow upon the other, will in a few years find the latter to exceed the other in growth every way; and they will not decay near so soon.

All sorts of resinous trees, or such as abound with a milky juice, should be lopped very sparingly; for they are subject to decay when often cut. The best season for lopping these trees is soon after Bartholomew-tide; at which time they seldom bleed much, and the wound is commonly healed over before the cold weather comes on. *Miller's Gard. Diet.*

The generality of the world are against pruning timber trees at all, and where they naturally grow straight and regular, it is much better let alone. But all common faults in shape may be regulated by thus lopping them while young, and

and it can be attended with no ill consequence to the timber; for the cut not lying near the timber-pith, cannot affect it, when grown up, and squared in the working for beams and other uses, or to be quartered; for all the defects occasioned by such wounds, are in the superficial parts, and all the four quarters are perfectly sound within.

As to the largest forest trees, they should not be lopped at all, except in cases of great necessity, and then the large boughs must not be cut, but only the side branches; and even these must be cut off close, that the bark may soon cover the wound, and yet a little slanting, that the water may run off, and not lodge upon the cut part.

If there is a necessity of cutting off a large bough, as by its being broken or cankered, let it be cut off slanting at about four feet distance from the body of the tree, and that if possible near some place where there is a young shoot from it, which may receive the sap, and grow up in its place. No stump must be left standing out farther than this, because they are wounded parts which never can heal, and which will always be letting in the water, and will serve as pipes to convey that water into the heart of the body of the tree, and by degrees will utterly spoil it. All that grow upright, whether they be large or small branches, must in cutting be taken off slanting, never evenly, for the same reason; those boughs that bear from the head are to be cut with the slope on the lower side, and on any occasion that great wounds are given to a tree, they should be covered with a mixture of clay and horse-dung, which will make them heal much sooner than they otherwise would do. *Mortimer's Husbandry, vol. II. p. 91.*

To LOWK, to weed corn.

LUCERN, a plant frequently cultivated in the manner of clover, and known among botanists by the names of *medica* and *medicago*.

It is the *alfafa* of the Spaniards, and the lucern grand treffle, or *fœnum Burgundiacum*, as some botanists call it, of the French. It has a perennial root, and an annual stalk, which rises full three feet high in good land, and is garnished at each point with trifoliate leaves, whose lobes are spear-shaped, about an inch and a half long, and half an inch broad, sawed towards the stalks. The flowers grow in spikes, which are from two or near three inches in length, standing upon naked footstalks two inches long, rising from the wings of the stalks: they are of the pea-bloom, or butterfly kind; of a fine purple colour, and are succeeded by compressed moon-shaped pods, which contain several kidney-shaped seeds. It flowers in June, and its seed ripens in September.

There are the following varieties of this species of lucern, viz. one with violet-coloured flowers; another with yellow flowers; a third with yellow and violet flowers mixed; and a fourth with variegated flowers: but as Mr. Miller observes, these are only variations of the same plant, arising accidentally from the seed. However, neither the yellow nor the variegated flowered lucern is ever so strong as that with purple flowers; nor is it consequently so profitable to the husbandman.

Columella calls this the choicest of all fodder, because it will last ten years, and will bear being cut down four and sometimes six times a year; it enriches the land on which it grows, fattens the cattle fed with it, and is a remedy for sick cattle. About three quarters of an acre of it is abundantly sufficient to feed these horses during the whole year. Yet, notwithstanding it was so much esteemed by the ancients, and hath been cultivated to great advantage in France and Switzerland for many years, it has not yet found so good a reception in England as it justly deserves; nor is it cultivated here in any considerable quantity, though it will succeed as well in this country as in either of the last mentioned: being extremely hardy, and resisting the severest cold of our climate.

Mr. Rocque lays it down as a maxim in his practice, that lucern will grow on any soil, provided it be not so wet as to rot the roots.

The strongest land is however to be preferred, and the deeper the soil the better will be the crop, as the roots will have room to extend themselves.

The land should be prepared in the same manner as for barley, being ploughed, harrowed, and cleaned from all sorts of weeds; and the stronger the land is, of course the more ploughing and harrowing it take will to mellow it, and bring it to a fine tilth.

When this work is done, the lucern seed must be sown

broad-cast, (not in drills) in fine weather, after the rate of about fourteen pounds to an acre.

This allowance of seed will be sufficient to supply the number of plants that will be wanted to yield a full crop; but they will not stand so thick as to starve one another, though there is some allowance for part of the seed failing.

But should every seed take, the method of culture hereafter recommended will sufficiently reduce the number of the plants, and, without the trouble and expence of the New Husbandry, give each plant space enough to extend its roots, and collect the necessary quantity of nourishment.

To return to the culture, before the last ploughing, the land should be manured, not with old rotten stuff as is usual, but with fresh stable-dung, that has been thrown up in a heap three or four weeks to heat and ferment. This will enable the young plant to push forth its leaves and stalks with luxuriance, and get forward in its growth the first summer.

When the dung is in full fermentation, it is to be laid on the land and ploughed in as soon as possible, that the salts of the dung may not have time to evaporate: the land must then be harrowed and sown, and afterwards harrowed again with a light or bush harrow; and lastly, rolled to settle the ground and break the clods.

If corn is to be sown amongst it, it should be only half a crop; otherwise it will be apt to destroy the lucern, especially if it proves a wet season, and the corn is rank: but if no corn is sown amongst it, the lucern will thrive much better.

Lucern may be sown from the beginning of March to the end of May; but April, in dry weather, is the best time.

If much rain falls on the new-sown lucern, it will be apt to swell too fast, and burst; but if it holds fine for three or four days, it will be in no danger.

Mr. Rocque does not approve of drilling the lucern, because the roots are too much confined in the drills: they say it is to clean the lucern between the rows that they drill it: but it is for want of knowing the nature of lucern, and it discourages people from sowing it, drilling and hoeing being very expensive ways; the quickest and cheapest, and by much the best way, being to sow it broad-cast, like clover, as the roots will stand nearly at equal distances one from another every way.

Lucern requires, it is true, a great deal of nourishment from the earth; but there is no occasion this nourishment should be supplied by the surface. It is well known that the roots of lucern will run to a great depth in the ground, from whence they must of course extract a large quantity of food: this spares the surface; and in fact the land where lucern grows requires only that the natural grass should be prevented from getting to a head, which it is in our climate very apt to do, and if let alone would soon choke up the lucern.

It is mentioned above, that if corn is sown with lucern, it should be only half a crop: some of your readers may not, perhaps, readily comprehend the meaning of this expression: therefore, to render it more clear, I shall here observe, that when barley or oats are to grow with lucern, a bushel only of either, according to Mr. Rocque's method, is to be sown first on an acre, then fourteen pounds of the lucern.

One thing is to be observed, that if the corn, notwithstanding its being sown so thin, should grow so rank as to endanger the lucern, it will be much best to mow it before the harvest, as it is better to lose the crop of corn than to kill the lucern.

The barley, or oats, however, need not be entirely lost, as they may, when mown, be given green to cattle; or, if the weather is fine, will make excellent hay, provided they are properly dried; and it is best to do it in the swarth, as the rich juices are in that manner less exhausted. To sow it later than May is dangerous, for fear of a dry season, or its being eat up by the fly.

Lucern will not grow on fresh-broke-up land; it must be tilled a year or two: pease and beans, for one year, will prepare the ground; but, above all, potatoes excel for sweetening and mellowing of land: the next season a fallow for turnips, and when the turnips are fed off with sheep, it will greatly enrich the land, which should then be prepared for lucern.

In regard to the tillage, and time of sowing the lucern-seed, the nature of the soil must be considered. Heavy, strong,

strong land will require more ploughings and harrowings; and to be later sown: light land will need fewer harrowings and ploughings; and to be sown earlier, that the young plants may have strength to send their roots deep into the ground, before the hot dry weather comes on to hurt them; and if, for the first time, the land had a trench-ploughing, it would be of great advantage.

In Languedoc they sow no corn with the lucern; and when it is six or seven inches high, they mow it; by which all the seeds of annual weeds are cut off and killed.

In Normandy, the climate being much the same as in England, they sow corn with it.

In Picardy, and about Paris, they sow it, some with, others without corn.

At Avignon, when their lucern begins to decline, they manure the ground and plough afresh, and sow it with corn and lucern; and the old roots, growing again with the seed, make another fine crop: the ploughing will not hurt the old roots.

If a full crop of barley is sown with lucern, and the barley grows very strong, the best way is to mow the barley when it is in the ear.

If forward pease are sown on new-broke-up land to prepare it for lucern, it may be done in one year, and turnips sown on it as soon as the pease are off: the turnips may be fit to seed off by Christmas; and as soon as the turnips are off, the land should be ploughed, and lie fallow till a proper time to stir it again; or it may have a trench ploughing, as before directed.

This method of giving land a trench-ploughing, to prepare it for lucern, is much to be recommended, as it stirs the earth almost as deep as if it was dug with a garden spade: or what advantage this must be to a plant that sends its roots deep for nourishment, need not be mentioned, as it cannot but be obvious to every reader.

Was labour cheaper than it is in England, it would doubtless be much the best way to dig by hand all the land that was destined to lucern: many advantages would result from this method of tillage, and particularly the weeds and grass would not be so apt to grow as in ploughed land.

I would heartily recommend it to some of the gentlemen in Ireland, to sow with lucern some of their land that has borne a crop of potatoes; it could not fail succeeding, and they would have a fair opportunity of trying what crops this plant will, when best cultivated, yield.

I cannot but think, that on good land that has borne potatoes, there might be five good mowings in a year, particularly in Ireland, where the climate is rather milder than in England; and this without injuring the roots. An easy experiment would, however, soon make this matter known: I therefore heartily recommend it to the attention of your Irish readers; they are every day improving their lands, and will, doubtless, not suffer this hint to pass unnoticed.

When we consider the many advantages resulting from the culture of this plant, it is astonishing that it should so long escape our regard: the hint was given us by the Roman writers on the subject of agriculture, but we were too much attached to old customs to improve it.

In hot summers the seed may be sowed in England, but not from the first growth; that being generally too rank, and subject to rot at bottom.

In Languedoc they save it from the third growth; but as this climate is colder, it will not have time to ripen, unless saved from the second growth.

A dry soil is best to save the seed upon, as it is not so apt to grow rank; and then it may possibly do from the first growth.

As lucern, if the land is good, will bear several crops in one year, like clover; what Mr. Rocque means by the first, second, and third growths, are, he says, the different crops it produces in one summer, which are three, four, and sometimes five mowings, in case no seed is saved from it: if seed is saved, it must be from the second growth: the seed will be ripe in September, and must be gathered by hand.

When the plants are one year old, it will be proper with a large harrow, to go over your land as often as is sufficient to root up annual weeds and grass.

The harrow will not hurt the lucern, the roots of it being very tough: this must be done in dry weather, be-

fore it begins to sprout, which is very early in the spring that the weeds and grass may die; and if there are any patches of ground where the seed miscarried, a little seed must be sown and the spot harrowed: a dressing with rotten dung, at the same time, will repay the expences of it by a larger crop; if the harrow should cut or wound any of the roots, they will sprout and grow notwithstanding.

The second spring, after sowing, it will be proper to plough the ground, where the lucern grows, with a drill-plough, with a round share, without a fin or feather, and without a coulter, to prevent the roots being too much hurt. It should lie rough a few days to dry and mellow; then in fine weather, be harrowed down to mow it the closer.

One, not used to the culture of this plant, will be apt to think, that ploughing will destroy the lucern; but any gentleman, that will take the trouble to call at Mr. Rocque's, may be convinced that experience teaches the contrary.

To make hay of lucern, it should be mowed as soon as the bloom appears, or rather sooner: it must not be spread, like common grass, but lie in the swarth, like clover, and turned in the same manner; or the leaves, which are most nutritive, will drop off.

If suffered to stand too long before it is mowed, the stalks will be too hard for the cattle to eat it, and it loses much of its goodness.

The hay is good for all sorts of cattle; and when horses are fed with it, they should not have their full allowance of corn; the lucern answering, in a great measure, the purpose of both corn and hay.

It is also the most profitable of any sort of fodder to feed horses with in the summer, by mowing and giving it to them green.

If the land is good the produce is incredible; and according to the goodness and depth of the soil, so will be the crops.


Mr. Rocque says he has seen lucern mowed five times in a season; yielding, at the five mowings, nearly eight loads of hay per acre.

The spring ploughing amongst the lucern must be annually repeated: it kills the grass and weeds, and makes the ground ferment, which promotes vegetation; and the oftener it is refreshed with a little dung on the surface, the better it will pay for the trouble of cultivating it. If the dung is laid on before the winter, that the salts may be washed in by the rain and snow, and ploughed in, in the spring, it will greatly add to the profit.

This is the substance of Mr. Rocque's account of the culture of lucern; but as different sorts of soil may require different methods of tillage, he has subjoined the idea of a harrow, with two handles like a plough, which may serve in light land instead of the plough, and will save some labour.

The teeth must be set at seven or eight inches apart in the first row, and about five inches long without the wood. The second row must be placed nine or ten inches behind the first, and so that the teeth of the second row may be against the spaces of the first row; and they must be an inch longer than those in the first row, so that the ground, being loosened a little by the first row, the teeth of the second row may go something deeper; and the teeth of the third and last row must be an inch longer than those of the second, and placed so as that they may go in the same track with the teeth of the first row.

The harrow must be made of one solid piece, four or five inches thick, and the lower side must be rounded off towards the hinder part where the teeth are longest; whereby the person that holds it by the handles, pressing down a little, may force the second and third rows of teeth deeper than the first: and by bearing up a little, he may prevent any but the first row from working. A very little practice will be sufficient to make any one use it as occasion requires, and it will be so steady that no unevenness of the ground will be able to throw it out of its work, as a clod or stone will a common harrow.

 The manner the teeth are to be placed in.

Let it be remarked, that the foremost row of teeth are placed in a line across near the middle of the block or plank;

plank; the other two rows behind that; and the fore part of the harrow should be heavier than the hind part when the weight of the harrow is suspended on the first row of teeth. The teeth should be pretty strong, and round; their being square, as usual, may hurt the roots a little, which is to be avoided as much as possible, though the consequence would not be very great.

Farmers are fond of sowing broad-cast, it being no easy matter to make them comprehend the utility of a drill-plough on any occasion: the sight of so complicated an instrument terrifies them; they think it moves by clock-work: and as to the labourers, it is a very difficult matter indeed to get them to hold it.

I am fully sensible, as I have already observed, of the good effects of sowing corn and pulse regularly with intervals, but cannot approve of this method when applied to artificial grasses; and it would be well if we were to improve our old practices, before we should even attempt to bring the new methods into general use. *Museum Rusticum*, vol. I. p. 78.

In the succeeding volume of the above work, another correspondent has made the following remarks on the above method delivered by Mr. Rocque:

This gentleman, says our author, owns he is against innovations in husbandry, because it is difficult to bring the farmer from the old methods; and therefore seems to conclude, new ones are not to be attempted; at least, that seems to be his reason, for being against what he calls innovations.

Under "restrictions, &c." he approves of the new culture, but thinks it "preposterous to extend it to artificial grasses;" adding, "the only benefit lucern can receive from the horse-hoe, is, that it keeps down the natural grass." This gentleman cannot be a practical cultivator of lucern; neither can he know the uses of the hoe-plough; if he did, he could not assert a fact so contradictory in itself.

To inaccurate observers the seedling plant of lucern may appear to have no lateral roots; but a careful examiner will find a great number of small ones, every one, or most of which are furnished with fresh nutriment by the operation of the hoe-plough.

We shall not contend about Mr. Rocque's superior profit: his situation gives him advantages superior to a distant residence; and therefore that should not be mentioned by a generous writer.

I am a favourer and practiser of the New Husbandry, and I do deny that it will be more expensive than Mr. Rocque's method, but, on the contrary, it will eventually be cheaper.

By this method, he may, for a few years, have pretty good crops; but at length his plants will be found to dwindle, and his crops will lessen, unless he annually adds seed to the ground; whereas, in the new culture, the crop will be continually improving; as to the quality being inferior, that will be the fault of the owner, if he lets it grow too rank. This argument of your writer makes against himself, as thereby he admits the superior luxuriances of the plants cultivated by the horse-hoe.

I have sown lucern in broad-cast more than once, and have seen others do it; and it ever failed.

Mr. Rocque's rule, as this gentleman says, is, "that lucern will grow on any land, if not wet:" this is certainly premature: it surely must have the occupation of a dry, rich soil, or I am sure, from practice, it will not succeed; and as to "the strongest being preferred," I believe every one, who tries the cultivation of it on such, and upon light ground, will find the latter best adapted to it.

But the notion of sowing corn with lucern is quite as "preposterous," I think, as the new culture for it; and how a man of Mr. Rocque's famed abilities should adopt such a method, I am at a loss to guess. Neither should lucern be sown in March, as in its infant state it is very tender and timid of frost.

This gentleman says, "it is for want of knowing the nature of lucern, that they drill it." I might retort upon him; but his mistaken zeal, I fear, will more injure the cause he means to promote, than I hope it will discourage the practice of drilling this valuable plant, as, by all men who adhere to rational principle, that hath been found the most successful method. See Tull, Duhamel, &c. I should be glad to know what "the surface of the ground is to be spared for:" is it to give life to the natural

grass, that common and destructive enemy of this excellent plant?

Our author mentions the cultivation of it in France, &c. If he was ever at Paris, with his present attention, he must have seen, that after a few years they always plough up the promiscuous sown lucern, in order to prepare the ground again for that, or some other crop, when the lucern begins to dwindle, by the weeds or natural grass robbing it of its nutriment.

How much more must that be the fate of promiscuous sown lucern in these kingdoms, where he admits grass is apt to get a-head? That is not the case in France, and yet even their promiscuous sown crops are short-lived.

I know not whether he be as conversant with potatoe-ground in Ireland as I am; but I cannot omit to inform you the tillage will not do for lucern; for this plant the ground ought to be well pulverized: whereas, in the general potatoe tillage of this kingdom, not more than about two feet in nine of the ground is cultivated.

The manner of harrowing the lucern, practised by Mr. Rocque, although the teeth be round, must wound many of the roots: that might be well, as it would thin them; but repeated harrowing will, in time, wound them all; and notwithstanding they will afford grass afterwards, yet, when the winter rain comes on, lodgments of water will be made in those wounds, which will bring on putrefaction, to the destruction of the plants, unless Mr. Rocque has the art of conducting the harrow-pins always in the same direction; and could that be the case, what would destroy the grass where they did not pass?

The manner of ploughing the lucern, practised by Mr. Rocque, is still approaching to the horse-hoe, though by no means so effectual. I wonder to see our author even favour that, since it may be deemed an "innovation." This ploughing is to be repeated every year, and harrowing also: to this dung is to be added, "as often as may be." I am willing to believe this gentleman knows nothing of the expence which attends these operations, *i. e.* ploughing, harrowing, and, above all, dunging, besides the value of the dung, which would always be acceptable for other grounds: whereas, in the drill way of sowing lucern, when the land is once put in good order, it may ever be kept so by the hoe-plough.

Lucern is a grass of such inestimable value, that it will answer almost any expence; yet if the most certain method to obtain success shall be found the cheapest, there can be no reason for pursuing one more precarious and more expensive, which will be found when Mr. Rocque's method, or at least that so warmly recommended by your correspondent, who asserts it to be Mr. Rocque's, is compared in practice with the one I venture to recommend to the practice of my countrymen, which I take upon me to say will command success, if pursued.

The land should be a flexible loam, dry, deep, and rich, either by nature, or made so by art; not but it will succeed to admiration should a quarry be under. It should be well pulverized by plough and harrow, laid as flat as possible, and cleared of all weeds, particularly scutch-grass: when the ground is in this form, let a small plough, with two mould-boards, be run up and down the field, at every three foot upon the flat surface: this will completely form three foot ridges. If a pair of drill-harrows be not at hand, let the crown of every ridge be carefully raked clean, and even with an iron rake, and one row of seed drilled very thin, about half an inch deep, along the middle of every ridge, the middle or latter end of April, (the beginning of May may do) and be carefully covered. This sowing of the seed may be done by hand, if a drill-plough be not ready. By a master's attendance, a great deal may be done in a day.

Thus it may remain till weeds begin to appear, when the hoe-plough, or a small common one, should take away every alternate side of the ridges, as near the lucern as can be with safety (I go within two or three inches of my drilled crops.) In three or four days, return the mould to the former places with the plough, and then proceed to take off the other sides of the ridges in like manner, and return it as before.

If the ground be made in good condition before sowing, a crop may be mowed in July, the produce of which will surprise any one who is not acquainted with the plant.

In September it will be fit to cut again; but if in the intermediate time weed should appear, let the hoeing

be repeated: thus the weeds will be destroyed the first year.

After the second cutting, send in the plough again, and take off the sides of every ridge within about six inches of the plants, and so let them remain till February, when the plough should return the mould to every ridge; and in May the grass will be ready for cutting, and will continue to afford a crop every month during the summer.

The hoeing should be repeated, as before directed, as often as weeds appear; but observe never to horse-hoe it when the ground has any adhesion.

The hoeing before the winter is to keep the plants dry during that season, and to meliorate the soil of the alleys by the influence and mechanical operation of the winter frosts.

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My reason for troubling you, or your readers, at this time, is to remind you, that Mr. Rocque's small tract, lately published, contains some particulars respecting lucern, which were not noticed in my former letter, and therefore may, with great propriety, be now laid before your readers.

The first of these particulars relates to the manner of sowing the lucern; and in this Mr. Rocque differs widely from Mr. Miller, as he thinks it should not be sown without corn; but I will give you Mr. Rocque's own words, as they carry great weight with them. "You must not sow lucern without corn, unless your spot of land is too small to use a harrow in: in that case, you must sow it in drills, and keep it very clean hoed. The drills for such small spots are to be ten inches distant; if wider, it lodges in the drills. The reason I recommend sowing corn with it is, to prevent the weeds choking it; but, you must sow only for half a crop: otherwise your corn will be apt to destroy your lucern, especially if it proves a wet season, and your corn is strong. If there is no corn sown amongst it, you must be obliged to mow the weeds, and run a chance of cutting the lucern with them: and, being very sappy, you cannot imagine how detrimental it is to bleed it when

young; but when the corn will be fit to mow, the lucern also may safely be cut."

As the duration of lucern has been a question long agitated, and not, that I know of, finally determined, it will not be amiss to mention a fact related by this able cultivator, as it will be an encouragement to the planters of lucern.

"As to the duration, it will last as long as the ground is kept clean. I saw some at Mr. Middlemar's, at Grantham, in his garden, that was forty years old; and it was very fine. To keep it thorough clean, you must harrow it every time it is mowed; and, if requisite, at Michaelmas, and in February and March. If you once leave it foul, it will be very expensive to clean. You must make use of the drill-plough: but let the harrow be ever so strong, you need not fear its hurting it."

In my letter to you, above-mentioned, it is observed, that in preparing land for lucern, a trench-ploughing would be of great advantage: but in the piece lately published, Mr. Rocque says, "In case you are not well acquainted with the state of your ground, you must trench-plough it twice, according to the directions for ploughing, which are in my Hints upon Burnet; whereby the roots will run down the sooner out of the reach of dry weather: and if the soil that is turned up be ever so sour, future ploughings, harrowings, and manurings, will sweeten it sufficiently for the reception of the seed."

Mr. Rocque adds, in this place, that "lucern will grow very well in clay land, with proviso the ground works well. The difficulty in these lands lies in the harrowing; in dry weather the ground being so very hard, the harrow can do but little good, unless you take the season between wet and dry to harrow it, which you certainly must."

It is also observed that in the province of Languedoc, in France, the inhabitants mow their lucern when it is six or seven inches high, in order to kill the annual weeds. Of this practice Mr. Rocque now says, "By my own experience, I find they are in the wrong; for it bleeds it, so that the plants make but little progress when cut so young, and are a long time in recovering it. It ought never to be cut but when in bloom."

A great many imagine that the seed might profitably be saved in England; but Mr. Rocque is of a different opinion; and indeed I am inclined to join with him in this respect, as in this island it is at best but a precarious crop, and can be imported so cheap, that the seedman can afford to retail it at nine-pence per pound, at which price it was this year advertised. Mr. Rocque's observation on this point is as follows: "In hot summers the seed may be saved in England, but not from the first growth, that being generally too rank, and subject to rot at bottom: though I think it is needless attempting to save any of the seed in England; for, in the year 1761, which was a very fine summer, I tried to save the seed of the second growth, on light land, but made nothing of it; not saving above thirty pounds of seed upon four acres and a half. I also tried, that same summer, to save some off stiff land; but that proved still worse."

I have only now to give you Mr. Rocque's thoughts on the value of this grass, which, in my opinion, deserves to be preferred to almost all others.

The Practical Cultivator says, "I have already observed, it ought not to be cut but when it is in blossom: and that is but three times a year: but after mowing the third crop, you may, instead of mowing the fourth, feed it; but when frosts come, you must take your cattle off; because there are always young shoots, which would be bruised, if the cattle were not taken off. If it is rank in September, it is dangerous for cows, being too feeding; but turn horses and sheep upon it. As there is no grass, as has yet come to our knowledge, which gives the cows so much milk, you may let them graze about an hour, at most, in the afternoon, when the dew is off. When made hay, it is likewise the best for milk: wherever it is much cultivated, they prefer it to all other kind of hay."

When I was at Monosque, a city in Provence, which was about twenty-seven years ago, the carriers fed their horses upon it, preferably to any other, without corn; and the mules looked fat and in fine order. Six mules which I hired there, to carry my seeds at Nîmes, fed on nothing else, and yet carried their load all day long, without unloading. They have the custom of hanging little bags to their

their horses or mules heads; wherein they put lucern, on which they feed as they go.

It is acknowledged by all connoisseurs to be the most feeding of all pasture, either green or in hay. I trust not barely to report, but have experienced it to be so myself. I had colonel Vernon's horse sent to me from the country, in a very poor condition; and, in fourteen days, he was in very good order. The colonel was surprised to see how he had thrived in that short space of time.

Many are apt to condemn it; but it is for want of knowing its good qualities. It has been introduced for a long series of years; but so little noticed, that one and twenty years ago there was not two hundred weight of lucern grafs seeds to be sold amongst all the seedsmen in London; and I had much ado to re-introduce it; but now, within these three or four years, there is a prodigious consumption of it.

One Mr. Beadle, a farmer in Kent, has fourteen acres of it, for which he had a premium. When I called upon him, which was in the beginning of May last, he had mowed his lucern; and sold it upon the spot, for three pounds or three guineas a load. I blamed him for cutting it so young; but he told me he was compelled to it, to get fodder for eight hundred head of sheep that he had; but that, a little while after, it grew so fast, that he could turn his sheep upon it. Those that bought this hay must needs be well acquainted with the goodness of it, to fetch it on the spot, though they were ten or twelve miles distant.

It is not foggy, like clover or tares. Horses will work with it green, as well as with hay or corn: they do not sweat with it, as they do with other green fodder. I have been told, one of our post-masters kept his horses both winter and summer with it, and that his horses were the best on the road. They object, the hay of it is difficult to make: it is no more difficult than clover. All hay is difficult to make in wet weather: but when it is a bad season to make hay, do as Mr. Allen does; put it up in ricks when dry, and between every bed of hay, of any kind, put a layer of salt, and that will recover all the damage the rain can have done.

I have done it myself, this very last year, with a rick of burnet: to about twelve loads I have put a sack of salt among it; and every time my horse comes near it, he eats it very eagerly, though he can get but at the outside of it. It will keep in ricks as long as any hay.

Multitudes, at present, are pretty well acquainted with the excellence of both these grasses: but if any doubt the truth of what I assert, let them take the trouble to enquire into it, of Mr. Shennelly, the tobaccoist, at Houndsditch; to whom I have sent a load of lucern, and am to send another load of the same, and half a load of burnet hay.

Those who are not satisfied with the theory, may be convinced of the practical part, by seeing a field of mine of lucern, of four acres and a half, at Battersea, and the manner of working the harrow."

From what has been said on the subject of lucern, I hope your farming readers will be induced to adopt the culture of it; as, if they are not blind to their interests, they cannot but be convinced of the many advantages which would result to them from so doing. Mr. Rocque's method of cultivating this plant differs but little from the manner in which they raise clover; and the profit to the landholder will be abundantly greater. *Museum Rusticum*, vol. IV. p. 259.

The following method of cultivating lucern, is extracted from a very ingenious performance, entitled, *Essays on Husbandry*; the principal intention of which is, to recommend a newly-discovered method of cultivating this plant.

Mr. Rocque, as may be seen above, has adopted the old Roman method of sowing it, broad-cast, and harrowing the land from time to time by way of destroying the weeds. Mr. Miller recommends the new, or drill husbandry, for the culture of lucern; but the author of the *Essays* above-mentioned differs from both these practical cultivators, and raises his lucern in a nursery; after which he removes the young plants, and having cut off their stalks and tap-roots, transplants them, with great regularity, into the field where they are to stand for a crop.

I shall not pretend to decide which is the best method; yet I may venture to say, that I know it may be raised to considerable profit, both in Mr. Rocque's way, and ac-

ording to the rules laid down in the new, or horse-hoeing husbandry.

I have no doubt but it may succeed by transplantation; yet I greatly fear that the expences in this method will, when applied to any considerable extent of land, greatly exceed the worth of the crop.

These *Essays* being too learned for the honest farmer's reading, it is very improbable they should ever fall into his hands; yet, as it is a great pity he should not be permitted to judge for himself in a matter which may turn out so much to his advantage, we have taken the trouble of transcribing a few pages of the second *Essay*, which more immediately treats of the culture of lucern by this new method of transplanting.

In this extract we have omitted all reasonings that might render the narration obscure to the farmer; not that we had ourselves any objection to them, or did not approve of them; but that we were willing the honest cultivator should have as much of this matter laid before his view, in a plain manner, as was necessary for him to understand it: when this is done, he may judge for himself; and if on trial he finds the method here recommended answer, his best way will be to adopt it in his future practice.

Whoever proposes to sow a lucern nursery, or engages in any larger undertaking of cultivating whole fields of saintfoin, trefoil, buck-wheat, spurrey, fenugreek, sweet melilot, &c. would be no ways ill advised, if he prepared a bit of ground, and sowed a spoonful of the seeds about a fortnight before he proposed to sow his larger quantity; since, from the good or bad success of this little attempt, he may be enabled to judge whether the seedsmen has supplied him with seeds fit for vegetation. Without such precaution, a whole year may be lost; which is a mortifying circumstance in matters of husbandry.

In the end of March, 1757, a common day-labourer was ordered to sow a pound and a half of lucern seed, and keep the ground clear from weeds. The seed was sown on one of the least promising pieces of land in all the neighbourhood; but this was done by express order; for it was thought unfair to make the experiment on a better soil than the commonest sort of grafs-fields. The spot of earth set apart for the purposes, both of nursery and transplantation, was, in former times, a kitchen-garden: but the good soil, to the depth of eighteen inches, had been removed for the sake of manuring a corn-field. [To which we shall just add, that the attempt was made in an hilly country, where the staple earth is naturally shallow.] What remained was a cold, yellow, clammy stratum, which the country people looked upon as mere clay; but as nature having since been better examined, it appears to be a mixture of imperfect clay, and imperfect marle. No manure worth mention was used upon it, as will appear by the sequel.

To all seeming appearance, little, or next to nothing, could be expected from a piece of ground of such an unpromising cast; but upon the whole, the experiment proved successful and easy.

By the middle of August, the plants were, some of them, eighteen inches high; and many of them branched out, subdivided themselves, and made very fine side shoots: upon which it was resolved to venture upon the second part of the experiment, according to the accounts given by M. de Chateaucieux; therefore taking the advantage of a moist season, in the beginning of September, (which season, by the way, did not last long) we performed the work in the following manner. But here let it be just observed, in passing along, that the time of the year, pitched upon for transplanting, was, at least, three weeks too late for England, though perhaps highly proper for the territory of Geneva, or the southern parts of France. This therefore is set down as one of the *mutatis mutandis* so indispensably necessary in matters of agriculture, when the practice of one country is copied in another.

First the roots were dug up carefully; orders being given before-hand not to attempt drawing them, even with the smallest degree of violence, till the earth was entirely loosened at top and at bottom. In the next place, the long tap-roots were cut off eight, nine, or ten inches, discretionally, below the crown of the plant (the scissars being generally applied just beneath the forks of the root, if it be a branching root): then the stalks were clipped about five inches above the crown of the plant; and the remain-

be repeated: thus the weeds will be destroyed the first year.

After the second cutting, send in the plough again, and take off the sides of every ridge within about six inches of the plants, and so let them remain till February, when the plough should return the mould to every ridge; and in May the grass will be ready for cutting, and will continue to afford a crop every month during the summer.

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As the duration of lucern has been a question long agitated, and not, that I know of, finally determined, it will not be amiss to mention a fact related by this able cultivator, as it will be an encouragement to the planters of lucern.

"As to the duration, it will last as long as the ground is kept clean. I saw some at Mr. Middlemar's, at Grantham, in his garden, that was forty years old; and it was very fine. To keep it thorough clean, you must harrow it every time it is mowed; and, if requisite, at Michaelmas, and in February and March. If you once leave it foul, it will be very expensive to clean. You must make use of the drill-plough: but let the harrow be ever so strong, you need not fear its hurting it."

In my letter to you, above-mentioned, it is observed, that in preparing land for lucern, a trench-ploughing would be of great advantage: but in the piece lately published, Mr. Rocque says, "In case you are not well acquainted with the state of your ground, you must trench-plough it twice, according to the directions for ploughing, which are in my Hints upon Burnet; whereby the roots will run down the sooner out of the reach of dry weather: and if the soil that is turned up be ever so sour, future ploughings, harrowings, and manurings, will sweeten it sufficiently for the reception of the seed."

Mr. Rocque adds, in this place, that "lucern will grow very well in clay land, with proviso the ground works well. The difficulty in these lands lies in the harrowing; in dry weather the ground being so very hard, the harrow can do but little good, unless you take the season between wet and dry to harrow it, which you certainly must."

It is also observed that in the province of Languedoc, in France, the inhabitants mow their lucern when it is six or seven inches high, in order to kill the annual weeds. Of this practice Mr. Rocque now says, "By my own experience, I find they are in the wrong; for it bleeds it, so that the plants make but little progress when cut so young, and are a long time in recovering it. It ought never to be cut but when in bloom."

A great many imagine that the seed might profitably be saved in England; but Mr. Rocque is of a different opinion; and indeed I am inclined to join with him in this respect, as in this island it is at best but a precarious crop, and can be imported so cheap, that the seedsman can afford to retail it at nine-pence per pound, at which price it was this year advertised. Mr. Rocque's observation on this point is as follows: "In hot summers the seed may be saved in England, but not from the first growth, that being generally too rank, and subject to rot at bottom: though I think it is needless attempting to save any of the seed in England; for, in the year 1761, which was a very fine summer, I tried to save the seed of the second growth, on light land, but made nothing of it; not saving above thirty pounds of seed upon four acres and a half. I also tried, that same summer, to save some off stiff land; but that proved still worse."

I have only now to give you Mr. Rocque's thoughts on the value of this grass, which, in my opinion, deserves to be preferred to almost all others.

The Practical Cultivator says, "I have already observed, it ought not to be cut but when it is in blossom: and that is but three times a year: but after mowing the third crop, you may, instead of mowing the fourth, seed it; but when frosts come, you must take your cattle off; because there are always young shoots, which would be bruised, if the cattle were not taken off. If it is rank in September, it is dangerous for cows, being too feeding; but turn horses and sheep upon it. As there is no grass, as has yet come to our knowledge, which gives the cows so much milk, you may let them graze about an hour, at most, in the afternoon, when the dew is off. When made hay, it is likewise the best for milk: wherever it is much cultivated, they prefer it to all other kind of hay.

When I was at Monosque, a city in Provence, which was about twenty-seven years ago, the carriers fed their horses upon it, preferably to any other, without corn; and the mules looked fat and in fine order. Six mules which I hired there, to carry my seeds at Nimes, fed on nothing else, and yet carried their load all day long, without unloading. They have the custom of hanging little bags to their

their horses or mules heads; wherein they put lucern, on which they feed as they go.

It is acknowledged by all connoisseurs to be the most feeding of all pasture, either green or in hay. I trust not barely to report, but have experienced it to be so myself. I had colonel Vernon's horse sent to me from the country, in a very poor condition; and, in fourteen days, he was in very good order. The colonel was surprised to see how he had thrived in that short space of time.

Many are apt to condemn it; but it is for want of knowing its good qualities. It has been introduced for a long series of years; but so little noticed, that one and twenty years ago there was not two hundred weight of lucern grass seeds to be sold amongst all the seedsmen in London; and I had much ado to re-introduce it; but now, within these three or four years, there is a prodigious consumption of it.

One Mr. Beadle, a farmer in Kent, has fourteen acres of it, for which he had a premium. When I called upon him, which was in the beginning of May last, he had mowed his lucern, and sold it upon the spot, for three pounds or three guineas a load. I blamed him for cutting it so young; but he told me he was compelled to it, to get fodder for eight hundred head of sheep that he had; but that, a little while after, it grew so fast, that he could turn his sheep upon it. Those that bought this hay must needs be well acquainted with the goodness of it, to fetch it on the spot, though they were ten or twelve miles distant.

It is not foggy, like clover or tares. Horses will work with it green, as well as with hay or corn: they do not sweat with it, as they do with other green fodder. I have been told, one of our post-masters kept his horses both winter and summer with it, and that his horses were the best on the road. They object, the hay of it is difficult to make: it is no more difficult than clover. All hay is difficult to make in wet weather: but when it is a bad season to make hay, do as Mr. Allen does; put it up in ricks when dry, and between every bed of hay, of any kind, put a layer of salt, and that will recover all the damage the rain can have done.

I have done it myself, this very last year, with a rick of burnet: to about twelve loads I have put a sack of salt among it; and every time my horse comes near it, he eats it very eagerly, though he can get but at the outside of it. It will keep in ricks as long as any hay.

Multitudes, at present, are pretty well acquainted with the excellence of both these grasses: but if any doubt the truth of what I assert, let them take the trouble to enquire into it, of Mr. Shennelly, the tobacconist, at Hound-ditch; to whom I have sent a load of lucern, and am to send another load of the same, and half a load of burnet hay.

Those who are not satisfied with the theory, may be convinced of the practical part, by seeing a field of mine of lucern, of four acres and a half, at Battersea, and the manner of working the harrow."

From what has been said on the subject of lucern, I hope your farming readers will be induced to adopt the culture of it; as, if they are not blind to their interests, they cannot but be convinced of the many advantages which would result to them from so doing. Mr. Rocque's method of cultivating this plant differs but little from the manner in which they raise clover; and the profit to the landholder will be abundantly greater. *Museum Rusticum*, vol. IV. p. 259.

The following method of cultivating lucern, is extracted from a very ingenious performance, entitled, *Essays on Husbandry*; the principal intention of which is, to recommend a newly-discovered method of cultivating this plant.

Mr. Rocque, as may be seen above, has adopted the old Roman method of sowing it, broad-cast, and harrowing the land from time to time by way of destroying the weeds. Mr. Miller recommends the new, or drill husbandry, for the culture of lucern; but the author of the *Essays* above-mentioned differs from both these practical cultivators, and raises his lucern in a nursery; after which he removes the young plants, and having cut off their stalks and tap-roots, transplants them, with great regularity, into the field where they are to stand for a crop.

I shall not pretend to decide which is the best method; yet I may venture to say, that I know it may be raised to considerable profit, both in Mr. Rocque's way, and ac-

ording to the rules laid down in the new, or horse-hoeing husbandry.

I have no doubt but it may succeed by transplantation; yet I greatly fear that the expences in this method will, when applied to any considerable extent of land, greatly exceed the worth of the crop.

These *Essays* being too learned for the honest farmer's reading, it is very improbable they should ever fall into his hands; yet, as it is a great pity he should not be permitted to judge for himself in a matter which may turn out so much to his advantage, we have taken the trouble of transcribing a few pages of the second *Essay*, which more immediately treats of the culture of lucern by this new method of transplanting.

In this extract we have omitted all reasonings that might render the narration obscure to the farmer; not that we had ourselves any objection to them, or did not approve of them, but that we were willing the honest cultivator should have as much of this matter laid before his view, in a plain manner, as was necessary for him to understand it: when this is done, he may judge for himself; and if on trial he finds the method here recommended answer, his best way will be to adopt it in his future practice.

Whoever proposes to sow a lucern nursery, or engages in any larger undertaking of cultivating whole fields of saintfoin, trefoil, buck-wheat, spurrey, fenugreek, sweet melilot, &c. would be no ways ill advised, if he prepared a bit of ground, and sowed a spoonful of the seeds about a fortnight before he proposed to sow his larger quantity; since, from the good or bad success of this little attempt, he may be enabled to judge whether the seedsmen has supplied him with seeds fit for vegetation. Without such precaution, a whole year may be lost; which is a mortifying circumstance in matters of husbandry.

In the end of March, 1757, a common day-labourer was ordered to sow a pound and a half of lucern seed, and keep the ground clear from weeds. The seed was sown on one of the least promising pieces of land in all the neighbourhood; but this was done by express order; for it was thought unfair to make the experiment on a better soil than the commonest sort of grass-fields. The spot of earth set apart for the purposes, both of nursery and transplantation, was, in former times, a kitchen-garden: but the good soil, to the depth of eighteen inches, had been removed for the sake of manuring a corn-field. [To which we shall just add, that the attempt was made in an hilly country, where the staple earth is naturally shallow.] What remained was a cold, yellow, clammy stratum, which the country people looked upon as mere clay; but as nature having since been better examined, it appears to be a mixture of imperfect clay, and imperfect marle. No manure worth mention was used upon it, as will appear by the sequel.

To all seeming appearance, little, or next to nothing, could be expected from a piece of ground of such an unpromising cast; but upon the whole, the experiment proved successful and easy.

By the middle of August, the plants were, some of them, eighteen inches high; and many of them branched out, subdivided themselves, and made very fine side shoots: upon which it was resolved to venture upon the second part of the experiment, according to the accounts given by M. de Chateaucieux; therefore taking the advantage of a moist season, in the beginning of September, (which season, by the way, did not last long) we performed the work in the following manner. But here let it be just observed, in passing along, that the time of the year, pitched upon for transplanting, was, at least, three weeks too late for England, though perhaps highly proper for the territory of Geneva, or the southern parts of France. This therefore is set down as one of the *mutatis mutandis* so indispensably necessary in matters of agriculture, when the practice of one country is copied in another.

First the roots were dug up carefully; orders being given before-hand not to attempt drawing them, even with the smallest degree of violence, till the earth was entirely loosened at top and at bottom. In the next place, the long tap-roots were cut off eight, nine, or ten inches, discretionally, below the crown of the plant (the scissars being generally applied just beneath the forks of the root, if it be a branching root); then the stalks were clipped about five inches above the crown of the plant; and the remain-

ing plant, after these amputations (which may appear, at first sight, to be very bold ones) was thrown into a large vessel of water which stood by for that purpose, in the shade. Such refreshment is no ways unnecessary; for this plant is very impatient of heat and sun-shine after it is taken up; nay, to such a degree, (at least the first half year of its growth) that one may almost call it a sensitive plant. The same day, making use of a dibble, or setting-stick, and filling every hole with water before the roots are put in, we transplanted them in rows, two feet asunder, and each plant six inches apart in the rows; having first made little drills, or channels, and sprinkled, or half filled them with sea-sand and wood-ashes kept dry (two parts of the former to one of the latter); which was done with a view of loosening the soil, and giving a little warmth to a piece of ground which was naturally cold and clayey; nor was any other manure used. The drills were afterwards once watered, to take off the dryness and heat of the ashes. The roots were placed firmly in the ground, and two inches of the stalks covered with mould.

Yet here it must be freely acknowledged, that the hopes of possessing a large crop occasioned one mistake, which we chose rather to mention than suppress, as many people may happen to entertain the same false expectancies. The mistake was, that we made our rows two feet asunder, which was over-narrow; and placed the plants, in the lines, only six inches apart, which brought them nearer together than they ought to have stood, even though the ground was very poor: nor did we foresee, that horse-hoe ploughing is five times more efficacious, as well as cheaper, than hand-hoeings.

Therefore, after frequent experiments, since made, it appears best to make the lines three feet four inches distant from each other: and if the soil be good, it may not be amiss to allow each plant a foot distance one from another in the lines, for thus the hand-hoers will work more commodiously, and a little hoe-plough may be guided safely up and down the intervals, which will save a great deal of trouble; nor will the future crops be lessened, by such thin transplanting, half so much as may be imagined; but, on the contrary, the plants will be larger, more juicy, and better tasted; which circumstance may be extended in favour of the New Husbandry in general. Space and culture improve the herbage and seeds of plants; in proof whereof I have been assured, from good authority, that all the corn, raised by M. de Chateauvieux, sells at an advanced price; being larger, brighter, and healthier than common corn, and, consequently, more fit for sowing, or making bread.

But, by way of confirming the necessity of allowing lucern roots a good share of space, a friend of the author's filled an acre with plants, according to the first directions; but the soil proving extremely good, and free from weeds, it soon appeared that the roots stood too close; in consequence whereof, every other plant was taken up the next autumn, and a fresh acre of land being properly prepared to receive them, he thus gained a new plantation of lucern, at a small expence, with little trouble; and what is more remarkable, it is thought the second acre bore a larger quantity of herbage than the first would have done, if the plants had continued as they were, without being thinned, to the amount of one half. Of course, there is reason to conclude, that this slight hint, which took its rise from mere accident, ought not to be looked upon as quite unuseful, since two acres may be raised with almost the same expence as a single acre.

In ten days, though a drought succeeded, some transplanted plants made shoots of three inches height: which vigorous growth gave better hopes than had been conceived at first.

It was also some encouragement to the undertaker, that he found wild lucern within two musket shots of the place where the nursery was formed. These plants were certainly *aborigines*; for they grew in a part of the kingdom where the name of lucern had rarely been heard of, except by gentlemen. Besides, no person curious in husbandry would have ventured sowing the seeds in such an unpromising piece of ground; for the field, where the wild lucern grew, was a sort of coarse uncultivated morass, and valued only at about two shillings and sixpence an acre.

Yet still the approach of winter made many persons doubtful concerning the success of this new plantation; nevertheless, it was some satisfaction to recollect, that there is less harsh, severe cold in England (and that almost by

one third) than in the territory of Geneva, where the original experiment was made, and where the plant we are speaking of has been known to thrive so extremely well.

At length the winter passed over, and, out of four thousand roots, only thirty or forty perished, whether by frosts, immoderate rains, or any other accident, is hard to say; but the labourer filled up all the vacant spaces from the nursery in about an hour, and in April, 1758, most of the plants were nearly equal in size and strength; of a deep juicy verdure, with few or no discoloured sickly leaves; but, May the 8th, people counted sixty stems from one particular root, and the stalks and leaves of some chosen plants weighed near half a pound at one cutting. Yet we learn, by experience, that lucern must only be considered as in a progressive state, till the third summer after transplanting; and then, M. Duhamel assures us, that one flourishing plant will produce a pound of well-dried hay; which is saying a great deal, and much more than I could ever verify; for if a single plant produces one pound of hay, it must have weighed four pounds when it was green. Yet I have received an account from an eminent physician in our own country, (who planted two acres of lucern by my directions) that many of his plants, in the second year, yielded near half a pound of hay each plant.

As an acre of lucern, thus managed, will contain more roots than one is apt to imagine at first guess, how great must the produce be of four or five cuttings every year, and those confessedly the most nourishing and palatable food that cattle can eat! For thus much is certain, amongst other advantages, that, if a field be industriously hoed, ploughed in the intervals and spaces, and hand-weeded in the rows, for the first two or three years, it is almost sure, that horses, cows, or sheep, will hardly find a single weed in a large quantity of green food.

We will now mention the state of our transplanted lucern in its second year, namely, 1758.

And here let it be remembered, that what cultivators call a proper time for cutting is, when the plants are about fifteen or sixteen inches high, at an average, throughout the field; but this must be understood in a relative sense, for some plants will be two or three feet high, and others may not be above ten inches, or one foot, in height, according to the circumstances of health, space, situation, &c. of the several roots.

The cuttings of the year 1758 were as follow: May 8th, June 7th, July 12th, August 20th, and October 1st.

In the year 1759, it was cut five times, and six times in 1760; which made sixteen cuttings in three years. Nay by the 9th of April, in 1760, some of the lucern plants were near seventeen inches high, at a time when no field in the neighbourhood had grass of four inches height, though you took five or six acres together. The same lucern was cut twice, before any hay-making began in the country round it, if we except some few meadows lying near market-towns.

Having carried on my first experiment thus far, upon almost as unpromising a piece of land as could be found, and being sensible I had made some mistakes from want of experience (having as yet never seen any transplanted lucern in England), I gave directions for making a small plantation in Berkshire, but still took care to choose a field that could hardly be called middling land. It was overrun with coarse weeds, had been long out of tillage, and the earth in most places was hardly four inches above a bed of chalk; which (let farmers say what they please of it, in respect to *saintfoin*) is no ways favourable to the growth of lucern, especially if the latter be transplanted; for the chalk flakes, when thaws and rains come on; and it either heaves the plants out of the ground, or exposes the fibres of the roots too much to the cold. Yet upon this I ventured with my eyes open; for Pliny (whose authority I scruple not to take, when I have no other) had given me a caution concerning lucern raised upon chalky lands; but what induced me to make the attempt was, that the goodness of the soil might not lead me to say more concerning the success of an experiment than other people may hope to find.

The little field, or close, consisted of one rood of ground, or a quarter of an acre; which we threw into fifty-four rows, each row containing one hundred and ten plants, or five thousand nine hundred and forty in the whole. In the second year after transplanting, (and lucern is not then arrived to its due size), and at the first annual cutting, (which

(which is not the best cutting, as the herbage suffers much from the winter) I weighed, out of curiosity, a parcel of the prime plants, which, one with another, weighed about one pound and a quarter each. But supposing that every plant weighed only one quarter of a pound, and admitting we give up the sixth cutting, (which is more than one needs to do) then the crop of forty perches, or one fourth of an acre, amounts to a very considerable return of ten tons, at least, of green lucern per acre.

An acre of transplanted lucern, rightly managed, will bring in five pounds a year, free and clear from all expences, and that for a considerable tract of time. Now certainly this advantage deserves well to be considered; for the husbandman is said to be a good manager who makes three rents each year; a first for the landlord, a second for the labour, &c. and a third for himself: but an acre of lucern will for several years produce five rents, clear of all out-goings for rates, rent, workmen, manure, &c. supposing the land to be let at fifteen shillings an acre, as usually happens in most estates that lie at some distance from cities and market towns. On the contrary, if land be dearer near rich populous places, the ground will be better, and the produce more advantageous. This gives lucern its value near towns and cities, where two or three acres may be rented: but ten or twenty cannot; and sure it is some advantage in husbandry to make one acre supply the place of two or three, and especially where it is difficult to rent land, even at a very high price.

It is certain, that the profits arising from transplanted lucern have been no ways exaggerated in my account; for by some collateral observations, it may be easy to carry the value of an acre something higher than has been here represented. Suppose green vetches (which are rarely cut more than once) and green lucern to be of equal value as food for horses (which is making a supposition no good writer in husbandry will allow to the disadvantage of lucern); now a perch of green vetches (if the crop be good) sells for sixpence at seventy miles distance from London, and a perch of transplanted lucern will weigh as much, or very nearly as much, at two cuttings, out of the four or five annual cuttings; which (every circumstance being duly considered) brings an acre of lucern (to say the least of its advantages in husbandry) to be of equal value with two acres and a half of vetches; not to mention that lucern is a perennial plant, and vetches are annual; which, upon the whole, makes another difference in point of profit.

As I think it unfair to suppress any unsuccessful circumstances in matters of husbandry, I will here ingenuously confess, that the most material of my mistakes were these: I followed my foreign instructions (which, at that time, were but few) with too much diffidence, and in too literal a manner. I was not enabled, through want of experience, to adapt the husbandry practices of other nations to the English climate. I transplanted too late, filled my rows too full, and allowed not sufficient space for the intervals. By following the French directions over closely, I cut the tap roots too short in the best plants, and knew not (as it is a point unmentioned by any cultivator of lucern) how to manage a root that was very small. The means of avoiding and rectifying all which mistakes and difficulties, are by the help of subsequent experience, carefully pointed out.

And here it may be worth considering how to apply a field of lucern, carefully and industriously cultivated, to the greatest advantage. In such a case, let us suppose the plantation to consist of two acres, and that four large horses are to be supplied with green fodder, from the end of April till Michaelmas. Now in order to manage this affair with dexterity, count the number of rows or lines in the lucern field, and place in one of the head-lands thirty land-marks, at equal distances; and thus, having cut a proper portion, day by day, you will be ready to begin afresh, after the last cutting.

When I say you will be ready to begin afresh at the end of thirty days, I must desire to be understood, with a small degree of latitude: for physical accidents are so numerous and unavoidable in regard to the growth of plants, (though lucern is liable to fewer checks and miscarriages than most other cultivated field vegetables) yet still the nature of the thing will not allow us to predict the time of each and every periodical cutting with much certainty; nevertheless, thus much may be depended upon, even for some years successively, that, after the first annual cutting, our di-

rections, here given, will be attended with no inconvenience to the owner; for there will rarely be more than three or four days difference between the times of the second, third, and fourth cuttings: nor will the want of lucern fodder, during such short intervals, be of the least ill consequence; for, surely, that husbandman must be a very improvident manager who has not other grass fields by way of a momentary supply.

The times, therefore, of the second, third, and fourth annual cuttings, are tolerably certain; but the first cutting, according to the nature of the winter, may be accelerated or retarded a fortnight, three weeks, and, perhaps, a month.

The time of the fifth cutting is also, in some degree, variable and uncertain, as the solar heat decreases, and the days grow shorter. A sixth cutting, which is seldom of much consequence, chiefly depends on a fortunate season, in conjunction with the industrious good management of the cultivator.

From this succession of fresh green food appears one singular advantage in raising lucern: and in the next place care must be taken, that your plantation be always proportionable to your number of cattle; or, in other words, let it be a rule with you to have rather over much lucern, than too little; for then one cutting may be set apart for hay, which may be given occasionally to favourite horses and sick cattle. But, in case no hay is made, the owner of the ground, even then, by means of the supplies he derives from green lucern, will be enabled to spare a large quantity of other grass for hay-making; and thus two acres of lucern will give him the power of saving two or three tons of hay more than he could have saved otherwise; consequently lucern, in effect, helps to keep cattle both in winter and summer.

By such sort of husbandry, and provident management, the stock of hay for winter will be considerably increased, and the owner enabled, for the space of five months at least in the other parts of the year, to allow his horses very nearly the same quantities of green food each day; all equally fresh, wholesome, and well tasted: which single circumstance, (if it related to horses only) gives lucern the preference over all other sorts of green fodder hitherto known, and in process of time may be applied (as has been experienced with much success) to the fattening of horned cattle, provided such cautions are used as shall be specified hereafter, and which ought always to be remembered. Now whatever increases the number of cattle, augments the quantity of dung necessary for carrying on the more successful cultivation of arable lands; and whatever, by multiplying the number of cattle, affords more animal food to man, will of course contribute towards lessening the price of meat, which will assist society in general, and more particularly the manufacturer and peasant; for the grand secret of well managing a trading populous country, is to supply the inhabitants with flesh and corn upon easy terms; for then mankind will multiply of course (supposing the government to be mild and equal); nor will other nations undersell us in the commodities we export to foreign markets.

Now lucern, in matters of husbandry, comes the nearest of any article yet known, towards attaining the points here proposed; forasmuch as one acre of land, thus cultivated, will support as many cattle in spring, summer, and a part of autumn, as four acres of common, natural, upland grass did before. But this use of lucern is greater, if land be scarce; or if the nation be populous, and the soil has been cultivated to the extent of the old husbandry: for then the introducing this plant is, in effect, the same as creating new land, if the superior produce of lucern, both in quantity and quality, be fairly considered by us.

Yet one thing must be well understood in the new practice of raising lucern. Negligent husbandmen, and such as expect good crops without labour, expence, frequent ploughings, weedings, &c. would act a wise part in not attempting to cultivate the plant here mentioned: nor is it advisable for gentlemen of fortune to commit this part of husbandry to bailiffs and servants, who (be their master's advantage ever so great) will not like the labour (though they were well paid for it) of turning fields into a sort of gardens, and, besides all this, may conceive a prejudice against improvements, and take some small delight to see them miscarry: so that all random, careless, and insincere methods of culture, must have nothing to do with raising plants, which, though hardy and long-lived after they at-

tain a certain age, yet are surprizingly delicate and tender when they are young, or when first transplanted; and more especially if wild couch-grass and other weeds should spring up amongst them.

For these reasons, at first setting out, I must advise every good cultivator to be particularly industrious in the extirpation of weeds, and that he overburdens not the strength of the earth from a principle of avarice, but allows her the just refreshments of manures, and gives her at least some breathing space of ease and repose.

It is highly unreasonable to expect success in the management of this plant without care, and highly improbable (if the seeds are good) to miscarry with due care. It is true, many people have failed in the process of this experiment; but then one is generally enabled to point out the error, as likewise the cause of ill success, with tolerable exactness. To begin well in cultivating this plant is doing but little; rules and directions must be cautiously observed for three, or two years at least. Few people make mistakes in the beginning of an experiment: but, generally speaking, after three or four months are expired, the master's attention and keenness wear off, and the bailiff or gardener, (as sometimes the raising of a lucern nursery falls in the province of the latter) are extremely glad not to refresh his memory: for the one does not like an additional trouble out of his department, (a punctilio which has great weight with all servants); and it is a maxim with the other, never to admit any thing new in matters of husbandry, but admire those sorts of crops which Columella describes, crops that can hold up their heads, and prosper under all the negligence of a pretending cultivator.

It is true, many difficulties and discouragements attend making experiments. The continuance of life is as short as that of art is permanent; and few husbandry experiments can be made oftener than once in a year: nor must we reason too much by analogy, from success in one production, to success in another of a different species. Attention also is required, and that even to the minutest circumstances: and again, too many experiments die with the observer; which, though highly useful, did not appear considerable enough for human vanity to establish a system thereon.

Yet still all these difficulties and discouragements may be counter-balanced by the advantages which result afterwards to society.

Lucern cannot easily be freed from manifest disadvantages by any other method of culture than what is here recommended. That it has usually miscarried, when sown with spring corn, after repeated trials in this kingdom, from the year 1757 to 1764, is well known to many readers; for common wild grass, and particularly couch-grass, may be called its destruction, if not its poison, principally indeed by starving the roots of it, but probably from its effluvia too. This likewise I have always observed in plants of a different species that stand too near each other; they immediately, as it were by a declaration of war, contend for mastery: the roots are constantly attempting depredations and encroachment upon each other; whilst the stalks, especially those of weeds, make the same efforts in longitudinal shoots; and that plant which overtops the other, provided the shoots are equally thick and strong, always gains the victory, and, by overshadowing and dripping upon its antagonist, forces it to dwindle away and perish. This struggling for life and mastery draws up the plants too weak and spindling, and the conquered plant usually dies. Now weeds, generally speaking, are more hardy, savage, and hungry, than manured vegetables. If such be the case, where is there a country to be found that abounds with foul grass and weeds more than England? So that, if lucern be sown in the usual way amongst corn, like ray-grass, clover, and hop-trefoil, no care can keep an acre clean. It may last two years, (only one crop being tolerable) and then must perish in the common course of nature. A gentleman very lately made this experiment (in a great degree against his judgment) for the sake of farmers, in hopes of finding out a cheap, easy, and compendious method of raising lucern; but the crop at the end of fifteen months was as near being overpowered and starved as can be imagined; which made him venture to take up and transplant the few good roots that remained, which, being freed from the bad neighbourhood and incumbrance of coarse grass and other weeds, appeared to prosper very well. Again, if lucern be raised in drills according to

the best directions hitherto given by our ingenious countrymen, Tull and Miller, (who, to do them justice, were the first persons, amongst our modern writers, that saw the great advantage of this grass, and pressed the culture of it strongly on the English nation); certain it is, that such a method will greatly exceed the promiscuous sowing of lucern with spring-corn. Yet still, in the practice of drilling, a considerable part of the seeds may be faulty, and then the rows will appear naked and unsupplied with herbage: nor can the hopper be supposed always to drop the little grains at precise distances, plant from plant. Nevertheless, such persons as prefer drilling may fill up all the vacant spaces with transplanted roots.

In the method of cultivating lucern, which is here recommended, an acre will be found to contain about such a number of chosen healthy roots as the ground is capable of supporting, and admit a greater number of them than the reader will be apt to imagine, *prima facie*; for it will hold, according to my first experiment, about twenty-six thousand plants: but, if the ground be clean, rich, and well conditioned, it may be more advisable to observe the greater distances already mentioned; upon which principle, the acre will contain about thirteen thousand plants; and this is the number, all things considered, I am most inclined to recommend; for the produce of such an acre will be full as large and profitable as the former, and the ground will be managed with less expence and more convenience.

It may be observed farther, that, in transplanting lucern, there will be one advantage (and that no small one) which can never be obtained in drilling, or promiscuous sowing; each root will stand at a proper distance from its neighbour, and receive its allowance of food in due quantity without diminution. In the next place, you will seldom see a plant wanting, and rarely (except by mistake) a plant supernumerary: but, if a few sets should chance to die, it will be easy to supply the vacant spaces from the nursery, and that as people find by experience, in any moist day, from April till the middle of September.

There is another advantage which arises from transplanting lucern; for, by cutting the tap-root, you prevent its penetrating ten or twelve feet perpendicular into the ground, which the plant naturally does in three or four years, except it be obstructed by a stratum of rock, or chilled at root by weeping springs, or finds admission in a bed of cold watery clay. Then the crop makes a poor appearance, or, perhaps, goes off all at once.

People who hand-hoe or horse-hoe lucern, need not give themselves much pains about breaking or cutting off a lateral root accidentally, not but that some care and caution must always be used; however, what seems to injure the parent-plant, proves in the end no ways disadvantageous to it: for horizontal, or side roots, thus cut, or broken, push forth new roots and filaments laterally; and thus the suckers, or tubes that suck nourishment, are multiplied by a cause which had the appearance of lessening their number. Yet transplanted lucern will no ways bear such rude treatment as the ancients sometimes gave to untransplanted lucern, when they thought fit to make it undergo the discipline of harrowing.

How long lucern may last cannot be known by the experiments which are here related, namely, from the spring of 1757, to the beginning of the year 1764; but some persons of credit have observed the plants to continue in good strength and health near twenty years. [I suppose they mean here and there particular plants, and not a whole plantation.] Tull, indeed, tells us that, except lucern be choked or starved by grass and weeds, he hardly knew when to say it will die a natural death; and probably it may not prove the less long lived for being transplanted; since hand-hoeings, horse-hoeings, and digging will give new strength and health to the plants. The spreading of the roots will be facilitated by loosening the soil, and letting in the good influences of the atmosphere; their growth also will be augmented by giving them that additional nourishment of which the weeds defrauded them: and, in the last place, all manures will more easily reach them; for thus much is a certain fact in husbandry, that, when the ground is rendered clean, light, and penetrable, the roots love to expand themselves, in order to procure a greater quantity of nourishment.

I fairly acknowledge that I am not enabled, from my own experience, to fix the common duration of lucern, whether

whether transplanted or drilled, (and that from no difficulty in the thing itself, but because a sufficient number of years has not elapsed since making my experiments); but thus much I can take upon me to say, from my own knowledge, that lucern sown at random, or by what we call promiscuous sowing, as the ploughman sows rye-grass and clover, (whether with or without spring corn) will not last to any tolerable purpose above two years, or three at most. But as this plant is of the greatest use and value, where land is dear, and scarce, as near cities and towns, I see no reason to doubt, but that the same spot of ground may be continued as a lucern plantation for half a century at least; for if the rows are three feet four inches wide, (which I look upon to be a *sine qua non*) then, whenever the old lucern decays, new lines may be planted in the middle of each interval which has lain fallow, and also been manured and pulverised for a considerable number of years; and thus progressively, *vice versa*, to a long continuance.

Not being able therefore to give positive satisfaction concerning the continuance of lucern rightly managed, I shall propose something that is not merely a query, and which, perhaps, may give the reader an equivalent information. In a few words, it is as follows: when lucern is grown old, and the owner proposes to break up the plantation, layers might be made from all the principal stalks, and removed into fresh ground. These layers, in all probability, may succeed extremely well, according to some few experiments made abroad in the years 1755 and 1756.

As to the expence and risque of cultivating small quantities of ground, agreeably to the method here laid down, it is to be hoped that curious gentlemen will not be deterred by some few minute difficulties or objections, but give the present experiment fair, patient, and repeated trials; for neither the out-goings nor the hazard will be very considerable. But at present it is no ways our intention to persuade farmers (at least such as are in low circumstances) to quit their little certainty for an advantage which may appear to them quite uncertain.

Let them wait, at least for a few years, in hopes some cheaper and more compendious method may be discovered for their sakes; and if, at present, they make any experiments, let them be in small portions.

The first point of consideration, when I undertook to recommend transplanted lucern to the public, from my own experiments, was to bear constantly in mind whether the profit counterbalanced the expences and labour of culture, and that in a double or even treble proportion; since, otherwise, I was doing little more than postponing utility, for the sake of introducing a new sort of husbandry, which only deserved to be called ingenious.

We all know that the farmer expends much money, and gains very little from a crop of wheat at the expiration of his twelve months; but if we take ten years together, and compare the profits of lucern on the one hand, and wheat, barley, oats, and clover, on the other, the balance will certainly turn in favour of the lucern-crops, and that in a proportion of three, or two, to one, at least.

The expence of raising an acre of lucern in the manner which we recommend, (and supposing even digging to be made use of instead of ploughing) amounts, as nearly as I can remember, to the following sums:

	l.	s.	d.
Fine-digging and picking thirty perches for a nursery	0	12	0
Seed	0	7	0
Hand-weeding the nursery twice, and transplanting into vacant patches such plants as stand too thick	0	13	0
Digging an acre for receiving the roots	2	10	0
Transplanting	1	5	0
Hand-weeding and hand-hoeing the rows, with a four-inch hoe that cuts downwards, and then with a larger plantation-hoe which cuts horizontally	1	0	0
Two horse-hoeings	0	5	0
Total	6	12	0

"It is true, the expences of raising lucern, in this manner, will vary, when applied to parts of England different from those where the experiment was made, as the price of

labour may be dearer, and rents run higher; but then the ground ought to prove better, which will balance the difference.

This plantation of lucern may be cut three times the first year after transplanting; as some repayment for the out-going expences: next year the profit will be more considerable.

On the other hand, those who prefer the drill-method of raising lucern, as less expensive, may seem to save about two pounds, or more, upon an acre, at the first appearance of things; but then the rows, in case the crop succeeds (which is a doubtful point) must be thinned with good judgment, which will cost money; and the vacancies in them must be filled at last with transplanted roots: nay, M. de Chateauvieux asserts, that drilled lucern will rarely be so large and flourishing as the transplanted; for the effects of horse-hoeing, and the influence of manures, may prove of less service to the roots of the former, at a depth of twelve or thirteen feet, than to the roots of the latter, whose finest imperceptible fibres will hardly descend above a yard perpendicular.

It is hard to say at what precise time the assistance of the hoe-plough should be called in: but the owner of the plantation may venture on the attempt, I think, with safety, in three days after the second cutting, about the beginning of June; for the roots then will be tolerably well settled in the ground, and before that time the flat plantation-hoe may be used, choosing such an one as is about eight inches and a half wide in the cutting part.

As continued hand-hoeings will be chargeable, troublesome, and almost endless (being in truth little more than a temporary expedient, and slight scratching the surface of the earth), remember to make a light plough, with which you are to cultivate the spaces between the rows; and in this case you may either invent a plough according to your own fancy, or copy such as are used at home, or in other countries, on the like occasion.

The share of this plough should be sharp, about sixteen inches long, with a coulter proportionable; the plough itself no heavier than a strong lad of fifteen years of age can carry: and thus one horse, after some obstructions of no great consequence in the first attempt, will afterwards draw it with ease. Yet still the trouble will be lessened, if the field be prepared by digging and picking up the roots and stones, instead of common ploughing, just before the ground is to receive the transplanted roots; therefore, after a full second consideration, the former practice is recommended preferable to the latter; and if the lucern stands nine or ten years, the difference of the expence will not be perceived.

As the rows will be one yard four inches asunder, there will be room sufficient to guide the plough safely along the intervals, and yet no room to spare: it behoves the ploughman therefore to be extremely careful in the slice he cuts next the lines: such a stroke must be a shallow and a dexterous one, nor must he approach too nearly. A man, an horse, and a boy to lead the horse, will manage an acre in a day, when they know their business; for it is more a matter of nicety than fatigue, since the ground ploughed in an acre will hardly exceed half an acre.

After the first time of using the horse-hoe plough (which a man's own discretion, upon considering the strength of the plants, will best determine), it may be laid down for a general rule, that it will be always found most convenient to horse-hoe the intervals (as long as the plantation stands) the third day after each cutting; for by that time the new shoots will make the plants visible, nor will any side-branches stand in the plough's way.

It may be proper also to hand-weed the lines once a year; and the larger weeds may be taken up expeditiously with the three-pronged spade or the field-spade.

We will now consider the expences of an acre of lucern the second year, which will stand as follow:

	l.	s.	d.
Clearing the lucern plants from weeds in the rows by hand	0	8	0
One hand-hoeing of the intervals	0	8	0
Four horse-hoe ploughings	0	11	0
Compost-dressing for manure, or foot, or wood, peat ashes, at an average per year	0	10	0
Dispersing the manure	0	3	0
Total	2	0	0
Such			

Such will be the yearly charges, or in some proportion very like them, during the continuance of your lucern, which I fix at a medium of ten years: M. de Chateauvieux says it may last twenty; and Pliny goes as far as thirty; though the expression may be looked upon to be exaggerated.

In regard to manuring lucern, it may suffice to suggest here in general terms, that if the ground be stiff, cold, and of a clayey tendency, then wood-ashes, foot, and lime, are proper dressings. If the ground be hot, shallow, and brashy, a compost of calcined clay, dung rotted to a fine mould, and pond-mud, long exposed to sun and frosts, and frequently turned, may have its use: and if the ground proves of a middle nature, then malt-dust will not be amiss. All these manures are easily procured, and therefore we have mentioned none that are scarce and dear: but as variations of soil are infinite, and few people know the true nature of any field (especially if it be of the mixed kind), we recommend the compost dung-hill, as the surest and most universal assistant upon such occasions.

Many other manures may be good for lucern, but dung probably is not one of the best, except it be very old, and well corrected with proper mixtures of a sweet, as well as fertilizing nature, sufficiently warm and cherishing, but no ways rank; for dung (especially if it be new) produces in general very luxuriant, troublesome weeds, insects in abundance of various kinds, and gives the grass a foul, cloying, putrid taste.

The owner's eye, it is true, may be deceived, and his hopes encouraged by the largeness of the crop; but the sagacious four-footed animals will distinguish better than we can pretend to distinguish; and if they could present a petition to their masters, as the white heifers are reported once to have done to the emperor Julian, they would remonstrate not a little against the immoderate use of this manure. Nevertheless, assertions like the present ought to be confirmed by some proof: an experiment therefore was made upon four acres of grass ground, of which one half was dressed with stable dung, and the other with wood ashes kept dry. The former moiety appeared the most rich and luxuriant of the two, but the cattle always neglected it, till they had bitten the latter down to the bare earth.

Having thus given the result of my experience in regard to dung as a manure for lucern, I shall subjoin only one short caution, which is, that no dung, not even of the best kinds, must be spread on a lucern plantation, till it be two years old at least.

In all grounds inclinable to moisture, and such particularly as are of a clayey cast, it is pretty certain, that the preference ought to be given to foot-dressing, and, after foot, to chimney-ashes (those of green wood especially) provided they are housed and secured from wet; then soap-boiler's ashes may take place, coal-ashes well sifted, charcoal-ashes, and malt-dust; nor might the ashes of lime be amiss, nor lime itself, when mixed with such fine mould as may be found under a short sweet turf, in lanes or commons. The compost-dunghill also, as observed before, should be applied to, which, at the end of twelve months, having been thrice turned, will spread almost as well as ashes or foot: nor will such compost want strength when it is rightly managed: for if the dunghill be moistened at times with the brine, soap-suds, dish-washings, and chamber-lice, &c. of the family, then, when it is removed into the fields, the sharp, pungent, strong salts, which fly off, will make the labourers sneeze, and occasion a smarting in their eyes.

When you manure lucern with foot, dry chimney-ashes, lime, soap-boiler's ashes, &c. it is sufficient to dress the rows only, because these finer sorts of manure may be dispersed in the nicest, exactest quantities, if sown in the Berkshire manner, with a peat-ash spoon; but if coarser manures are to be employed in larger quantities, as old dung, marle, compost-dressings, &c. I would then advise the proprietor of the field to manure the intervals and rows promiscuously.

Nothing can be more cheaply and easily managed than manuring lucern with foot-dressings; for the labourer, if he makes use of a peat-ash spoon and seed-lip, may sprinkle the rows of an acre in four or five hours, walking down the first interval, and returning by the second, and so progressively.

Ashes may be sown in the same manner.

It may not be amiss to answer a couple of questions which have been often proposed.

The first question is, how, and in what manner (by way of result from the considerable number of experiments made by me) I would advise any gentleman to prepare three or four acres of land for receiving lucern? this being an undertaking of some moment.

The second question is, how to perform this work in the shortest, safest, and most economical manner? Concerning both which points my ideas are as follow, this only premised, that I am here endeavouring to make the expence of the undertaking as cheap as possible; otherwise, where people pay no regard to a few incidental charges, I would recommend Mr. Boyle's method of preparing a field for receiving transplanted lucern, who began his experiments of lucern in the same year that I did, but proceeded upon a larger scale; for he undertook the culture of six acres at once.

His preparation of the field was as follows:

In the year 1757, he gave his field a summer fallow, and having thoroughly ploughed and harrowed it (not as farmers understand these words, but effectually, instead of superficially) he sowed wheat after the ground had been dressed with lime. In 1758, his crop of wheat was very great. Immediately after harvest, he gave the land in question a severe discipline, using every method for pulverising the earth, and extirpating weeds, that the best husbandmen are acquainted with, either in our kingdom or abroad; so that the field appeared again a perfect fallow. Then ploughing it very narrow and sharp, he made water thorough with the plough, and left it in this condition for the winter 1758.

In spring 1759, he made many French drains in the field, as before they had made open ones for the winter: and, by stone-picking the land, had nearly stones sufficient to fill them. In March, the same year (taking advantage of the first fine weather) he slit the ridges with the plough, and reduced the land to the finest tilth he was able, and transplanted the lucern from his nursery in autumn; in the whole process of which he followed Duhamel exactly.

Nothing in husbandry could be more sensible and masterly, than this preparation of a large piece of the land for receiving lucern.

In the present case it may suffice to say, that supposing the nursery to be properly prepared, and the seeds sown in the first week of April, before the season for transplanting, according to directions already given; I would recommend a field in good tilth, after barley harvest, and before oats have been sown in it. This field should be thoroughly ploughed and harrowed twice, which we will suppose to be, for example, in autumn of the present year, 1764. After each ploughing and harrowing, there should be a very diligent burn-beating. But if the season should prove too wet at the time of a second burn-beating, we make a virtue of necessity, and the weeds and trumpery must be raked together and carried off.

Then give the field a trench-fallow ploughing for winter, and early in March, 1765 (if the weather any ways permits), having manured your ground as the relative nature of the soil requires, and ploughed and harrowed it again to an exquisite fineness, drill in a crop of field-pease, as early in the spring as is convenient with prudence and safety; for this crop must be ripe, and removed, by the last day of July. Much depends upon this point of foresight: however, the pease, by standing thinner than in hand-sown promiscuous crops, being at the same time banked and hoed with greater ease, and enjoying more room, free air, and sun-shine, will, in all probability, gain an advance of ten days at least in their ripening. This will be a great point secured; for it is in husbandry as in war; there are critical moments, which never present themselves a second time in the same campaign.

This pea-crop being hacked, and moved from the field by the fourth or fifth of August, call in all the assistance you have of husbandry-strength, or can procure, and plough and harrow the field, and burn the pea-roots, weeds, &c. as often as you have time, before the twentieth of August: and then (your nursery being supposed to be in perfect readiness) transplant your roots as before directed, and contrive to close your work by the end of the month.

Mr. Lullin de Chateauvieux has obliged the world with many

many valuable experiments, on the culture of lucern, which must not be omitted here : but it may not be amiss to give first Mr. Miller's directions for cultivating lucern, as it has been often mentioned in the article. They are as follows :

"After having well ploughed and harrowed the land very fine, you should make a drill quite across the ground, almost an inch deep, into which the seeds should be scattered very thin : then cover them over a quarter of an inch thick, or somewhat more, with the earth : then proceed to make another drill, about a foot and a half from the former, sowing the seeds therein in the same manner as before, and so proceed through the whole spot of ground, allowing the same distance between row and row, and scatter the seeds very thin in the drills. In this manner an acre of land will require about six pounds of seed ; for when it is sown thicker, if the seeds grow well, the plants will be so close as to spoil each other in a year or two, the heads of them growing to a considerable size, as will also the roots, provided they have room. I have measured the crown of one root, which was in my possession, eighteen inches diameter, from which I cut near four hundred shoots at one time, which is an extraordinary increase, and this upon a poor dry gravelly soil, which had not been dunged for many years, but the root was at least ten years old ; so that if this crop be well cultivated, it will continue many years, and be equally good as when it was first sown : for the roots generally run down very deep in the ground, provided the soil be dry ; and although they should meet a hard gravel a foot below the surface, yet their roots would penetrate it, and make their way downwards, as I have experienced, having taken up some of them, which were above a yard in length, and had run two feet into a rock of gravel, so hard as not to be loosened without mattocks and crows of iron, and that with much difficulty.

"The reason for directing this seed to be sown in rows is, that the plants may have room to grow ; and for the better stirring the ground between them, to destroy the weeds, and encourage the growth of the plants, which may be very easily effected with a Dutch hoe, just after the cutting the crop each time, which will cause the plants to shoot again in a very little time, and be much stronger than in such places where the ground cannot be stirred : but when the plants first come up, the ground between should be hoed with a common hoe ; and if, in doing of this, you cut up the plants where they are too thick, it will cause the remaining to be much stronger. This hoeing should be repeated two or three times while the plants are young, according as the weeds are produced, observing always to do it in dry weather, that the weeds may the better be destroyed ; for if it be done in moist weather, they will root and grow again.

With this management, the plants will grow to the height of two feet or more, by the beginning of August, when the flowers will begin to appear, at which time the lucern should be cut, observing to do it in a dry season, if it is to be made hay, and keep it often turned, that it may soon dry, and be carried off the ground ; for if it lie long upon the roots, it will prevent their shooting again. After the crop is taken off, you should stir the ground between the rows with a hoe, to kill the weeds, and loosen the surface, which will cause the plants to shoot out again in a short time ; so that by the beginning of September there will be shoots four or five inches high, when you may turn in sheep upon it to feed it down : nor should the shoots be suffered to remain upon the plants, which would decay when the frosty weather comes on, and fall down upon the crown of the roots, and prevent their shooting early in the succeeding spring.

"The best way therefore is to seed it until November, when it will have done shooting for that season : but it should not be fed by large cattle the first year, because the roots being young, would be in danger of being destroyed, either by their trampling upon them, or their pulling them out of the ground : but sheep will be of service to the roots by dunging the ground, provided they do not eat it too close, so as to endanger the crown of the roots.

"In the beginning of February, the ground between the rows should be again stirred with the hoe, to encourage them to shoot again : but in doing of this you should be careful not to injure the crown of the roots, upon which the buds are at that time very turgid, and ready to push. With this management, if the soil be warm, by the middle

of March the shoots will be five or six inches high, when if you are in want of fodder, you may feed it down till a week in April ; after which it should be suffered to grow for a crop which will be fit to cut the beginning of June, when you should observe to get it off the ground as soon as possible, and stir the ground again with the Dutch hoe, which will forward the plants shooting again, so that by the middle or latter end of July, there will be another crop fit to cut, which must be managed as before ; after which it should be fed down again in autumn : and as the roots by this time will have taken deep hold in the ground, there will be little danger of hurting them, if you should turn in larger cattle ; but you must always observe not to suffer them to remain after the roots have done shooting, lest they should eat down the crown of the roots below the bud, which would considerably damage, if not destroy them.

"In this manner you may continue constantly to have two crops to cut, and two feedings upon this plant, and in good seasons there may be three crops cut, and two feedings, which will be a great improvement, especially as this plant will grow upon dry, barren soils, where grass will come to little, and be of great use in dry summers, when grass is often burnt up : and as it is an early plant in the spring, so it will be of great service when fodder falls short at that season, when it will be fit to feed at least a month before grass or clover ; for I have had this plant eight inches high by the tenth of March, old style, at which time the grass in the same place has scarcely been one inch high.

"That cold will not injure this plant, I am fully satisfied ; for in the very cold winter, anno 1738-9, I had some roots of this plant which were dug up in October, and laid upon the ground in the open air till the beginning of March, when I planted them again, and they shot out very vigorously soon after : nay, even while they lay upon the ground they struck out fibres from under the side of the roots, and had begun to shoot green from the crown of the roots. But that wet will destroy the roots, I am fully convinced ; for I sowed a little of the seed upon a moist spot of ground for a trial, which came up very well, and flourished exceedingly during the summer season, but in winter, when the great rains fell, the roots began to rot at bottom, and before the spring most of them were destroyed.

"The best places to procure the seed from, are Switzerland and the northern parts of France, which succeeds better with us than that which comes from a more southern climate : but this seed may be saved in England in great plenty ; in order to which, a small quantity of the plants should be suffered to grow uncut till the seeds are ripe, when it must be cut, and laid to dry in an open barn, where the air may freely pass through : but the seed must be defended from the wet ; for if it be exposed thereto, it will shoot while it remains in the pod, whereby it will be spoiled. When it is quite dry, it must be threshed out, and cleansed from the husk, and preserved in a dry place till the season for sowing it : and this seed saved in England is much preferable to any brought from abroad, as I have several times experienced ; the plants produced from the French, Helvetian, and Turkey seeds, which were sown at the same time, and on the same soil and situation.

"I am inclinable to think that the reason of this plant's not succeeding, when it has been sown in England, has either been occasioned by sowing it with corn, with which it will by no means thrive (for though the plant be very hardy when grown pretty large, yet at its first coming up, if it be incommoded by any other plant or weed it seldom does well ; therefore it should always be sown by itself, and carefully cleared from weeds until it has strength, after which it is not easily destroyed) ; or, perhaps, people have sown it at a wrong season, or in wet weather, whereby the seeds have rotted, and never come up, which hath discouraged their attempting it again : but however the success has been, I dare aver, that if the method of sowing or managing this plant, which is here laid down, be duly followed, it will be found to thrive as well as any other sort of fodder now cultivated in England, and will continue much longer : for if the ground be duly stirred after the cutting of each crop, and the first crop fed, as hath been directed, the plants will continue in vigour twenty years, or more, without renewing, provided they are not permitted to seed, which would weaken the roots more than four times cutting would do.

"The hay of this plant should be kept in close barns, it being too tender to be kept in ricks open to the air as

other hay : but it will remain good, if well dried before it be carried in; three years. The people abroad reckon an acre of this fodder sufficient to keep three horses all the year round : and I have been assured by persons of undoubted credit, who have cultivated this plant in England, that three acres of it have fed ten cart-horses from the end of April to the beginning of October, without any other food, though they have been constantly worked. Indeed the best use that can be made of this grass, is to cut it and give it green to the cattle. Where this hath been daily practised, I have observed that by the time the field has been cut over, that part which was first cut, hath been ready to cut again; so that there has been a constant supply in the same field from the middle of April to the end of October, when the season has continued long mild; and when the summers have proved showery, I have known six crops cut in one season: but in the dry seasons there will be always three. When the plant begins to flower it should then be cut: for if it stands longer the stalks will grow hard, and the under leaves will decay, then the cattle will not so readily eat it. Where there is a quantity of this cultivated, some of it should be cut before the flowers appear, otherwise there will be too much to cut within a proper time.

"When this is made into hay, it will require a great deal of making: for as the stalks are very succulent, it must be often turned, and exposed a fortnight before it be fit to house; for this requires a longer time to make than sainfoin: therefore, when it is cut, it should be carried to make upon some grass-ground; because the earth in the intervals of the rows will wash up, and mix with the hay in every shower of rain; and, by carrying it off as soon as it is cut, the plants will shoot out again soon: but it is not so profitable for hay, as to cut green for all sorts of cattle, but especially horses, which are extremely fond of it; and to them it will answer the purpose of both hay and corn, and they may be worked at the same time just as much as when they are fed with corn, or dry food." *Miller's Gard. Dict.*

Experiments on Lucern cultivated according to the New Husbandry, by M. de Chateauvieux.

"It is truly with regret, says M. de Chateauvieux, that I am forced to treat a subject of this importance, in so summary a way as the limits of this letter require. However, I hope that even this general account of my experiments may be a guide to those who would cultivate this plant. Many persons who live at a considerable distance from this place (Geneva) have already followed my example, and are extremely well satisfied with their success.

"Though I agree with M. Duhamel, and the other partisans of the New Husbandry, that lucern and sainfoin thrive best when cultivated in beds; yet my practice differs, in many respects, from theirs. This difference consists in,

1. The Principle which I apply particularly to the Culture of Lucern.

"Lucern grows naturally with one large perpendicular, or tap-root, which penetrates very deep into the earth, and has few, if any, lateral roots. From similar experiments on other tap-rooted plants, I was induced to think, that this too, by transplanting it, and at the same time cutting off part of its tap-root, might be made to shoot out several horizontal roots, which, reaching into the loose mould of the alleys, and extending themselves there, would collect a greater quantity of nourishment for the plant, and consequently enable it to produce more abundant crops.

"The event has proved, that when we reason on sound principles, we seldom err. My transplanted lucern pushed out numbers of large lateral roots, and these branched out again into others, which may be multiplied without end by frequent culture of the alleys: for the horse-hoe has the same effect on these horizontal roots as cutting has upon the tap-root.

2. The Method of transplanting the Lucern.

"I made several beds, some about three feet wide, (including the alleys) into which I transplanted a single row of lucern; others about three feet nine inches, into which I transplanted two rows; and others about four feet three inches wide, in which I put three rows. The design of this variation was, to see by which of these three methods the same extent of ground would produce the greatest quantity

of lucern: I believe it will require five or six years to determine exactly which of them will be best; because, as the plants increase every year in bulk, their produce alters, and may perhaps not keep in proportion to their first years, though probably the difference would not be great. But without waiting so long, I can already see, that the crop will be greatest by planting only one row on each bed.

"The plants in the single rows were six inches asunder, nor should they ever be nearer; and those in the double and triple rows, were eight or nine inches distant from each other. I must observe, that I likewise sowed lucern with the drill, in beds, in which it has remained without transplanting. It is very fine: but not near so strong and flourishing as that which I transplanted. When lucern is sown where it is to remain, it necessarily requires being thinned, and that operation takes up more time than transplanting it would do."

Rules to be observed in transplanting Lucern into Beds.

"1. The middle of the beds must be raised and arched as high as possible; and as the lucern is to remain several years on the same ground, no pains should be spared to prepare the earth as well as can be.

"2. Lucern should be sown in the spring, and in a rich mould, that the plants may be strong enough to transplant in September.

"3. Plants two or three years old may be transplanted as well as younger ones.

"4. They should be transplanted in September, that they may have time to take fresh root before the winter comes on.

"5. If they cannot conveniently be transplanted in September, it may be done in October, provided the weather be not frosty.

"6. The mould into which they are transplanted should be moist; and if the weather be somewhat rainy, it is so much the better. In this case, I have never found it necessary to water the plants.

"7. If lucern is transplanted in November or December, there is danger of the frosts forcing many of the plants out of the ground.

"8. If too warm and dry a season prevents transplanting in September or October, it is best to stay till the winter is past. The plants will then be sure of taking root, and very few of them will fail.

"9. If they can be transplanted in autumn they will yield pretty good crops the next year: but if they are not transplanted till spring, the next year's crop will be but indifferent.

"10. The plants must be taken out of the nursery, with great care and patience, that their roots may not be damaged.

"11. The roots should be left about six or seven inches long, and the green tops should be cut off within about two inches of the crown of the root.

"12. The plants will take root the sooner, if they are put into water as soon as they are taken up, and kept in it till they are planted.

"13. They are planted in holes made with a planting stick in the same manner as cabbages or lettuces are planted in a garden.

"14. The best way of planting lucern is, to cut a straight channel two or three inches deep and set the plants at the bottom of it, covering them up to the neck.

"15. Great care should be taken not to suffer any weeds to grow among the lucern; at least for the two or three first years. To this end, the rows should be weeded by hand, as well as the edge of the alleys near the plants, where the horse-hoe cannot go.

"16. The alleys may be stirred, either with the single cultivator, or the cultivator with two mould-boards; which at the same time that it destroys the weeds, keeps the mould loose.

"17. The first stirring may be given with the cultivator with which a furrow may be cut on each side of the main furrow in middle of the alleys, by which means the earth will be turned over on both sides of it.

"18. The second stirring may be given by the cultivator with two mould-boards, by drawing it along the middle of the alleys. This will turn the earth towards the rows. By these alternate stirrings, the alley will be constantly kept in a loose state.

"19. This culture is so easily performed, and in so short a time, that it may be repeated frequently. In this I dif-

I differ from M. Duhamel, who orders it but seldom. My opinion is, that the alley should be stirred once a month, during the whole time that the lucern is in a growing state.

" 20. If the alleys be kept from weeds, less stirring them may do: but the mould should never be suffered to grow too hard.

" 21. As soon as some of the plants begin to blossom, the lucern should be cut. It will then make excellent fodder, superior to every other kind.

" 22. The lucern hay should be dried as quick as possible, and frequently turned. The less it is exposed to the heat of the sun the better fodder it makes.

" 23. Lucern must not be housed till it is dry: but at the same time care must be taken that it be not too dry: for then many of the leaves will fall off, as they dry sooner than the stalks.

" 24. Cattle must not have too much lucern given them at a time, till they are accustomed to it.

" 25. No cattle should ever be suffered to feed on the beds of lucern. If the earth is very dry, towards the latter end of autumn, sheep will do it the least hurt. If the plants are then tall enough to be moved, the best way is to cut them, and give them green to the cattle.

" These rules contain all that is essentially necessary for making and keeping in good order this kind of artificial pasture. I can safely say, that whoever tries them, will be abundantly rewarded for his trouble and expence. Saint-foin may be cultivated in the same manner."

Account of the Produce of Lucern planted in Beds, and cultivated according to the Principles of the New Husbandry: with some important Reflections on the Advantages which may be obtained therefrom: by M. de Chateaufvieux.

" No judgment should be formed of what lucern may produce, by the crops of the first or second year: it is then too young to be able to yield much. If we were to calculate even by its third year's produce, we should still consider, that as the plants increase every year in bulk and vigour (and where they will stop I am not yet able to determine) the produce will be proportioned to that increase, and consequently the crop of each succeeding year will be greater than that of the former.

" The crops I am going to speak of, are those of the second and third year: but my calculations will be made on that of the third year. It is proper to remember, that the year 1753 and 1754, were uncommonly dry, inasmuch that sometimes, not a drop of rain, nor scarce any dew fell between the cutting of one crop and that of another. The seasons were so unfavourable to the production of grass, that hay rose to an excessive price.

" I shall first say what was the state of the plants of lucern in the third year, and afterwards how much hay they yielded.

State of the Plants in their third Year.

" As the part of the plant which I now consider is that which is buried in the earth, I uncovered numbers of them, that I might be able to judge of their general state. I was greatly struck with the effect which transplanting had had upon them. Instead of one perpendicular root, which they usually have, all these plants had three, four, five, and sometimes more, almost equally big roots. They were, in general, three quarters of an inch in diameter, and proceeded from the original root, which was now at least an inch in diameter, and in many of the plants an inch and a half. After the most careful search that I could possibly make, I could not find one plant of lucern sown in the common way, though it had stood twelve, twenty, or more years, whose tap-root had grown to the bigness of an inch diameter: few of them were above half, or at most three quarters of an inch thick. This difference is very great.

" I likewise found, that the roots of the transplanted lucern had produced another kind of roots, of which I saw none about those of the old lucern. These were a great number of fibrous roots, some of which were already one twelfth of an inch in diameter, and looked as if they would also become principal roots.

" The stalks seem to rise out of the earth; and from the first time of cutting them, a kind of head forms just above ground, which extends itself every year. The first year, this head was two or three inches wide: the second

year it was generally about six inches over, and this third year, almost half the plants have a crown ten or twelve inches in diameter: and as many of them have grown so as to touch one another, their crowns are become of an oval form, having extended themselves on the sides, where they met with no resistance.

C R O P S.

" I have a field of lucern in beds, divided into two parts. This is the third crop of lucern off one of them. The beds are 250 feet long. In 1753, I cut this lucern six times; viz. in May, June, July, August, September, and the beginning of November. This last cutting was not near so plentiful as the others, and I dried it within doors:

" These cuttings off one bed, on which there was but one row of lucern, yielded 140 pounds of well dried hay.

" In 1754, the lucern was late before it began to shoot, and the earth was drier than the year before. I had but five crops: the first was cut on the 27th of May; the second on the 1st of July; the third on the 27th of July; the fourth on the 26th of August; and the fifth on the 23d of October. These five cuttings yielded in all 225 pounds of well dried hay off each bed.

" A field 250 feet long, which was the length of my beds, and 210 feet wide, contains an arpent of our measure. This arpent, divided into sixty-eight beds, each three feet wide, producing after the rate of 225 pounds of hay off each bed, would yield in all 15300 pounds; which is infinitely more than is ever obtained in the common way.

" The beds with three rows yielded much less. The third year, their crops amounted to no more than 169 pounds off each bed, which is a fourth less than the others: and as these beds are wider, instead of having sixty-eight, as in the former disposition of the arpent, there will be only forty-seven, each four feet three inches wide, the total produce of which will be but 7943 pounds: consequently this arpent will yield little more than half as much as an arpent laid out in beds three feet wide, planted with only single rows."

Remarks by M. de Chateaufvieux.

" The plants of lucern had the fate of all kinds of plantations: that is to say, some of them were more vigorous than others. The greatest number of the plants produced each of them a pound of dry hay, and some of them yielded two pounds. I look upon these last as such extraordinary productions, that I do not expect many of them to yield the like quantity again. I think one may be very well satisfied, if the plants, one with another, yield a pound of hay a-piece every year. This is nearly the result of my experiment on beds which had but one row; and the produce of these would have been still greater, if many of my plants had not failed: in the room of which I set young ones, which could not acquire sufficient strength to yield full crops.

" In these experiments, I have employed no dung: neither have I for any of my corn fields. I have reserved it for improving my pastures and meadows; and intend next to apply it to my lucern, which, I doubt not, but will be much the finer for it. The only thing now remaining is, to know by experience which will be the best way of using it. I have some thoughts on that head, which may render it much more profitable.

" Lucern deserves to be cultivated with care: not only on account of the great quantity of fodder which it yields, but likewise because the quality of its hay is superior to any other. The New Husbandry will render it still more perfect. Plants cultivated this way enjoy the benefit of a free circulation of the air, and that circulation keeps them sweet and sound, and free from all mustiness towards their roots: for, being open to the rays of the sun, that great source of kindly vegetation, they attain great perfection in all their parts, both as to their substance, and their flavour. Cattle eat this food greedily, and are better nourished with it, than with any other: but as every excess is bad, too great a quantity should not be given them at once, especially at first, lest it should swell them. The best way is to bring them to it by degrees.

" I have experienced these qualities in this hay, by comparing

paring it with every other sort. The excellence of this, justifies the principles on which the New-Husbandry is founded, I have offered to my horses bundles of every kind of hay, and at the same time a bundle of this hay of lucern. They have not hesitated a moment to prefer the latter. Nothing but its superior qualities could determine them in this choice, which never varied, and has always been in favour of the lucern cultivated in this manner.

"It would be lavishing this excellent fodder, to feed horses entirely with it. It need only be given them by turns with common hay : which will be a great saving : for this lucern will supply the place of oats. I am certain that my horses fed partly with this hay, and without oats, will be in better plight, stronger, and more vigorous, than those which are fed with meadow hay and corn in the usual way. It is now some time since I have fed my coach-horses with it, and have retrenched their oats. Instead of this last food, and at the hours they used to have it, I give them lucern chopt, as the Spaniards do straw to their horses. Mine are fond of it, and shew the same impatience to find it in their manger, as if it was oats ; and since their being put under this diet, they are in better condition than before, and so mettlesome, that the coachman has enough to do to keep them in.

"When I said that retrenching the oats would be a considerable saving, I did not so much mean the saving of the expence of that corn, as the better improving of many vast tracts of land which are sown with oats, and might with proper management produce much more useful and more profitable sorts of grain, notwithstanding the too general prejudice, that some lands are not capable of bearing any better. For my part, I am thoroughly satisfied, that whatever ground can bear a crop of oats, can likewise, under the New Husbandry, bear any other grain."

Continuation of M. de Chateauvieux's Account of his Experiments on Lucern, in the Years 1755 and 1756.

"The great drought of the year 1755, was accompanied with great heat ; and the year 1756 was very rainy, and moderately warm, there being but very few hot days in it.

"My lucern was exposed to a most severe winter in 1755, when the frost was excessive hard, and lasted very long. M. de Reaumur's thermometer was some days, at different times, eight, nine, ten, twelve, and thirteen degrees below the freezing point ; and on the third of February a thermometer in the open air stood at sixteen degrees below freezing. These severe frosts made me uneasy for my lucern, which, however, bore them without receiving any damage.

"The rains in 1756 did no hurt to these plants, but they prevented my cutting them at proper times. I had but four crops of lucern this year, being obliged to wait for an appearance of fine weather to dry it in, before I could venture to cut it down. These rains likewise hindered my giving the proper hoeings to the alleys, which were full of weeds during the summer and autumn. I chose rather to leave them in that condition, than attempt to hoe them while the ground was over wet, not doubting but the spring hoeings would easily destroy them.

"In 1755, I cut my lucern five times : the first was, on the third of May, before any flowers appeared : the second on the twelfth of June : the third, on the fifteenth of July : the fourth on the twenty-first of August : and the fifth, on the seventh of October. I was obliged to finish the drying of this last cutting in barns, and under cover.

"In 1756, which was the fifth year of these plants, I cut them but four times : the first, on the third of June : the second, on the first of July : the third on the fourth of August : and the fourth on the twenty-seventh of September.

A bed 250 feet long, with only one row of lucern,

Yielded	{	In 1754	-	-	-	-	225	} pounds of dry hay.
		1755	-	-	-	-	197	
		1756	-	-	-	-	281	

In three years, 703 pounds.

A bed of the same length, with three rows of lucern,

Yielded	{	In 1754	-	-	-	-	169	} pounds of dry hay.
		1755	-	-	-	-	180	
		1756	-	-	-	-	226	

In three years, 575 pounds.

Observations by M. de Chateauvieux.

"We see, by the above account of three years, that a piece of ground laid out in narrow beds, planted with only one row of lucern, yielded a greater produce than the same extent made into wider beds, and planted with three rows.

"I shall not, however, pretend to determine from this one experiment, that it is best to lay down large fields in this manner. I think it will be right to try first, whether the success will be the same on different soils, and likewise on lands whose exposition may be more or less advantageous. If after repeated trials, the beds which have but one row of plants, yield the greatest quantity of hay, that method certainly is to be preferred. To clear up this point still more to my satisfaction, I continue to plant lucern in beds, some with one and others with three rows.

"The difference between the crop of 1756, and those of the two preceding years, would induce me to think that rainy seasons are best for the production of hay : but still, the greater quantity which the year 1756 produced, must not be imputed to the rain only : we should likewise consider that the plants had thrived greatly since 1754 ; that their stems were grown much larger, and their roots much stronger and more numerous, and that they were consequently able to yield much greater crops than before. They have abundantly answered my expectation, both as to quantity and quality.

"With respect to the quantity, it is much greater than that of any common fodder : I mean, of any that the same extent of ground would have produced, if cultivated in the common way, though it would then have been covered with an immense quantity of plants. This is a fact, which numbers of experiments prove, and which we shall cease to wonder at when we consider the great effects of the frequent stirring of the alleys. To this it is that I owe the repetition of my crops and their being all of nearly equal goodness. I do not exaggerate when I say that every summer month, which is the time I generally allow between each cutting, will produce shoots two feet long, and sometimes more : and supposing that I cut them but five times a year, each plant will have produced after the rate of nine or ten feet length of shoots, and that in the same time that most meadows will not produce grass above two feet long.

"As to the quality of this hay, I continue to prefer it to all other fodder. My experience has confirmed what I said of it in 1754 ; and I shall only add, that I have since found, that it is as good at the end of four years, as when it is first cut. If there was any difference, horses would soon be sensible of it : but they eat of either without distinction.

"I feed my horses with it, chiefly in the summer, at which time they do most work, and am more and more sensible of the advantages of it. Five or six pounds of lucern a day, are sufficient for a middle-sized horse : but the quantity may be increased or diminished, according as the horse is nourished by it : for in that there is great difference." *Culture des Terres, tom. IV. c. iii. art. 15.*

The following account of the cultivation of lucern, was communicated to the public by a very ingenious husbandman, and merits the attention of the reader.

Having read and heard a great deal of lucern, I determined to have some of it myself ; and Mr. Miller's method seeming to me by far the most rational, I resolved to follow it : accordingly, the 17th of July, 1763, I ordered a field of three acres and a half, then under rye-grass and clover, to be ploughed deep, and sown with turneps. The crop was middling : I sold them to a cow-farmer for nine guineas : he drew and carted them home. If I had had sheep, I would have fed them on the field.

By the twenty-seventh of March, 1764, the field had been twice ploughed, the first time ten, and the last time near twelve inches deep, with the Rotherham-plough and four horses a-breast : the soil is light and stony, with a rock of gravel about ten or twelve inches deep, and had never before been ploughed above six or seven inches deep ; however, I knew it was right to go as deep as I could for a tap-rooted plant, as the lucern is.

I was greatly pleased with reading M. Lullin de Chateauvieux's account of his method of transplanting lucern, and determined to follow it, from a full conviction that it must be superior to every other method.

Accordingly I ordered the field to be sown with Poland oats, and laid out about twenty-eight rods in beds four feet wide, alleys one foot and a half, which were sown with lucern in broad-cast by my gardener, in the same manner

manner as you sow cabbages or favoys in feed-beds : one bed, however, out of curiosity, I ordered him to sow in the following manner :

Run a garden-line through the middle of the bed from one end to the other ; draw a small drill along the line, about half an inch deep ; then move the line six inches, and make another drill, and so on : by this means you will have nine drills on a bed four feet wide. When this is done, fill a quart or a pint bottle near full with your lucern-feed, cork the bottle, bore a hole in the cork, and insert a quill cut at each end : this will be found a great assistance in sowing the seed thin and regularly in the drills : and I must observe, that the bed which I sowed in this manner afforded me the greatest quantity of plants, and by far the finest. Another advantage attending it is, that it is kept clean with much more ease, and far less expence ; for a gardener, with the small three-inch hand-hoe, will clean a great deal of ground in a small space of time. When the bed is sown, the seed must be covered with care : rather chuse the backside of a small rake than the teeth.

By the middle of August, my plants looked very well, and were mostly in bloom, when I ordered them to be mown, and given to my horses and cows, who seemed as if they had a high treat.

The oats being got in, I ordered the field to be deep ploughed again, and then waited for a season of rain to begin my planting, which, by my journal, did not come till the fifteenth and sixteenth of September ; and the field being first well harrowed, we went to work the seventeenth, and continued planting till the twenty-ninth ; nor can I now see any difference between those planted the seventeenth or twenty-ninth. Though I quite agree with the author of the Essays, that it is best to plant sooner than I did, if possible ; yet I must observe, that what may do for gardens, or small pieces of ground, will not do for fields. From the last week of August to the middle of September, seems to me a very proper time. But "filling each hole with water, making drills, half-filling them with sea-sand or wood ashes, and watering each plant," as the author of the Essays mentions, is an endless and very expensive work.

For my part, I kept my eye on M. Chateauvieux's directions, as laid down above, with regard to that part that relates to planting ; but another ingenious gentleman, having cautioned the public against planting on ridges, I must needs say, I was fearful of the rain and frosts myself, if planted in that manner, especially on light land ; and therefore I ordered my field to be ploughed as level as possible, and made my man, after the field was ploughed, go three bouts on each side the furrow, so that, when harrowed across, you could hardly tell where they were. The field being brought to this order, as I said before, we began to plant the 17th of September : two men with spades dug up the plants, and two women cut them : some care is certainly required in taking them up, but I did not find it great ; it was done by common labourers. The women were ordered to cut the plants to about six or seven inches long in the root, and the tops to about two inches, as M. Chateauvieux directs. They did it very handily : their method was to take them up one by one, (so that they could throw by the faulty ones) and when they had about a dozen in their hands, they cut them at top and bottom with one stroke of the knife at each end. Each had a washing-tub by her side, filled to about six inches with water : as they cut the plants, they set them in the tubs ; and as they filled one tub, another was brought them.

The method of planting is the same as for cabbages : men who are used to work in gardens will do it very handily with a dibble or planting stick ; but that mine might stand with all possible exactness, each man had a garden line and reel : and as I think I shall be very able to keep them clean with M. Lullin's single cultivator, the rows are only twenty inches apart, and six inches in the lines.

If I find a difficulty in keeping them clean in this method, then by drawing every other row, which may be done with great ease, my plants will stand at the distance directed by M. Chateauvieux, of three feet four inches.

I was very impatient to see the effect transplanting would have, and therefore, as soon as my plants in the seed-bed were about six inches high, I drew several, cut and transplanted them, and in the autumn I took up these plants, and found they had all formed new tap-roots round the bottom of the piece (if I may so call it) planted, and

instead of one, they had from five to thirteen new roots : this, you may suppose, gave me great pleasure, and convinced me, that the illustrious Swiss was quite right.

The author of the Essays on Husbandry, I find, cut his plants with scissars ; this must be very tedious work ; and, with submission, I think he is quite wrong in cutting his plants to the length of nine or ten inches. Six or seven inches seem to be a more proper length ; for the ground being dug or ploughed about twelve inches, the new roots will have five or six inches of well-loosened mould to strike into, which must be a great advantage to the plants ; and if gravel, or a strong clay, is near the surface, I am convinced, mine, or rather M. Lullin's, is the best method.

Yet this gentleman says, he cut his tap-roots too short, and knew not how to manage a root that was very small : in regard to the last, I must observe, that, if they were very small, I ordered them to be thrown away. So much has been said on the necessity of keeping lucern in broadcast, drills, or transplanted, free from weeds, that I will say nothing on that subject.

At the same time that this gentleman so warmly recommends M. Chateauvieux's method of cultivating lucern by transplanting, he has, I fear, thrown a stumbling-block in the way of most gentlemen, and, I think, every farmer ; I mean his calculation of the expence ; this, therefore, I must endeavour to remove.

When I began to cultivate lucern in this manner, the only defect I could find in M. Chateauvieux's account was that he had not told the public how much ground they were to set apart for a nursery : this deficiency, however, I can supply to those who come after me, for sixteen rods will be about the quantity for an acre ; and then, I think, the expence of transplanting will stand as follows :

	l.	s.	d.
Digging, spit-deep, sixteen rods, at three-pence per rod	0	4	0
Seed, three pounds, at one shilling per pound	0	3	0
Weeding the nursery twice with the three-inch hand-hoe. (By sowing in this manner, transplanting will not be wanted ; nor do I think it proper, as they are to be transplanted again)	0	3	0
Ploughing	0	10	0
Transplanting	1	5	0
Hand-hoeing the plantation once, the middle or latter end of October, in dry weather, which men used to hoeing turnips, will do for three or four, but say	0	5	0
	2	10	0

This, I am persuaded, is the full expence of making the plantation ; yet the author of the Essays has strangely worked it up to six pounds twelve shillings per acre : however, I readily submit this account to the inspection of every farmer and every gentleman in this kingdom, conversant in matters of this kind.

If the spring-ploughing for barley or oats has been nine or ten inches deep, then a ploughing in autumn of twelve inches will be sufficient, and cannot be charged at more than ten shillings. The trenching for the seed-beds may be done at leisure time ; so may the weeding of the nursery, and the hand-hoeing of the plantation : then the real expence to the farmer will only be the seed and transplanting, or one pound eight shillings per acre.

As to what this gentleman calls the yearly charges, I can by no means agree to them : for the plantation having been weeded in October, will lie very safe and well till the latter end of February or beginning of March : then in dry weather, it may be hand-hoed again, the expence of which has before been charged at five shillings per acre ; to which add four horse-hoeings after each cutting, at eleven shillings, which makes sixteen shillings per acre the annual charge.

I cannot recollect any thing further that is necessary to be said on the subject of transplanted lucern ; but as I would have every one, who writes to you on subjects of this sort, tell the truth, the whole truth, and nothing but the truth, so I think it but just to say a word or two on lucern sown in broadcast, or Mr. Rocque's manner. I live within a few miles of Mr. Rocque ; and must add, that I have paid great attention to the culture and growth of lucern and burnet for some years past : so that I think I am pretty well acquainted with them.

The author of the Essays says, "If lucern is sown in broad-cast with corn, no care can keep it clean: it may last two years, only one crop being tolerable, and then must perish in the common course of nature." And several of your correspondents are also of opinion it will never succeed in this method; but I know it will; for I have seen it cut three or four times. To cut it four times, the summer must be very favourable, and the last cutting will be late. Here I must remark, that lucern is not only excellent as a green fodder, but as an early one, especially if sown in drills, or transplanted; for that sown in broad-cast will not be fit for cutting so soon as the former, by a fortnight or more; however, the farmer may depend on three good crops in this manner of sowing.

In the spring 1760, Mr. Rocque sowed about five acres with lucern and barley: the land is light and hot, but being in good heart, the barley was rank, which obliged him to mow it green, and sell it to a farmer for feeding cows, &c. Indeed I believe it will always be best to do so; for the weeds, if there are any, are thus cut down, and the lucern thrives apace. The spring following, it may be harrowed with light harrows, and every year after with such harrows as you find clean it best. Last autumn, when the weather was hot and dry, I saw a farmer harrowing Mr. Rocque's field with large ox-harrows, and I do not perceive that it is at all hurt. The weeds and trumpery were raked up, and carted to a dung-hill, with which he has this spring dressed his field, and it is now in a fine thriving condition.

Lucern makes most excellent hay: horses are very fond of it, and, with one quartern of oats, I will be bound any gentleman will be well satisfied with the condition of his horses, even coach-horses; nor do I see it is at all more difficult to be made into hay than clover. *Museum Rusticum*, vol. IV. p. 307.

Experiments on Lucern, by Mr. John Wynne Baker, published by the Dublin Society.

The inestimable value of this plant has been so much spoken of by all the ablest writers on husbandry, that it is quite unnecessary for me to say any thing in its recommendation.

Here follow my experiments upon it this year:

No.

15. Sown in drills, three feet asunder.
16. Sown in drills, two feet asunder.
17. Sown in drills, one foot asunder.
18. Sown in the common or broad-cast way.

I sowed the seed for these experiments on the first of May, but the middle of April would have been a more proper season.

The lucern began to appear on the eighth day: in its first appearance, it has two very small leaves of an oval form.

These experiments were treated in the same manner as the burnet.

On the sixteenth of August, I cut the lucern of each experiment, and the produce of green fodder was as follows:

- Number 15. i. e. the three-feet drills, produced off one perch, thirty-one pounds and a quarter.
- Number 16. i. e. the two-feet drills, produced off one perch, forty-four pounds and a half.
- Number 17. i. e. the one-foot drills, produced off one perch, forty-three pounds.
- Number 18. i. e. the broad-cast, produced of one perch, fifty-nine pounds.

Upon the face of these experiments, the broad-cast has the greatest produce. Above the three-feet drills, twenty-seven pounds and three quarters; above the two-feet drills, fourteen pounds and a half; and above the one-foot drills, sixteen pounds.

Hence it may be concluded, by persons not acquainted with the nature and culture of this plant, that the broad-cast sowing is to be preferred, as yielding the greater produce; but I think that conclusion should not be too hastily drawn, for the following reasons.

These crops are all from the first cutting after sowing the seed, and therefore the lucern in the broad-cast was then as good, or probably better, than it will ever be again

in any succeeding crop, the ground being looser, and fewer weeds in it, than there ever can be hereafter; for the natural grass is already rising in it, although it was managed in the way practised by Mr. Rocque; which is to harrow, or rake the ground after cutting the lucern. Another reason is, that for the first year the plants are in their infancy; but in three years I apprehend the drills will more than treble their produce; whereas, at that time, I should fear the broad-cast would be quite or near destroyed by the natural grass. In other words, as fast as the drilled crops improve, I do conceive the broad-cast will diminish.

The culture of lucern in drills, with intervals of only one foot, I find is no better than the broad-cast, as there is no such thing as horse-hoeing between the rows, and where the crop should be large, digging would be too expensive.

But upon the comparative experiment, between the two and three feet intervals, I confess I cannot so readily pronounce; the two feet produce the most, by thirteen pounds and a quarter; whether that distance will continue to do so, I cannot say: it may happen that when the roots become large, which is the properest time to ascertain the fact, that the three-feet drills may have the greater produce: but time alone can determine the point, which really is very material to know.

Second Set of Experiments on Lucern.

These experiments were calculated to discover how far the roots of this plant would bear being wounded, as in the culture of lucern practised by Mr. Rocque: I do conceive many of the roots must be injured, to the manifest diminution of the crop.

In April, 1764, I sowed a little lucern in my garden. May the 1st, 1764, I treated some of the plants in the following manner, after thinning of them in the row, by taking all others from them, and leaving the plants single, and two feet asunder.

- Numb. 1. The root of this plant I split from the crown of it downwards, for about an inch.
- Numb. 2. The root of this plant was split first in the same direction as the former, and then I split it transversely, for about an inch downwards.
- Numb. 3. The root of this plant I cut a slice off one side, about an inch long, just below the crown of the root.
- Numb. 4. This plant I cut the whole crown of the root off.
- Numb. 5. This plant I split the root of, in the same manner as Numb. 1. and then cut about an inch and a half off one side.

After wounding these plants, I dug the earth round them, in order to feed the fibrous roots in the nourishment of the plants.

They never afterwards made any figure. Towards September, Numb. 1, 2, and 3, threw out a few weak stems, not worth notice; but Numb. 4, and five, never grew afterwards.

These experiments I mean to repeat in a greater number, and that for two or three years together, before I shall venture to draw positive conclusions from them; but I think these seem to prove, that Mr. Rocque's method is not to be preferred so much beyond Tull's, Duhamel's, and M. de Chateauvieux's, as his advocates would insinuate. But the fair trial between his method and the drill, will be to experiment carefully upon them for four or five years together; my experiments in wounding the plants, being only calculated to support theory by facts; for my notion of the consequences which must happen from his culture, is no more than theory.

Till I made this set of experiments, I confess I never was sensible of the texture and firmness of lucern roots, which are really very hard to cut, and not much unlike a dried stick, which I must confess seems to favour Mr. Rocque's method, so far as relates to my apprehension of the plants being wounded by his instruments, which, from the hardness of the roots, cannot wound them in the manner I did mine with a knife. And as my pursuits tend only to discover the truth in matters of husbandry for Mr. Rocque's honour, and my own credit, I could not omit to communicate this remark, as I hope the reader will believe I am endeavouring to ascertain the best culture for lucern, and not writing to lessen Mr. Rocque or

or his system: every man acting in a private capacity, has a right to adopt such as he pleases; but I, who am acting in a great measure for the public, think myself bound to be conscientiously exact in my scrutiny of every system which I shall comparatively experiment upon. If I am mistaken in the culture of lucern, I have the satisfaction of considering some of the greatest men, who have ever wrote upon the subject, are no less mistaken than I am.

Notwithstanding all that has been said by many writers on lucern, as to its tap-roots, yet I find it has many lateral ones, and it is only a few of the plants that send down but one tap-root, but an infinite number in all shapes and directions. At a year old, I find the healthy ones are from ten to eighteen inches long; I preserve them of that age now by me, and intend every year to take them up, in order to have them of all ages, the better to see their progress from year to year.

Upon the first of last May, some of my lucern, which was sown the year before, was eighteen inches high: but let it be observed, that it had the benefit of a south aspect, aided by the reflection of a fruit-wall. This induces me to believe, that a declivity with a south aspect will be the most advantageous situation for this plant, in this country; for, although lucern will live in the severest winters, yet it flourishes best under the influence of a warm sun; the only blessing we seem to want in this country.

In the summer months, I observe, in a good soil, and under proper culture, it grows about an inch in twenty-four hours; sometimes I have known it grow an inch and a half in the same time.

Third Set of Experiments on Lucern.

The transplanting lucern seems to have been first thought of by the ingenious and never sufficiently to be praised M. de Chateauxvieux, whose reasons for every new attempt are founded upon such solid and rational principles, that they have generally succeeded to his expectations. This gentleman says, plants of two or three years old may be planted equally well with those of one year old.

My plants last April were all one year old, which, upon taking up for the purpose of transplanting, I found differed very much in their size, which induced me to divide them into three parcels, *i. e.* the smallest, middling, and largest. These I transplanted in the following manner, six inches asunder in the rows, and the rows three feet:

- Numb. 1. Forty of the smallest plants, with their tap or leading roots cut off.
- Numb. 2. Forty of the middling plants, with their tap or leading roots cut off.
- Numb. 3. Forty of the largest plants, with their tap or leading roots cut off.
- Numb. 4. Forty of the middling plants, without cutting their roots.
- Numb. 5. Forty of the largest plants, without cutting their roots.
- Numb. 6. Forty of the smallest plants, without cutting their roots.

These six rows of plants were put down the twenty-eighth day of April. I watered them at the time of putting down, and once afterwards.

Very few of them died; so that the different sizes and methods seem to answer equally well the first season.

I intended to have cut the produce of each experiment for weighing; but a few days before that was to be done, my horses got into the place where it grew, and eat some of it, which disappointed my purpose. From the appearance of the experiments respectively, there would have been very little, if any difference, in the produce; but a third and fourth year's crop will ascertain how far cutting off the tap-roots will benefit the plants, and how far transplanting is preferable to sowing. Be it noted, that the transplanted roots make no great figure the first year.

In order to ascertain, with some degree of certainty, how far lucern may be worth the farmer's attention, I last summer made an experiment with an horse, to discover how much he would eat; which being known, we can, from the first set of experiments, pretty exactly tell how many horses an acre of lucern will maintain during

the summer months. The horse I chose for this purpose is a very large one; he had been ploughing from seven o'clock in the morning till seven in the evening, during which time I forbid his having any thing to eat. When he was taken out of the plough, I ordered him to a stable by himself, where I had provided for him fifty-six pounds of lucern, without any other food for that night, of which he had eat by next morning, forty-nine pounds; a quantity, which I own surprised me.

Lucern will in this country, in favourable seasons, mow four times in a summer after the first year, and we may safely calculate, that at every cutting it will yield half an hundred weight upon each perch, which at the four cuttings is two hundred weight upon a perch in the season, or sixteen tons upon an acre, *i. e.* thirty-five thousand eight hundred and forty pounds. This is a low calculation; but at this rate, suppose five horses to be allowed forty-nine pounds every twenty four hours, which is two hundred and forty five pounds, in that case an acre will maintain them one hundred and forty-six days, which is twenty weeks and six days. No man will contend for it, I believe, that any natural pasture will do any such thing. Add to this profit, the circumstance of making dung all the summer; an object, I am sorry to observe, not sufficiently attended to in this country, amongst the common farmers; if they can make a little for their potatoes, they seem to think of no more.

Lucern should never be sown upon wet or spongy ground, but upon dry rich land, and must always be kept free from weeds.

I sowed some last April in drills, upon ground not six inches deep, above a lime-stone quarry, and it grew very luxuriantly; but the soil is very good.

Turneps are the best preparation of ground that I know of for lucern, particularly if they be raised in drills, in the manner before represented.

My lucern in the broad-cast and one-foot drills, was infected with the rust or mildew, during its growth; this seems to be an objection to the sowing of it with such narrow intervals, or in the broad-cast way, since the two feet and three-feet drills were in the same place, and they were not at all infected with this disease.

An Account of the comparative Advantages of cultivating Lucern, on the Drill and Broad-cast Methods; for which the Society for the Encouragement of Arts, &c. adjudged their Premium of a Gold Medal.

The farm on which the following experiments were made, is a strong clay; a soil, in the opinion of all writers in agriculture, the most unfriendly to lucern. Encouraged, however, by M. Lullin de Chateauxvieux's experiments, the owner was tempted to try how the lucern would succeed when treated in the manner he proposes: and in the year 1761, he sowed a field of about three acres with lucern drills, two feet asunder. During the first year, he caused it to be weeded carefully; and from the places where it grew too thick, he supplied those in which it had failed. After every weeding, he caused the intervals to be stirred with a horse-hoe, resembling M. Lullin's single cultivator, which manifestly revived the plants.

In 1762, the plants throve greatly, being kept clean, and horse-hoed as in the former year; and the Society having published a premium for a comparative trial between lucern sown in broad-cast, and in drills, he determined to try one part of that experiment on this field, and not to bestow on his lucern any manure whatever, or to give it any other help than the horse-hoe.

In 1763, the plants were arrived at a size to yield so full a crop as to maintain five horses, from the middle of May to the end of autumn, or above five months. These horses, though constantly worked very hard, had neither corn or hay given them during all this time; and yet they continued in strength and spirit, and grew fat. A horse which in May was so weak, and in so bad a state of health, that it was thought he could not live, soon recovered when fed with lucern. The plants were in general between three feet and three feet and a half high, at the first and second cutting. The plants made so many shoots, and these shoots branched so much, that in three weeks after every cutting, or sometimes sooner, the intervals quite disappeared; the whole field being so equally covered, that it looked as if sown in broad-cast. December 1763, January and February 1764, having been uncommonly rainy,

rainy, the water stood in some parts of the field; and though there was generally such a declivity as that it might have been carried off, he resolved to let it remain, in order to see what effect it would have on the lucern. When the lucern began to rise in the rest of the field, in spring, he found that wherever the water had stood, the plants were killed. He supplied this loss by transplanting lucern from other spots; and these plants thrived very well. By a continuance of the same treatment, the lucern remained in a very flourishing state: and retained a beautiful verdure and vigour, during the very great drought of the summer 1765. It has yielded four cuttings every year, and sometimes five.

Having observed in a root of lucern, taken up in the winter, that the spring shoots had no connection or concern with the remains of the shoots of the preceding summers, but proceeded from numbers of little tubercles, with which the head of the root was set very thick; it appeared evident, that the plants could not sustain any damage, though covered with a depth of earth during the winter. This suggested a hint, that the intervals might be ploughed as deep as possible early in the winter, turning the earth on the beds; and that by letting the earth remain in this condition till spring, the clay, or strong soil in which the lucern grew, would be mellowed, or loosened, by the winter's frost and rain: and being harrowed smooth in February, the fresh lateral roots, which shoot out in the spring, would find a fine fresh mould to extend themselves in, which must tend greatly to the benefit of the plants. This thought was confirmed by experiment: for the spring crops is amazingly vigorous, ever since this practice was followed, and the shoots, though of great length, and most plentifully supplied with branches, are so strong, that no rain or wind lays them, even when they have stood to be in full bloom, as is the case with part of the first crop; the horses not being able to consume the lucern before part of it is necessarily in bloom. Another advantage arising from this practice is, that the grass which takes root near the plants, and which cannot be otherwise destroyed but by hand-hoeing, is killed by being so long covered with the earth laid on the beds.

In 1761, a spot of ground of an exactly similar soil was inclosed for a kitchen-garden; and there being part of it, which was not wanted for other uses, in the spring of 1762, it was sown with lucern in broad-cast, as a counter experiment to the former. The warmth of the garden, and the partiality of the gardener to this method, who held the field experiments very cheap, gave his lucern every advantage that could be desired. It came up well, and was kept free from weeds; but it neither grew so fast nor so high as the lucern sown in drills. The difference became much more sensible during the second and third years; for in 1764, the field lucern had got the start of it so far, that this did not rise to half the height, nor did it yield a quarter of the quantity of fodder; so that he thought it needless to prosecute the comparison further.

Seeing so very remarkable a difference between the lucern raised in drills, and that raised in broad-cast, he resolved to try what share of this advantage might be placed to the horse-hoe, and what to the distance at which the plants stood; which distance afforded the roots more room to extend in. With this view, in 1764, he sowed a neighbouring field in rows, two feet asunder, intending to horse-hoe one half, and to keep the other free from weeds by hand-hoeing only. The months of April, May, and June, of that year, were so dry that the plants came up thin; and the clay was become so hard, that the horse-hoe could not be made use of till late in the year. Even with this disadvantage there was seen a manifest difference, in favour of the plants that were horse-hoed. The same difference was also observable in the spring of this year: but the uninterrupted drought of this summer has kept the clay so hard that the horse-hoe could not be used.

Computing the rent of the land, and the utmost expence that can attend the horse-hoeings and cuttings, it will be found, that feeding horses with lucern will be a great saving, when compared with the price of the hay and corn, which horses must have necessarily consumed in the same time, being kept to equally hard labour.

The several cultivators of lucern have each recommended some particular method of sowing and cultivating it, either in broad-cast, drilling, or by transplantation; it thrives well in all these methods, but not equally. The broad-cast is easiest to farmers, who are accustomed to sow clover

and other seeds in that way, and the crops are very valuable, but inferior to both the others, in quantity and quality.

Mr. Rocque was a native of France, where they raise great quantities of lucern, and sow it broad-cast; and he recommended that method preferably to all others. At first he cut his lucern five times in the season, but afterwards recommends cutting it only three times, because he says cutting it oftener makes it bleed too much. But in this he seems to speak partially: for broad-cast lucern grows slower than the drilled or transplanted, and if allowed to grow to the proper maturity, namely, till it begins to blossom, the broad-cast will commonly produce but three cuttings in England; and his produced no more, after the first or second year. His objection to drilling it, that the roots are confined in the drills, is a great mistake; for gardeners find no such ill effect in drilling; but on the contrary, they drill many of their crops by choice; and it is a fact, proved by repeated experience, that drilled lucern yields greater crops than broad-cast, when both are tried upon the same land, and sown at the same time.

Mr. Rocque's method was wrong in another respect, viz. in dressing the land with fresh stable-dung, which without doubt is a sure way to fill it with weeds, and should be particularly guarded against in the cultivating lucern, weeds being peculiarly destructive to it, more so than almost to any other crop; and for this reason dung of all kinds are very improper for lucern. Soot, ashes of all kinds, and composts of various sorts of dry manure (that contain no seeds) powdered and mixed, are excellent dressings for lucern, causing it to grow luxuriantly; and a luxuriant growth is the principal intent of manuring lucern.

Mr. Rocque, however, very properly recommends harrowing of broad-cast lucern in order to clean it; for its roots are so tough and hard, that harrowing, and even a slight ploughing, do not much hurt them; but, on the contrary, is of considerable service to the crop, by pulling up some of the shortest roots, and thinning the crop; which will be a great deal too thick, if the land is well prepared, and so much as sixteen pounds of seed is sown upon an acre. It should not be weeded with large heavy harrows the same year in which it is sown, which would pull up too many of the plants: but next year there is no danger. And the best seasons for harrowing lucern, are in spring, immediately upon the breaking of a frost; and in summer or autumn, as soon as a crop is taken off: for at these times the ground is mellow, and the weeds are then most easily pulled up by the harrows. Some have objected to harrowing, supposing that such rough treatment would kill and wound so many of the plants, that the lucern must be of short duration: but experience has shewn this to be an error; and that where the harrowing has been performed with proper care, the broad-cast crops in England have continued to flourish for fifteen or sixteen years; whereof Mr. Young has mentioned some examples in his North Tour, and some have lasted almost as long in Surry: which are great encouragements to farmers to raise this valuable plant in the broad-cast way.

It must, however, be acknowledged, that drilling the seed is a much better way than sowing it broad-cast, and of obtaining better crops; this may be done by close drilling the seed, in rows six or seven inches asunder, and the crops cleaned by harrowing; but better if the rows are two feet or more distant, to be thinned in the rows, and set out to the distance of two or three inches, and the spaces between the rows cleaned of weeds by a cultivator, which will at the same time improve the crops and the land: and in this way the crops are superior to the broad-cast, or close drilled, and is a method of culture very easily performed. But to those who would practise an accurate and spirited husbandry, the very best method of cultivating lucern is upon ridges. M. de Chateaubien in this way obtained above five tons of lucern-hay per English acre, reckoning his crops at an average of four years; and it is remarkable that his crops were improving, though they had no manure, and only hoed with his cultivators; the crop was greatest the fourth year, being at the rate of seven tons and a half of hay per acre. His ridges were a little more than three feet broad, and a single row of plants upon each ridge, and six inches distant.

When lucern is transplanted upon ridges, the roots are shortened to six or seven inches, and the tops to two inches. Cutting the tap-roots makes it throw out many lateral roots, which

which spread near the surface of the ground, where they enjoy the warm influence of the sun, causing the plants to shoot quick, and produce more cuttings in the season, than if the tap-roots descended deep into moist cold ground. This is an advantage that the broad-cast lucern cannot have; but the drilled may, though not transplanted: for by ploughing the earth from one side of the rows, the tap-roots are easily come at, and may be cut with a long sharp knife in October, without endangering the plants, or checking their growth.

M. Duhamel had forty tons of green lucern upon an English acre, which he computes at ten tons of hay; by which it seems that his lucern was full blown before he cut it; for then it does not lose so much of its weight in drying, as if it was cut before it blossomed: for forty ton cut just before it begins to blossom, will waste to about eight ton, in drying to hay: but it should be always cut before it blossoms, as it is then in perfection. It was cut four or five times in the season by these gentlemen, and produces as many cuttings here, and in some summers more. Mr. Donnellon, at Artane, near Dublin, who had long cultivated lucern, writes, "that good lucern the second year should yield three pounds and an half to a square yard, and says, I have frequently had it so. I cut some drilled, and some in the random way in August, both sown the April before; the drilled weighed one pound and a quarter the square yard; the other not half as much. Thorough saved hay made of it is not above a fifth of the weight when it is cut." He cut his lucern four or five times in the season; and the produce, in the above proportion, was six tons of hay per English acre, at four cuttings; and at five cuttings, above seven tons and a half per English acre. This lucern was planted upon three feet ridges.

Planting it upon ridges is the best method of all; but if the ridges are only three feet broad, and the plants six inches distant in the row, the bulbs, or crown of the

roots spread, and in two or three years they meet, and form a row of six inches broad on the middle of each ridge; and then there is not room to horse-hoe them properly, nor earth enough to be hoed; for this reason it is better to set the plants at nine inches distance in the rows, and to make the ridges four and a half or five feet broad. The heads of the plants will soon spread and meet, (for they have been known to spread to a foot or eighteen inches diameter, where they had room, and good nourishment): and when they meet, will form a broad row upon each ridge, of nine inches; and will produce four, five, or six cuttings in the summer, in quantity proportionable to their breadth, and the culture bestowed upon them: and as three feet ridges, and plants six inches distant, have produced above five tons of hay every year, without manure, these well hoed and manured may be expected to yield eight tons of hay every year: for lucern is cut as often, and yields as great crops in England, as in France or Italy. These would produce still greater crops, if allowed more room, which the curious will find upon trial. One great advantage of cultivating lucern in this manner is, that there is not a weed among such lucern, and the stalks are rich and succulent, incomparably nourishing food for cattle, and for foiling horses, superior to any of the cultivated grasses.

That the thick sowing the lucern seed very much lessens the crops, appears very clearly from Mr. Wynn Baker's experiments upon this plant. He sowed some lucern seed in 1764, in drills one, two, and three feet distant, and in broad-cast, all upon the same ground; and he transplanted some of this lucern at one year old from seeds; at the same time shortening the roots to six or seven inches, and the tops to about two inches, as practised by M. de Chateauxvieux. The lucern of these several experiments, growing upon equal quantities of land, were cut all at the same time, and the products were per Irish plantation acre, as follows:

	The three feet drills.				Two feet drills.				One foot drills.				Broad-cast.				Transplanted.			
	Ton.	cwt.	qr.	lb.	Ton.	cwt.	qr.	lb.	Ton.	cwt.	qr.	lb.	Ton.	cwt.	qr.	lb.	Ton.	cwt.	qr.	lb.
1st year, 1764	2	4	2	16	3	3	2	8	2	12	2	0	4	4	1	4	Not cut by mistake.			
2d year, 1765	8	17	0	16	9	10	0	0	8	17	0	16	8	2	3	12	10	12	3	12
3d year, 1766	32	0	2	24	29	10	0	0	31	0	0	0	16	2	3	8	34	12	2	10

This lucern yielded but four cuttings in the year, the land being cold and poor, and lying upon a bed of stone, and but about six inches deep above the stone quarry. It had no manure. The three feet drills, and the transplanted, were hoed with a small plough: the two and one feet were hand-hoed, and the broad-cast was cleaned with a rake.

Here it is observable, that the broad-cast yielded the largest crop the first year; but continued to decline the following years greatly. And the three feet, and the transplanted were also gaining upon the narrower drills, though the narrow had many more plants in them: for none of the rows were thinned; so that the one foot drills had thrice as many plants in them as the three feet drills, and yet produced a smaller crop, viz. the one foot drills produced but thirty-one tons the third year, and the other produced thirty-four tons and a half. But the most remarkable difference is in the one foot drills and the transplanted; this last having only two plants in a foot long of the row, and the other probably more than ten times as many: yet these ten produced not half the crop of the thin plants: but the broad-cast, which was sown thick all over the ground, produced the smallest crop of all; a plain proof that thick sowing diminishes the crops to a very great degree. It also very much lessens the value of the crops; the large plants are by much the most succulent, weighty, and nourishing, and are entirely free from weeds; but the broad has always many weeds, which are a considerable part of the crops.

Clayey or strong land retains much moisture, which makes such land cold, and the crops raised upon it late, and for this reason, though lucern will grow upon strong land, mellow loams are the most proper for it, a warm aspect, and the land laid in ridges, well manured, and frequently hoed; with these advantages it will yield surprising great crops, which it is very capable of producing. In 1765, Mr. Baker observing one of his plants of lucern, which he had transplanted the year before, was very vigor-

ous, he cut it by itself, and it weighed twenty-seven ounces, which at six plants per yard square, is ten pound two ounces per yard, or thirty-five ton, eight cwt. of green lucern upon a plantation acre, at one cutting. He says he knew of no extraordinary advantages which this plant had, unless any accidental quantity of manure had dropped near it. At four cuttings, an acre of such plants would produce one hundred and forty-one ton, twelve cwt. of green lucern in one summer, or twenty-eight ton, six cwt. of hay upon one plantation acre (seventeen ton, fourteen cwt. of hay per English acre) the second year after it was transplanted.

He further observes, that his lucern was not in general ready to be cut till May every year, and produced but four cuttings in the season, but that having transplanted half an acre of lucern, upon land that had a better aspect, (than that of his other experiments) this half acre lying to the south-east, had such effect, that though this soil was rather inferior, the lucern upon it was from ten to fourteen inches high, the 27th of March 1767, its second year from transplantation, and his other lucern was then but six inches high.

Lucern not only produces great crops, but they are also highly nourishing to cattle, more so than any of the other grasses, or than any of the plants or roots commonly given to them, as will appear from experiments, those particularly that have been made by the same accurate experimenter.

He bailed up two of this largest milch cows, and fed them a month with green lucern only; and found, that each of these cows eat eighty-four pounds of the lucern in twenty-four hours, without waste: if he gave them more they made waste. They gave a great quantity of exceeding good milk, and of a good flavour, equal in quality to that from two other cows fed at the same time upon a choice small meadow. Butter was likewise made from the lucern and the meadow, which were both excellent, and of equal goodness. The cows were swelled by eating the lucern, if given them immediately after it was cut; but not if they were fed upon what was cut the preceding day.

Mr. Baker also fed his cattle upon turneps, cabbages, and turnep-cabbages, and found, that a fattening bullock eat a day nearly half his beef weight of turneps, and seven pounds of hay; and of cabbages, and turnep cabbages, three-eighths of their beef weight a day, besides seven pounds of hay: when fed upon turneps they refused water, but drank some with the cabbages. The two milch cows fed upon lucern as mentioned above, he says, were two of the

largest he had, and therefore weighed probably between four and five hundred; but admitting they were only four hundred each, and that a fattening bullock of that weight would eat as much lucern as each of them, viz. eighty-four pounds a day, the daily proportion of these three kinds of food necessary for a bullock of four hundred weight, is as follows:

A fattening bullock of 4 cwt. will consume every day,					
Of turneps	—	2 cwt. or $\frac{1}{2}$ his beef weight, and some hay	—	—	$\frac{4}{8}$
Of cabbages	—	$1\frac{1}{2}$ cwt. or $\frac{3}{8}$ of ditto, and ditto	—	—	$\frac{3}{8}$
Of lucern	—	$0\frac{3}{4}$ cwt. or $\frac{3}{16}$	—	—	$\frac{3}{16}$

By which it appears, that lucern goes above twice as far as cabbages in feeding bullocks, and still further than turneps.

If the value of these crops are estimated in proportion to their produce per acre, an acre of good turneps weighs from twenty to thirty tons; the last is a great crop, and seldom obtained by farmers in the way of hand-hoeing. Mr. Young, indeed, speaks of fifty tons of turneps produced upon an acre, and in that proportion throughout a whole field, but does not mention by what culture, hand or horse-hoed; and there is no doubt, if we compute from the size or weight of very large turneps, an acre may produce that quantity; but certainly in common practice, the crops are rarely so high as thirty tons; and twenty tons may be reckoned the full average of good crops.

Of cabbages the Scotch are the largest hitherto introduced into common culture, and the weight of them is sometimes as high as forty pounds a piece; but the best crops to only about fifty tons per acre, and the average from twenty to forty tons per acre.

Good crops of green lucern may be reckoned from twenty to forty tons, and the average about twenty-five tons per acre, when drilled on the level; but considerably more if upon ridges, and horse-hoed.

A bullock may be well fattened upon lucern in four months, or, allowing twenty weeks to fatten him upon turneps, cabbages, or lucern; he will in that time consume of these sorts of food, in the proportions above mentioned, admitting him to weigh four hundred when fat, the quantities following:

	Cwt.	Cwt.	Ton.	cwt.	lb.
Of turneps, in twenty weeks, at 2 a day (besides $8\frac{3}{4}$ of hay)	—	—	14	0	0
Of cabbages, in ditto, — at $1\frac{1}{2}$ a day (and $8\frac{3}{4}$ of ditto)	—	—	10	10	0
Of lucern, in ditto, — at $0\frac{3}{4}$ a day (no hay necessary)	—	—	5	5	0

An acre of each of these will fatten,					
Turneps,	25 ton per acre will fatten, with hay near	2	fuch	bullocks.	
Cabbages,	30 ton per ditto, ditto, with hay, near	3	ditto,		
Lucern,	25 ton per ditto, ditto, without hay, near	5	ditto.		

All which shew plainly, the superiority of lucern turned, and cabbages, when compared together, either by weight, or by the acre.

Carrots are a very nourishing and hearty kind of food for all sorts of cattle, and are by some so highly extolled, that they may perhaps be thought equal or superior to lucern: but as there are few accurate experiments made of feeding black cattle with them in the comparative way, the value of them cannot be ascertained exactly. The large experiment made by Mr. Billing is not fully satisfactory in this point: for he states his crop, and the application of it in feeding cattle, by the load; but does not mention the weight of his loads, or the weight per acre; which renders the experiment obscure.

We may, however, from what he says of his carrots, approach nearly to their feeding quality. His $30\frac{1}{2}$ acres sown with carrot seed, produced in all 510 loads of carrots, which is about $16\frac{1}{2}$ loads per acre, upon an average. He had long experience of fattening cattle with turneps, and in using his carrots found that one load of them was nearly equal in feeding to two load of turneps, and probably the loads of these two were of nearly equal weight. Now as it appears above, that $\frac{3}{16}$ of lucern goes as far in feeding as $\frac{1}{16}$ of turneps, the lucern is $\frac{5}{16}$ more feeding than turneps, and consequently than $\frac{3}{16}$ of carrots; and therefore lucern is superior to carrots in the proportion of 4 to 3; but by the acre the superiority is still greater; for an acre of land will produce twice the weight of green lucern, as of carrots.

Mr. Baker fattened sheep upon turneps, cabbages, and turnep cabbages. His sheep when fat weighed about 80 pounds each, and they eat daily of

Turneps, 20 pounds, $\frac{1}{4}$ of their mutton weight.

Cabbages and turnep cabbages } 15 pounds, or $\frac{1}{6}$ of their mutton wt.

By this it appears that sheep eat but half the quantity a day that bullocks do in proportion to their weight: so that if sheep can be fattened in as short time as bullocks, fattening sheep is by much the most profitable; for the price of mutton and beef at market is much the same in general, and mutton is frequently dearest.

LUG, or LUGG, the same with pole, or perch, a long measure of sixteen feet and a half.

LUPINES, a species of wild pea, cultivated principally as a manure.

Lupines require the least labour of any thing that is sown; and will thrive in any soil, except the chalky and mirey; but delights particularly in poor, hungry, worn out land, especially if it be dry and sandy. If sown in February or March, after a single very shallow ploughing, and slightly harrowed in, or even harrowed in without any ploughing, it will blossom three times between May and August, and prove an excellent enricher of the ground when ploughed in, just after its second blooming: though Mr. Miller, holding the lupine to be a very great impoverisher of the ground whilst it grows, thinks it is still better to parboil the seeds, to prevent their sprouting, and then to strew about sixteen bushels of them upon an acre of land and plough them in. In warm countries, lupines are much sown in vineyards for this purpose only, and are found to be one of the best manures that can be laid to the roots of the vines. Their seeds ripen towards the end of September, or in the beginning of October. They are very bitter: to remedy which, the Spaniards and Italians, who feed their cattle, horses not excepted, with them in winter, steep them in river-water and salt, till that bitterness is gone, and afterwards dry them thoroughly over a fire or in the sun. They even make bread of them, when corn is very scarce, and put them to several other culinary uses. The best time for mowing them is after a shower of rain, because the seeds drop easily out of their pods when they are gathered too dry. They must, however, be laid up very dry, or worms will soon breed in them. The red, and the blue lupines, which are frequently planted in our gardens by way of ornament, grow wild, and in great quantities, about Madrid.

LYE, a fluid impregnated with salts, &c. See the article STREPS.

LYNCHETS, or *Lynchets*, grass partitions in arable fields.

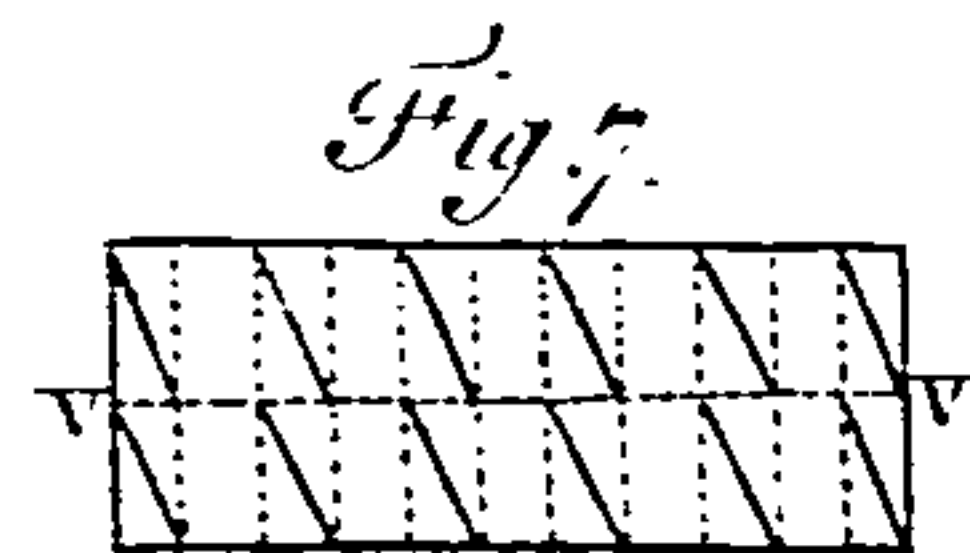
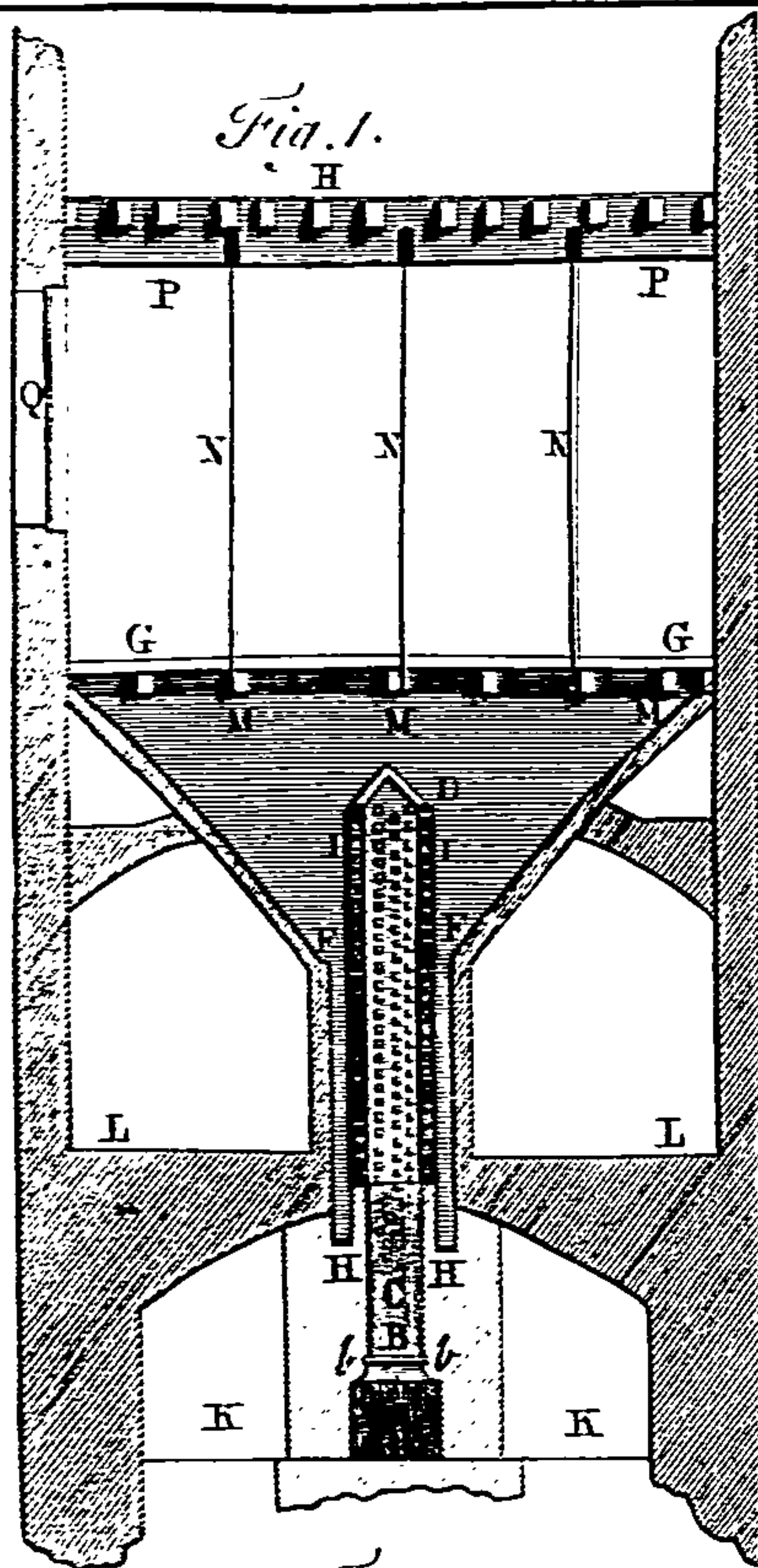


Fig. 2.



Fig. 3.

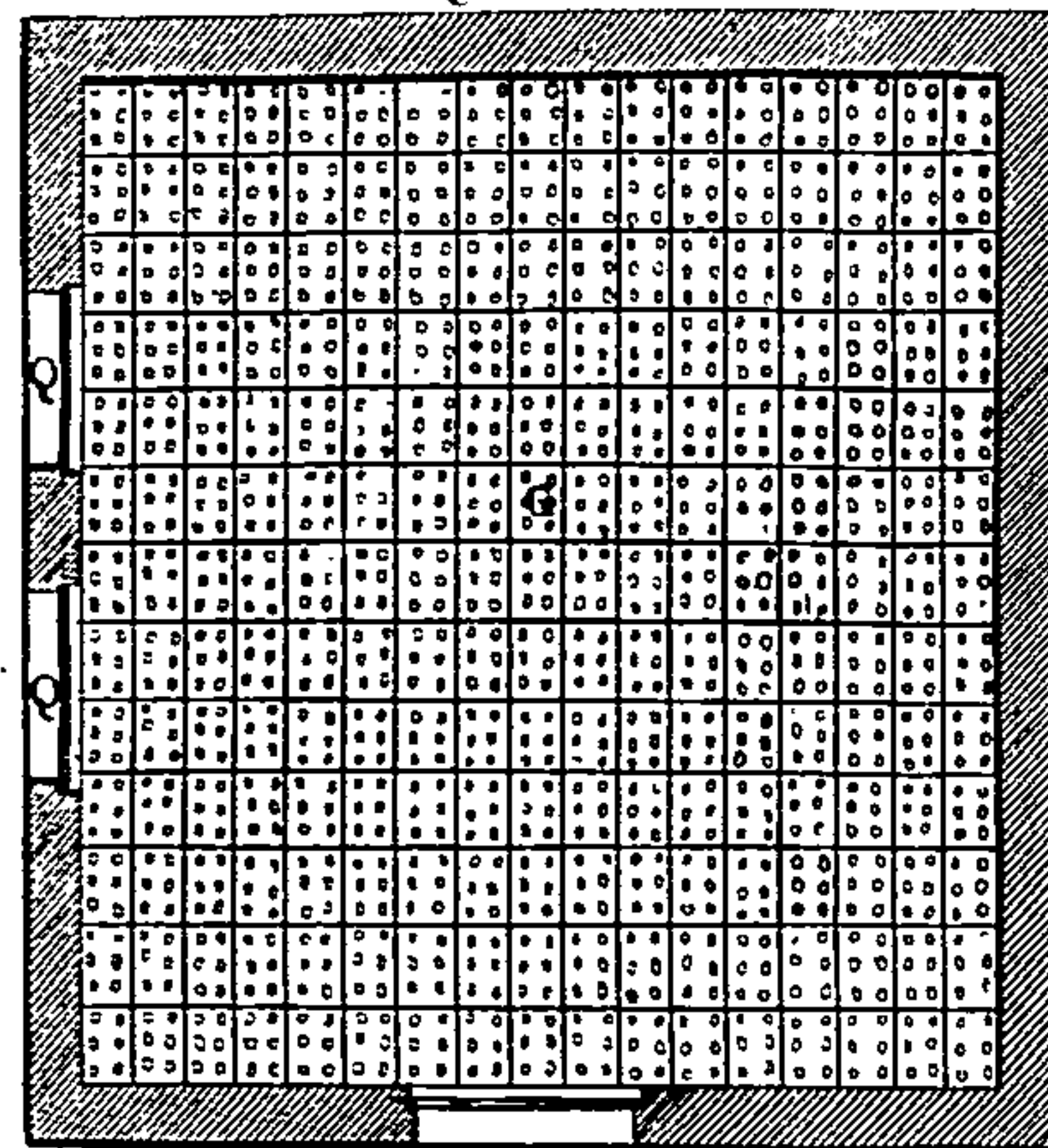


Fig. 6.

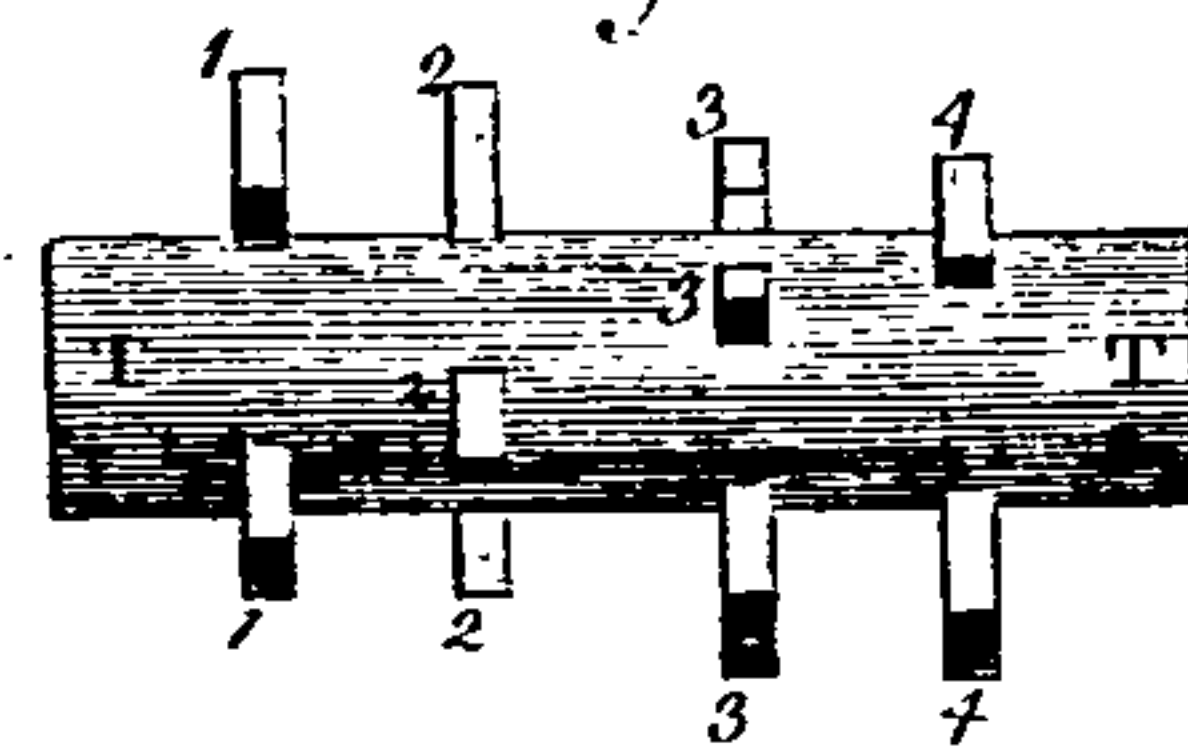


Fig. 4.

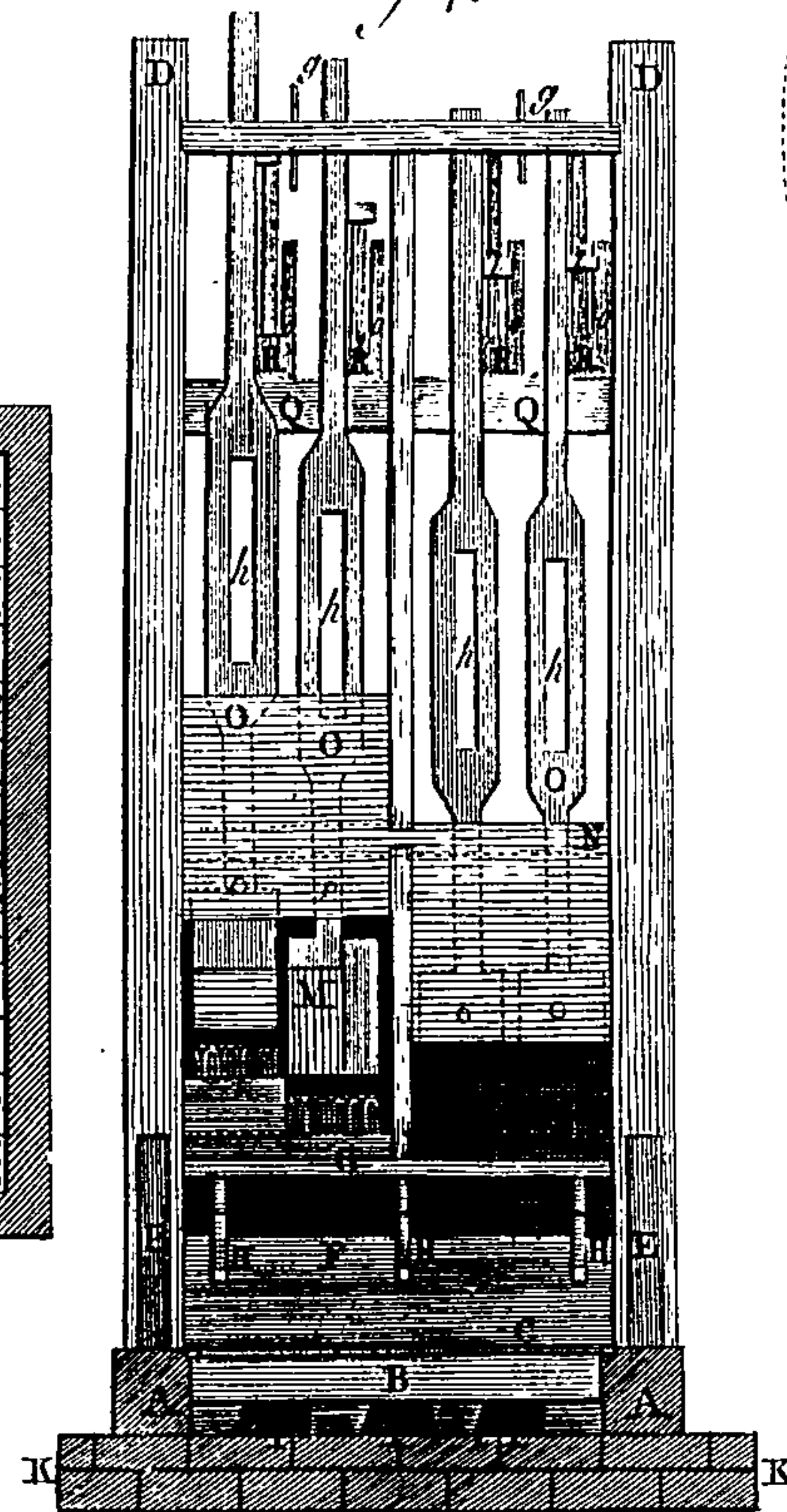
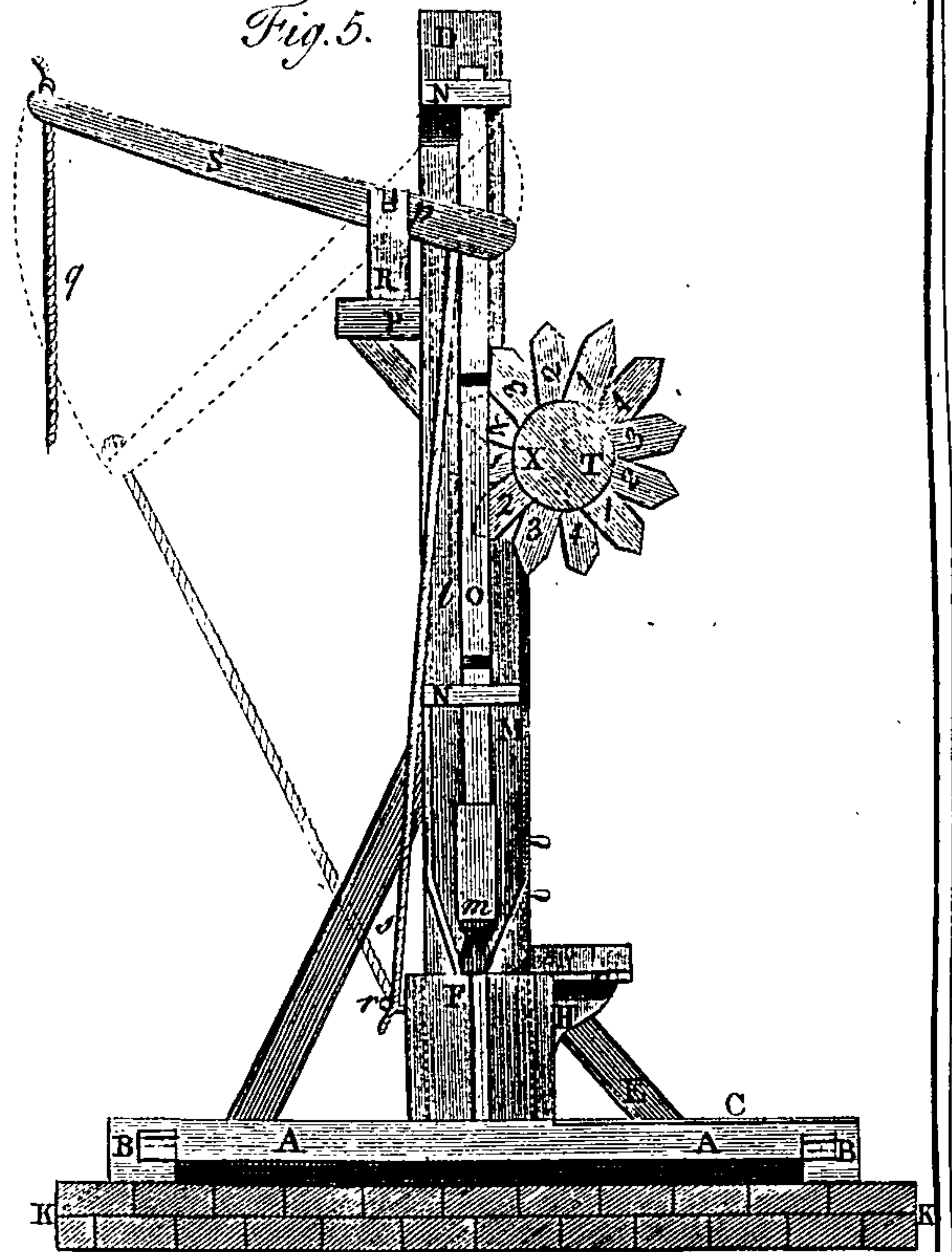


Fig. 5.



Scale of 6 Feet.



M.

MACHINE for ascertaining the force necessary to draw ploughs. Mr. Young, in his Annals of Agriculture, vol. I. says, "that Mr. Samuel More, secretary to the Committee of Agriculture in the London Society of Arts, invented a machine for measuring the force exerted by horses in drawing, that does great honour to his talents. It is a spring coiled within a cylindrical case, having a dial-plate marked with numbers like that of a clock, and so contrived that a hand moves with the motion of the spring, and points to the numbers in proportion as the force is exerted: for instance, when the draught equals 1 cwt. over a pulley, the hand points to fig. 1. when the draught is equal to 2 cwt. it points to fig. 2. and so on.

"Till this very useful machine was invented, it was exceedingly difficult to compare the draught of different ploughs, as there was no rule to judge by, but exertions of the horses as apparent to the eye; a very undecisive mode of ascertaining their force. The society was no sooner in possession of this gage, but experiments were directed to be made, under the eye of the Committee of Agriculture, with several ploughs, on comparison with an iron one sent in by Mr. John Brand for a bounty.

"The committee determined that Mr. Brand's plough was an improvement, and merited a bounty from the Society. The Society at large confirmed the resolution, bought the plough, and gave a bounty of 20l."

MACHINE FAN. See WINNOWER MACHINE.

MADDER, the English name of a plant, cultivated with great advantage in several parts of Europe, and lately in England, being a very capital ingredient in the dying business.

There are several species of madder, all of which afford a dye. M. Guettard, of the Royal Academy of Science, has experienced that the ladies bed-straw, or cheese-rennet (gallium) may be made to yield one; and of this kind is probably the Ray-de-chaye, which is used on the coast of Coromandel for dying red. M. Dambourney has not, indeed, as M. Duhamel remarks, hitherto been able to extract a good colour from the gallium: but there yet remains room to hope he may be more successful in the future experiments which he intends to make on this root.

Mr. Ray mentions and describes four different kinds of gallium or mollugo, bastard madder, which, after the laudable example of our enterprising neighbours, should likewise afford matter of experiment to those who wish well to this country, and particularly to our dyers.

The azala or izari of Smyrna, perhaps more properly written hazala or lizary (according to the eastern method of pronunciation) which is the sort used by the French dyers at Darnetal and Aubenas, to give cotton that fine carnation colour for which Adrianople is famed, is a true madder. Some species of it grow naturally under hedges and in woods: and the roots of these, when carefully dried, yield as fine a dye as the azala of Smyrna. M. Dambourney has cultivated a species of madder which was found growing wild on the rocks of Oissel in Normandy, and the roots of this plant have yielded him as beautiful a dye as the azala of the East. We shall hereafter speak of it in his own words: but in the mean time we cannot help observing here, that Mr. Ray describes particularly a wild madder which grows not only on the St. Vincent's rock near Bristol, but also on the rocks about Biddeford in Devonshire, and in great plenty among the hedges almost all over the country. As Mr. Ray calls this the *rubia filicifolia monspeliensis major*, and as Mr.

Duhamel suspects M. Dambourney's Oissel madder to be that very species, it surely is a matter of great importance to this nation, and well worth the attention of patriots, to follow M. Dambourney's example in making proper trials of it.

The species most commonly cultivated is the *rubia tinctorum sativa*, J. B. III. 2714. and C. B. P. in 333, commonly known among us by the general name of madder. It is of this species that the plantations of madder are made in Zealand, and in the neighbourhood of Lisle.

The following method of cultivating this useful plant was sent to the editors of the Museum Rusticum, by a gentleman who has been a practical grower of madder for several years, and tried it upon land of various kinds.

My first trial, says he, was upon a small piece of ground near my house, of about forty perches of land, lying pretty low and moist, of a deep mellow soil, and rich black mould, inclining to sandy; and underneath, about two feet and a half, and in some places three feet of good earth, was a bed of loose sand, with a mixture of gravel.

I have been the more particular in the description of the nature of this land, because it produced the best English madder I ever had, both as to quality and quantity.

In March I caused this plot to be dug a full spit deep; and as it was under natural grass for some years before, I took care in digging to throw the top turf as low as possible, turning the mould uppermost, in order to prevent the grass from springing; which had the desired effect. I also took care to throw out all the roots of weeds, and other noxious plants which were found therein.

In this state it remained about a month; then with a line I divided it into beds five feet wide, and two feet interval between each bed, raising them a little in the middle with some of the earth in the intervals; then with iron rakes the beds were reduced to a fine garden mould, leaving them a little rounding, like asparagus beds, in order to shoot off the rain water; and having procured some strong packthread, at every foot distance I tied a small piece of white woollen-yarn, and thus continued the whole length of the line, which afterwards served as a rule where to fix the plants.

This line was extended, the whole length, upon the outermost bed, six inches from the side ridge of it; then with iron-shod dibbles a madder-plant was set strong in the ground, near every tuft of white yarn fixed along upon the line.

This row being thus planted, the line was removed two feet forwards which brought it exactly to the middle of the bed; this being also finished, the line was again removed two feet, and planted as before; and this method I continued till the whole was planted. Thus there were three rows of plants in each bed, at two feet distance, and one foot apart in the rows; and the distance between the innermost row of one bed, and the outermost row of the next adjoining bed, was three feet.

During the first summer I kept the young madder quite clear from weeds, by hand-hoeing, as soon as any appeared; and in October following I took the haulm that over-ran the intervals, and spread it over the beds, without cutting any off; then with a spade I covered the haulm with the earth from the intervals, about two inches thick.

In this condition it remained during the winter, and in March following, the young madder came up very thick and strong; and as fast as any weeds appeared, I kept them down by hoeing as before; but in the second summer I found there was no necessity of repeating the hoeing after the

the middle of June, for the haulm was now grown so very luxuriant as entirely to cover the surface of the ground, and thereby prevented the weeds from growing; and in October I again spread the haulm upon the beds, and covered it over with the earth in the intervals, as before.

There are three good reasons for covering the madder in winter.

The first is the new dressing of the beds with fresh untried earth.

Secondly, by this method deep trenches are formed at proper distances throughout the whole plantation, and consequently the beds are kept dry and healthy, and hereby the roots are prevented from rotting, which otherwise they are apt to do, if the water continues too long soaking on the beds.

The third reason is still more efficacious: for by this means the haulm is entirely rotted, and the volatile salts contained therein are washed down to the roots by the winter rains, which tend more to encrease the vegetation of the plants than double the quantity of any other sort of manure whatsoever, and for this reason, because the salt, inherent in the haulm, is of the same kind with that which was before extracted out of the ground by the growing of the madder, and is now returned into the earth again, in order to renew its former office of vegetation.

This, perhaps, may seem new doctrine to most of your readers; but experience convinces me of the truth of it, not only with regard to madder, but likewise in the propagation of asparagus, which, in a future letter, I may, if I have leisure, explain more fully by giving the public an account of my making and managing those beds.

If this hint was duly attended to, it is my opinion that both farmers and gardeners would find their account in it in the production of most sorts of vegetables.

But to return more immediately to my subject.

In the third summer very little work was required, only two slight hoeings in April and May, owing to the strength of the haulm, which covered the ground as in the preceding summer; and in October following the roots were taken up, and this small piece of ground produced one thousand nine hundred and sixty-five pounds of green roots, which were very large, and the madder, upon trial, found to be exceedingly good.

In cultivating madder, great care is to be taken to see that every set or plant has some small fibres at the root; and this ought particularly to be observed by those who are employed in taking them out of the ground; for unskilful persons, not used to the business, very often draw up such as have no fibres at all, and then they certainly miscarry.

The best way is, to remove the earth from the mother-plant with a small hand-hoe, or some such instrument; and then you may easily find which of the young plants has fibres, and which not.

In the second spring you must be cautious not to take off above two or three sets from each root; but in the third spring, when they are deeply rooted, you may take off almost as many as you please, without injury.

The sooner the young plants are set after they are taken up the better; and if you are obliged to have them at a distance, so that they cannot be set again in less than three or four days after they are taken up, they must be well watered at first planting, and repeated as often as you see occasion, till they have taken root.

In dry seasons, the young plants very often die for want of moisture, soon after they are planted; and in large plantations the expence of watering would be too great; therefore I always get my land ready early in the spring, and wait for some showers falling; and when I find them just at hand, and sometimes in the rain, I get a great many hands, and immediately go to work, some taking up, and others raking and planting; so that the whole is soon finished, even a large piece of ground; and when the plants are well watered at first, they soon take root, and afterwards they will stand a dry summer very well.

In the most favourable seasons, some few plants always die soon after they are set; therefore about three weeks after planting, you must go over your madder-ground, and replace such as have failed, with the best and most likely plants; and if the season be dry, let them be well watered at first planting; but if, after all, you find any miscarry, (which in a dry summer they sometimes will do) the best way is to fill up the vacancies with winter-plants in October following, just before you cover the haulm.

Madder may be successfully planted from the middle of March to the end of May, according as the spring is either forward or otherwise; but if showers should happen to fall in April, this is the best month in the year for planting madder. There should be no dung of any kind laid upon the ground during the time the madder is growing, because it has been found to give the madder a bad colour; and if the land is in good heart, and proper for the purpose, there will be no need of it.

It cannot be expected that any land, even the richest, should produce repeated crops of madder; for which reason, I am told, that the Dutch always allow an interval of six or seven years, in which time they manure the land very well, and sow it with corn or garden vegetables, and have always large crops, owing to the deep stirring of the ground, and being clean from weeds; and I can, from my own experience assert, that the best crops of corn always succeeded a madder-crop.

About five years ago, I planted an acre of madder on a light, dry, sandy soil, which produced a tolerable crop, but nothing equal to the other.

I likewise tried it upon an acre of land of a loamy mellow soil, somewhat sandy, about a foot deep in mould; and underneath it a cold, stiff clay: from this piece I had great expectations, as the plants thrived very well at first, but in the second summer, when the roots reached the clay, the plants died away, and came to nothing; therefore I am well satisfied a cold clay is by no means proper for madder.

I have also at this time, two other acres of madder, which I intend to take up next winter; it will then have stood three summers. The soil is a deep, hazel mould, worth about twenty shillings per acre. Instead of digging it with a spade, I plough-trenched it at least eighteen inches deep, but managed, in all other respects, like the former. From the appearance it made last summer, I have no great expectations from this plantation, though I fancy it will be a saving crop.

Expences attending the Culture of an Acre of Madder, supposing the Land to be worth forty Shillings per Acre.

	l.	s.	d.
Rent for three years	—	—	6 0 0
Digging ditto at two-pence per perch	—	—	1 6 8
Dividing ditto into beds, two men one day, at one shilling each	—	—	0 2 0
Raking ditto, two men one day, at one shilling each	—	—	0 2 0
Planting ditto with two thousand plants, one day, at one shilling and six-pence each	—	—	0 3 0
Six women to take up two thousand ditto, at sixpence each, one day	—	—	0 3 0
Hoeing the first summer five times	—	—	0 15 0
Covering ditto in autumn the first year	—	—	0 6 0
Hoeing ditto the second summer three times	—	—	0 9 0
Covering ditto in autumn the second year	—	—	0 6 0
Hoeing ditto the third summer twice	—	—	0 4 6
To be paid in lieu of tythe, at five shillings per acre per annum	—	—	0 15 0
Digging ditto out of the ground	—	—	5 0 0
Total of expences	15	12	2
As I always allow my people beer when they are about this business, I may add	—	—	0 6 0
Which brings the whole expence to	15	18	2

In the above account I have not reckoned any thing for the plants; for though they cost considerably at first, yet it is then done once for all to any person who continues to propagate madder, as he has always a constant supply from his own plantations.

	l.	s.	d.
Produce of an acre of madder	—	—	52 12 2
Expences	—	—	15 18 2
Clear profit	—	—	36 14 0

In the business I follow, which is that of a clothier, a great deal of madder is used in dying; and being of opinion

nion that there are many useful discoveries now lying dormant, only for want of proper methods to bring them to light, I determined to try an experiment on madder; accordingly I took twenty pounds of the green root, and having washed it clean from dirt and filth, I bruised it in a large iron mortar, just before using, and with other ingredients I dyed half a pack of wool of a dark full drab: upon examining my colour, I found it full as good as though I had used four pounds of the best umbro madder, imported from Holland; so that according to this calculation, which is founded on experiment, five pounds of green madder-root is equal to one pound of dry manufactured madder: and as I have found this method to answer, I have continued to use the root in this condition ever since, and find it much the best and cheapest way; for the green root is bruised very easily in the mortar, and thereby saves a great expence in drying, pounding, &c.

Before I quit this subject, I would advise those persons who are inclined to cultivate madder, to be very cautious in the choice of land for this purpose; for hereon their success chiefly depends. Madder being a plant that draws a great deal of nourishment, consequently the richest and deepest lands are to be chosen, and such as lie pretty low; for high lands are seldom fertile.

The following method of cultivating madder was communicated to the public by M. de Salens, a French gentleman, who is well acquainted with this branch of husbandry:

"I am apt to think, says he, there is hardly any kind of soil, but what madder will grow in; but it does not thrive alike in all: on the contrary, scarcely any plant sooner discovers the richness, or poverty of the land, by the state of its growth, than madder; in rich land, and a soil that agrees with it, it is luxuriant, and produces a great number of sizeable, well-conditioned roots; but in a poor, dry, hungry soil, the plant is visibly checked in its growth, and the roots of it are small, and few in number.

Madder is a great friend to moisture, and therefore thrives best on a good loam, with a clay bottom. It is very fond of fresh land just broke up; but it must be so situated as not be subject to be overflowed, as that will destroy the plant.

Madder requires, to come to a state of perfection, a great deal of nourishment: yet it is said not to impoverish the land; and this, in fact, is evident; for when the madder is dug up, the earth will be in excellent condition to bear a good crop of wheat.

I have tried several ways, and at length am of opinion, that the best method of raising madder in France is from the seed: it occasions, indeed, at first, some delay; but by continuing to sow a quantity in the nursery every spring, you will never fail to have plenty of plants.

The seed must be sown on a bed of earth, dug well, and made very fine with the rake, with which instrument the seed must be slightly covered.

When the plants appear, they must be carefully weeded, and set out with a hoe: the bed must, during the whole first and second summer, be kept very well hoed, and clear of weeds; and if this is done, they may be planted out the second autumn.

I have many reasons for preferring this method in France; but I shall forbear giving a detail of them, because my opinion, with respect to planting madder in England, is different.

The seed of madder does not ripen so well with you, as with us; neither does it, as I have been informed, take so well on being sown. For these reasons, I would recommend it to you, to make your plantation with shoots that are put forth by the old roots in spring. I have practised this method, and met with success.

For madder to succeed well, there should be a great depth of good soil, and it should be turned up very deep with a plough, or, what is much to be preferred, with a spade. When the ground is properly repaired, it should be planted with sets, being the spring shoots pulled up in a madder-plot, with some root to them; for, if they have not some root and fibres, they will not take kindly: these shoots generally come from the layers of the plants, and great care should be had in taking them up, or the crop of madder will be damaged: the best way of doing it is with a dibble that has a flat edge, shod with iron; this, on being thrust into the ground, cuts off the roots at a proper length, and by gently declining the handle of the dibble,

raises the set without injuring the fibres of the root; and great care should be taken not to take up too many of these shoots or stalks, as they are undoubtedly necessary to the support and thriving of the principal roots, which, were they deprived entirely of their stalks, would certainly perish.

It is scarcely necessary to inform you, that as fast as these sets are taken up, they should be immediately replanted.

To make the method of planting these sets more intelligible to you, I must observe, that they are planted nearly as potatoes are planted in Ireland; that is, a straight furrow is drawn, the sets are put into it, the earth of the second furrow is thrown over them, the second furrow is filled up with sets, &c. and so on till the whole ground is planted.

We place the sets here within three inches of each other; but this I think is too near for good land: perhaps they would thrive better, was double the space allowed: when three rows are planted a foot asunder, we leave an interval of four or five feet, according to the state of the land."

Grounds planted with madder, always succeed best when gentle rains fall soon after the work is done, as the sets take root the readier, and the whole gets into a thriving state.

In Holland and Flanders, this method of planting differs from that above described: they take up their sets from an older madder ground in May, and they plant them again immediately with a dibble, about three inches asunder, in rows about fifteen inches from each other; they form their beds about ten feet wide, and leave intervals of only one foot and a half or thereabout.

The best time of planting a madder-ground is undoubtedly in autumn, as the sets are then best furnished with roots; and the rain, which commonly falls at that season, forwards their growth.

As the stalks of the madder-plants are to be laid down and covered with earth, the intervals should be every now and then stirred to keep the soil loose. This covering is done when the stalks are about fourteen or fifteen inches long: after the ground has been well cleared of weeds, a part of the shoots in each row is laid down in the intervals on the loose earth, and slightly covered with the same earth; observing, however, not to cover them entirely; the end of each shoot should be left out of the ground, or they will not grow, and the whole work would be thrown away. The intention of laying these shoots down is, that they may be converted into roots, and thereby increase the quantity for sale; but all the shoots should not be laid down, or the disproportion betwixt the stalks and the roots would be too great.

This work may be done with great ease with the common implement, let a furrow be opened close to each side of the bed with a plough: in these the shoots are laid down, and covered slightly with a hoe.

None of the stalks of the madder should be pulled up the first year, as it will too much weaken the roots by disturbing them, and tearing off their fibres.

After laying down the shoots the first year, the madder-ground requires no farther care, except being kept clear of weeds; and in the autumn of the succeeding year it may be taken up, in order to its being prepared for sale: the earth of the intervals must always be kept loose by tillage.

When the madder-roots are taken up, the whole land gets a thorough ploughing, and some fresh roots or sets are regularly planted in rows, in the intervals of the former year; and when this second crop of madder is off, the land will be in fine condition to bear excellent crops of corn; for madder is no impoverisher of land, and the frequent tillage it requires, brings the land into fine tilth, reducing it into as small particles as the bed of a well-kept garden.

The best husbandry is, not to plant the same land in madder for many years afterwards: and whenever it is again planted with that crop, it should be well dunged, manured, and tilled the preceding year.

When the stalks begin to wither, that is, about the latter end of October, the roots are to be taken up; and the cheapest and shortest way of doing it, is to loosen the earth with a common plough, first taking off the earth-board and coulter: when the earth is thus loosened, women and children may serve to pick up the roots; and whatever difficulty occurs, the labourers turn up the soil with their spades.

But a much better, though rather more expensive method, is to have the earth of the beds turned into the intervals with a three-pronged fork: by this method the roots are taken up almost without damage; and many which lie a little deep are saved, but which would otherwise have been left in the ground and lost; and particularly most of the vertical or tap-roots are got up.

When the roots are taken up, they are dried as much as possible in the air, afterwards carried to a kiln, and lastly to the mill to be ground.

A light loamy soil is better for madder than a rich strong clay; it loves moisture, but is killed if it is overflowed: therefore, if the soil is in other respects proper, but too wet, it must be first drained, or at least the beds must be raised high, and the intervals sunk low: on the other hand, if the land is too dry, the intervals may safely, and even profitably, be raised above the beds: this will at least prevent the young fresh planted sets from being hurt by too much drought.

When the upper stratum of soil is deep, it is to be observed that the land cannot be stirred too deep: the only thing to be apprehended is the expence of doing it; the more the earth is reduced, the more nourishment will it afford to the roots of the madder; they require a great deal; but in general madder pays well for any labour that is bestowed on it.

Dry weather is, if possible, to be chosen for taking up madder roots, as the earth then easily falls off them, and they need not be washed, which is to be avoided; and, in fact, there is no occasion to wash them, unless they grew in a stiff soil, and the weather was very wet when they were taken out of the ground.

Some judgment is required respecting the time of taking up these roots; I have already mentioned that they will, in general, be fit for use by the latter end of the second autumn: but this is not always the case; and it is much better to let them lie in the ground another year than to spoil a crop.

The Dutch often take them up too small, and the French almost as often let them grow too large. The two extremes are equally to be avoided: the proper time to take them up is, when they are about the size of a swan's quill; they then yield most dye, and are of course most proper for use. The time when they arrive at this proper state depends not only on the nature of the soil in which they have been planted, but also on the good husbandry that has been bestowed on the land; for without proper tillage they will turn out but an indifferent crop; but if they are planted on a good loam, are well tilled during their growth, and have favourable seasons, they need never be left in the ground longer than the end of the second autumn, whether they are planted in the spring or the autumn.

I have mentioned in this letter many things which will appear trifling to you, when experience has made you more knowing in this culture; for depend upon it, a greater portion of knowledge is acquired by a little experience than by a great many precepts; the first makes a deep impression on the mind, whilst the latter are soon chased away by new, and perhaps more pleasing ideas.

I would recommend it to you, when you begin to plant madder, to depend more on the judgment you shall form of things, than on any thing you can read on the subject. If you miscarry in some instances, you will certainly rectify matters in your future practice: a sensible man cannot be long in the wrong.

I have not, I know, given you any systematical instructions in the affair of cultivating madder; and this I purposely avoided doing; for, had I attempted telling you in what manner this useful plant ought to be cultivated in England, I should certainly have miscarried, and all I could have said would have amounted only to probable conjecture: had I, on the contrary, given you a circumstantial detail of our methods of practice here in France, it would only have served to mislead you, so much do the climates of the two countries differ. I am therefore in hopes, that my manner of treating the subject will be not only more agreeable, but more useful to you, as I have, for the most part, only mentioned such circumstances as may be equally useful in the culture of this plant in both countries.

Lay it down as a maxim, that the culture of madder, if properly managed, is very profitable; there are few crops pay better; but then the two extremes are to be carefully avoided; we must not let our expences be so large as that no crop will repay them; neither must we be so sparing

as to baulk the growth of the plant for want of proper tillage. A great deal is required, yet too much may be bestowed on it, for the reason above-mentioned: the golden mean is best in this, as well as in all other matters: and what this mean is, can only be learnt from experience; for it is absolutely impossible to lay down maxims that will suit all countries, all climates, and all soils.

What has hitherto been said relates to the common way of cultivating madder; we therefore shall now give, in his own words, the great improvements made in this article by the ingenious M. Dambourney.

"M. Rondeaux, says he, found, eight or ten years ago, on the rocks of Oissel, two plants of madder, which he took up and set in his botanic garden. He afterwards gave me some slips of them, and I planted them in a similar place, out of curiosity: but M. Duhamel's Treatise soon made me perceive the importance of cultivating this plant. I accordingly applied myself to it: and by following all the methods which had been pointed out to me, and those which seemed to coincide with them, I succeeded so far as, in four years, to have plants enough to try this culture in the open field. In the mean time I learnt that M. Peter Dupont cultivated with success, at Elboeuf, plants of madder which he had received from Lille in Flanders. He was so kind as to make me a present of an hundred sets of them; and this little reinforcement, added to what I had raised of my own, obliged me to seek for room in my garden at Oissel, wherein to extend this culture. Finding no other spot vacant there, but two walks, I sacrificed the pleasure of enjoying them, to my then new and prevailing inclination. I therefore dug up one of them, the soil of which is a yellow and sandy clay, underneath which, at a spade's depth, is a bed of large gravel, close knit with very strong earth: but I did not suffer this to be broken into. I divided the walk lengthwise, and, without dunging it at all, planted in December 1757, in one half of it, first the sets which I had received from Elboeuf, and then immediately after, but without mixing them, those which I was able to take from my own plantation. The other half of the walk was sowed in the month of April 1758, with seed which I had gathered from my own plants. The other walk was disposed of in the same manner, as fast as I could get plants or seed to stock it; taking care the first year to keep my beds well weeded, and to lay down the branches as fast as they shot out.

"So early as in the autumn of 1758, I gathered seeds from my plants of Oissel madder, whether raised from seeds or from slips; but that of Elboeuf had not then blossomed, though it had put forth stalks three feet high; and even in 1759, it produced blossoms on only a few stalks, whilst the Oissel madder was loaded with them. When the stems were withered, I had the curiosity to take up some of the roots, and was thereby informed of the following interesting facts.

"1. Though it is said positively, in the Dictionnaire Encyclopedique, that madder raised from seed requires five years to grow to the same size as that which is raised from slips attains to in eighteen months, yet I found all things equal in this respect; and if there was any sort of advantage on either side, it was in favour of that which had been sown: both the one and the other occupied the whole depth of the ground so far as it had been loosened, and their roots had, in several places, penetrated through the hard bed of gravel underneath: but in order to pierce through it, three or four roots had twisted themselves together, and shaped themselves exactly to the form of the passage they found between the pebbles, in consequence of which they were more or less choaked there; though they afterwards resumed their natural shape and plumpness in a bed of small pure sand which lies underneath the hard bed, and in which I have been obliged to leave some of them at the depth of four feet.

"It is plain therefore, from this instance, that no time is lost by raising madder from the seed, and that this plant may be raised successfully in the most indifferent soils, even without the help of dung.

"2. I took advantage of some fine days to dry in the sun, but separately, the roots which I had taken up. Every thing seemed to give the preference to those of the Elboeuf species. They were larger and redder than the others, and their powder was finer to look at: but the effect proved very different. To make a fair comparison of them, I dyed, with equal quantities of each of these sorts of madder, two equal parcels of cotton prepared in exactly the same

same manner: that which was dyed with the madder originally of Oissel took a much brighter colour, and resisted during thirty minutes a boiling which the other could not bear during ten. I likewise compared its effect with that of the lizary or hazala of Smyrna; and the advantage as well in point of brightness as of the durability of the colour, was also on the side of the Oissel madder.

"This valuable kind appeared to me from that moment to deserve the preference. In the spring of 1760 I sowed all the seed I had of it, part upon hot-beds, and part on beds in my kitchen-garden; and I desired M. Rondeaux to help me to find out more plants of it upon the rocks of Oissel or of Orival: but he assured me that he had searched for such several times, in vain: nor was he more successful in a journey which he took thither last August, with M. Dangerville.

"I therefore determined to have recourse to the suckers which grow around these plants: but though I took them up as carefully as possible, I could scarcely get any that were rooted; and notwithstanding that most of those which I did plant were yellow for the length of from four to eight inches, yet nine of them in ten died. The off-sets of the Elboeuf madder, on the contrary, though taken up with but little precaution, have a great many fibres and young roots, and their taking fresh root is sure, provided they are planted in cool weather. Nature seems then to compensate the cultivator for the scantiness of the seed which this last species produces, whilst the other yields it in abundance.

"Not to neglect any means of multiplying the Oissel madder, I dug up a small spot of it, about the fifteenth of last June, and took from thence all the slender roots, which run in great plenty just below the surface of the ground: I cut them into pieces at every second joint, and planted them the same day in channels, where all those that were brown and woody became good plants, and those which were then only yellow and tender, rotted.

"The doing of this taught me what I had not learnt from M. Hellot's memoir, nor had any of my correspondents in Holland informed me of it; namely, from what part of the root it is that the most valuable colour is obtained. After all my runners were thus taken off, and replanted, there still remained the stock, furnished with lateral and with descending roots, resembling in form and colour large earth-worms. In three days of sun-shine they were dry, and the parenchymæa, or pulpy part of the root, being then lessened in bulk, the outer skin became wrinkled, because it was then too large. To clear them of this wrinkled skin, I had recourse to a method first thought of by M. Paynel, of Darnetal, which was, to put these roots in a large sack of coarse canvas, and to shake them strongly therein. The friction of the sack, and of the roots one against another, took almost all that outer skin, which I afterwards separated by winnowing, and what then remained, was that which alone ought to be called fine and true peeled bunch-madder, the effect of which is as superior to that of the azala, as the azala is superior to the finest Dutch madder. I would not however advise the cultivators of madder to follow this method, any farther than there may be curious and nice buyers ready to give them a price proportioned to the expences it occasions.

"By thus taking up each species of madder in the spring, one has, as M. Duhamel gives room to hope, not only the advantage of obtaining suckers and joints of roots for raising new plants; but also, if the season be not quite unfavourable, one may dry the root itself in the sun sufficiently to make it keep, and by this means the expence of drying it with fire in a stove is saved, and the injury which the fire does to the quality of the madder is avoided. The colouring part would be still more valuable if the root were dried in the shade, under a shed open on all sides; and to accelerate this drying, I have successfully made use of a bed of half-baked bricks, upon which I have spread the fresh roots. A bed of dry ashes, six inches thick, may also be used; but in this case it must be covered with cloths upon which the roots must be laid, that the ashes may not mix with them when they are turned. A floor of plaster likewise facilitates this drying; and I believe it far preferable to bricks, on account of the ferruginous parts which these generally contain.

"The principal difference which distinguishes the Oissel species is therefore observable in its roots, which are slenderer, of a less bright colour, less furnished with fibres

at their joints, and those joints farther asunder than in the Elboeuf madder: but besides this, an attentive eye will discern many more distinguishing marks.

"In the spring of the second year it rises ten or twelve days earlier than the other sorts, its stalks are slender, and they trail upon the ground as soon as they are a foot long; its leaves are of a pale green, long, narrow, thin, waved along their edges (pretty much like that of the laurel); its blossoms are disposed in loose spikes, and each of the seeds which succeed those blossoms stands upon a pretty long foot-stalk.

"The Elboeuf madder, which comes originally from Flanders, and is the same as the Flemish refugees carried into Holland, puts forth, on the contrary, strong stalks, which have frequent joints, and are able to support themselves even when they are two or three feet long. Its leaves, which are of a deep green, are thick, broad at their base, and terminate in a point almost like the leaf of the great myrtle, and they are not at all, or very little, waved. It does not blossom till the second or third year: its flowers are very apt to fall off, and when this accident does not happen, its seeds stand on short foot-stalks. This seed grows very well: but the ease with which well rooted shoots are obtained from this species renders it the less valuable.

"In order to enlarge my plantation, and likewise in hopes of enriching it with a new species, I wrote to Smyrna for some seed of the azala or azary, and luckily received three pounds of it on the 20th of August, 1760. It seemed to be absolutely like that of the Oissel madder, and I ventured to sow a small part of it, on the 27th of August, upon an old hot-bed which had lost all its heat. It rose well, and the young plants were not injured by the winter. I transplanted them into open ground at the end of last February; they are now in bloom, and their appearance is exactly like that of the Oissel madder, excepting that their stems are slenderer.

"As to the culture, I set out with scrupulously observing M. Duhamel's directions: but afterwards I ventured to deviate from them in some points, in order to adapt it to the less attentive genius of our farmers. In the first place, I have experienced the truth of what M. Paynel of Darnetal observed to me, viz. that the plants which are raised from layers, at a great expence, produce only long woody roots, which yield hardly any colour, remain hollow during two years, and produce very few of those vermicular roots, which are the only valuable ones. I have therefore quadrupled the number of plants in a given space; the ground has been well filled with them, and the expence of making layers has been saved; and, thoroughly to accommodate the culture of this plant to the practice which our country people are accustomed to, I have either planted the slips, or sowed the seed, in rows after the plough, as is done for kidney-beans; and the workman used to earth up these, performs mechanically the same operations for the madder, the expence of cultivating which in this manner is no more than that of raising those beans in the field.

"Having observed that the east winds in the spring, and the heat of summer, are equally fatal to whatever is then set in the lands about Oissel, and that, on the contrary, whatever will bear planting in the autumn succeeds very well in them, I took up, in October last, all the plants of two years old madder that were in my garden-walks, and these afforded me as many slips as were sufficient to plant half an acre of ground. Very few of them failed, because they were all brown and woody. As the roots which are taken up in autumn, and which one might wish to be able to keep, cannot be dried without fire, it is advisable to dig up in that season only the quantity necessary to furnish sets for replanting, and from June to September to take up what is intended for sale.

"On the 16th of last February I sowed in a hot-bed the greatest part of the lizary seeds which I had received from Smyrna, and the rest of them a fortnight after, in one of the beds of my kitchen-garden. I raised from them plants enough to stock four hundred and forty square feet of ground, in an open field, where they succeed perfectly well: but this transplanting checks their growth; so that if the seed is sown in the field in May, the crop will be in nearly equal forwardness: but I have not had cause to approve of sowing earlier in open ground.

"As it is right to make even inconveniences become lessons of instruction, the impossibility of drying without fire the roots which I took up in October, put me upon trying to use them fresh, in the state they were when dug out of the ground. I therefore washed them well, that no earth might remain upon them: but having myself experienced, that, as M. Duhamel observes, this root loses seven eighths of its weight when it is dried sufficiently to be reduced into powder, I judged that I must proportion my quantity accordingly. I therefore put into a quantity of liquor, which would have required a pound of powdered madder, eight pounds of fresh roots bruised in a mortar, and with this I dyed some cotton, in the usual way. When the dying was finished, I found that the liquor was still over-charged, though the cotton had imbibed so deep a dye as to require two boilings to bring it down to the usual colour: upon which I repeated the experiment with six pounds, and afterwards with four pounds, and I found that this last proportion of undried roots is that which gives a colour equal to what is extracted from a pound of dried and powdered madder. One half of the quantity of roots commonly used may therefore be saved by dying with them when they are fresh dug: but, though this is a great saving, it is not the only one.

"1. There is no need to build kilns or sheds for drying the roots in changeable weather.

"2. One is exempted from the inconveniences of a too hasty or too slow drying, either of which is equally hurtful to the quality of the madder.

"3. The waste occasioned by the peeling, garbling, winnowing, &c. of the roots, in the doing of which many, if not all of the small ones that are not, for example, thicker than the straws, are separated with the refuse parts, and thereby generally lost, is hereby saved.

"4. The expence of grinding is saved, together with the waste and fraud which may be committed at the mill; and likewise the inconvenience of waiting till the mill is at liberty, which is of no small consequence in places where there are not mills appropriated to the grinding of madder only.

"5. Lastly, the roots thus used do not evaporate or ferment, as the powdered madder always does, if it be not speedily used.

"All these advantages put together may be deemed equivalent to a saving of five eighths in the quantity. The planter who knows how to dye, may reap the benefit of them the moment that his roots are large enough to be taken up: the dyers by trade will by degrees be sensible of the advantage, and share the profit of the planter, when the madder-grounds are nearer them: they will even find themselves under a necessity of so doing whenever this method shall become general, and this will be a means of rendering it such; for as there is no particular time to be waited for in order to the madder's acquiring maturity, after it has been planted eighteen months, the husbandman who carries a parcel of fresh roots to market will be sure of selling them in that state, and the dyer may buy them daily, in proportion to the quantity he wants; or he may agree with the planter for such and such quantities to be delivered to him at such and such times. I have moreover experienced that these roots may be kept fresh during several months, by laying them in a hole three feet deep, in alternate layers of roots, and of earth.

"This experiment pleases me again in its tending to lessen the expence of dying, and consequently to reduce the price of our dyed stuffs at foreign markets, by which means our trade with other nations may be benefited: and it is likewise new, since neither M. Hellot nor M. Duhamel have pointed it out. I have also experienced that the Elbœuf madder is very good when it is used fresh; a circumstance by so much the more important to be known, as this species is not only the longest lived of any, but also the most easily propagated.

"The principal difficulty now remaining for me to surmount, is to find out some cheap and easy way of taking up the madder, without leaving in the ground its descending roots, which yield the best colour: for the method which I have hitherto practised has been considerably expensive. M. Duhamel proposes a plough which turns over the earth, without a coulter: but if I may judge from what I have seen, this expeditious instrument can suit none but lands where a clayey bottom hinders the vermicular roots from piercing deep. I wrote to Holland, to know how the Dutch manage in this respect; but those zealous

patriots are very reserved in every thing relative to this plant, of which we let them be the monopolizers: I was answered, that they use the spade and the fork. However, I shall try what my zeal and what incidents may suggest to me, and shall communicate whatever I may find to answer best.

"An objection which may, perhaps, be started against this branch of husbandry in France, is, that there may be danger of its prejudicing that of our corn, which is an article of the greatest necessity. But besides that we have immense tracts of uncultivated lands where it might be established, I can, with M. Duhamel, assert, that the profit of the madder may be had in the best fields of this province (Normandy) without diminishing the crops of the most valuable corn. In effect, it remains in the ground but eighteen months, and after it is taken up, a single ploughing is sufficient to enable the land to produce very fine wheat, without any manure. Now it is the custom in all our wheat grounds to take a crop but once in three years, and this may be had after the madder. Nay, an advantage may be reaped even in the first year, by sowing, between the rows of madder, onions and other pot-herbs, which do not root deep or occasion much shade: but there will be a still greater profit in making it grow jointly with kidney-beans, because the rows being regular, nothing would hinder the after-stirrings, which contribute so much to promote vegetation."

M. Dambourney continued his experiments on madder, and gives the following account of them:

"I have restricted myself to the three species which yield the brightest and most lasting colour: these are, the madder originally of Oissel, that which is sometimes found growing wild in the vineyards of Poitou, and the lizary or hazala of Smyrna. All these bear seed in their very first year, and in the second, one may gather two thousand seeds from a plant which would not afford at most above twenty or thirty slips. The difference between these means of propagation is striking, and ought to be decisive in all countries where the seed ripens well, as it does in almost every part of France.

"The manner of raising it from the seed, as practised by me, is thus: Along a wall which fences off the north wind, let a trench be dug two feet deep, five feet wide, and of such length as may be most convenient; then, towards the middle of February, let it be filled with hot dung of horses or mules, well pressed down, to within about three inches of the level of the ground, and afterwards fill it quite up to the top with fine mellow mould, pressed down gently, and laid smooth with a rake. A bed of this sort is preferable to any other, because a common labourer can make it very well, whereas it would often be necessary to have recourse to a gardener to make a raised hot-bed. The expence is not to be regarded, because this bed may be sown six times in a year, and the mould which may be taken from it afterwards will be worth as much as the cost of the dung. The using of this bed does not at all prevent sowing likewise in the beds of a kitchen garden: but as this last should not be attempted before the middle of March, for fear of frosts, there will be a great advantage in sowing upon the hot-bed; for a month gained in this season is invaluable.

"On the 20th of February, 1762, I sowed upon such a bed some madder-seed in small channels about an inch deep, and three inches asunder. This method is always preferable to sowing in broad-cast, because the seed is better covered, and the weeding is more easily performed. The young plants appeared after nineteen or twenty days, they were watered and weeded when necessary, and on the 30th of April they were fit to be transplanted into open ground.

"As most of our farmers are, unhappily, not able to advance money for a culture from which they have no prospect of reaping a return in less than eighteen months, I tried, last year, what would be the event of sowing madder at the same time as kidney-beans, and in the same furrows of the plough. The beans, which rise in less than eight days, required to be earthed up when the madder had scarcely appeared above ground; and this operation smothered the madder entirely. I therefore judged it most proper, this year, to substitute my young hot-bed plants of madder in lieu of the seed, and accordingly, when the weather was moist, for that is an absolutely necessary circumstance, I set some of my people to plant a piece of ground which had been well prepared for a crop

of dwarf-beans. In each furrow of the plough where these beans were sown, women and children placed the young plants of madder six or seven inches asunder, fixing the root in the bottom of the furrow by means of a handful of earth put around it, and resting the green stem against the side of the furrow, the surface of which is exceeded by at least one row of leaves. The ploughman stopped a little at the end of the furrow, till the whole of it was planted: he then opened with his plough, which had a shifting mould-board, a second furrow, in which nothing was either sowed or planted; and at the same time the earth turned out of this filled the first. A woman finished this filling with a rake, as well as to cover the beans completely as to earth up the plants of madder. The third furrow was sowed and planted like the first, and this was continued till the whole extent of the ground was planted in rows fifteen inches asunder. This work, which did not in the least alter the common method of cultivating the beans (excepting that only two thirds of the usual quantity of seed were used) was performed in five hours, by one ploughman, three women, and three children. The ground thus planted contained upwards of twelve thousand sets of madder; and these had taken fresh root, and had begun to shoot up when the beans rose. It was weeded twice, its surface was stirred, and the plants were earthed up as usual, without any danger. Both thrive well together: the beans were pulled up when they were ripe, and the madder, now sole possessor of the ground, covers it like an artificial grass. The greatest part of it has yielded a little seed. The crop of beans, notwithstanding the drought of this summer, is almost equivalent to the expences, and next year I shall have that of the seed and roots of the madder, at the expence of only a stirring of the surface and a single hoeing in the spring.

"My hot-bed was no sooner cleared, than I sowed it again with madder: but the extraordinary drought of the season obliged me to leave it there till the 6th of August, by which means I lost a crop. I then took advantage of a rainy day to transplant it: and this was done in the same way as before, excepting that the season was too far advanced to admit of sowing beans at the same time. The length of the roots of the madder likewise required more precautions to fix them with the earth at the bottom of the furrow, in which one of the horses being forced to tread in order to open the next furrow, the whole would have been trampled to pieces, or dragged out of the ground. Yet the same number of work-people, as before mentioned, set sixteen thousand plants in six hours. The spot is well filled, and the plants will be strong enough to resist the winter.

"On the 15th of May, being deceived by a small rain, I sowed near an acre of ground in alternate rows, as is practised for beans, but only with madder. I used for this purpose three quarts of seed, which I have much regretted; for the constant drought has hardened the surface of the earth so that the young plants have not been able to pierce through it, and consequently all has been lost. The method which I am now going to relate will prevent this inconvenience hereafter.

"I sowed my hot-bed, for the third time, on the 6th of August, with a design to let the young plants remain there all the winter, and not to transplant them till the end of February: but the nineteen or twenty days which this seed requires, in order to its sprouting, disconcerted me. It was necessary, in that hot season, to water frequently by hand, and this, besides wearing out the gardener, laid bare some of the seeds, which grew no more. It then occurred to me, that this might probably be remedied by sowing seed which had already begun to sprout. Accordingly, I filled the bottom of the box with moist mould a quarter of an inch thick, then covered this entirely with seeds, and so proceeded in alternate layers, the last of which was of mould. I kept this box well watered, though exposed to the sun, and each day I examined the progress of the seed. It was on the eighth that the germ began to appear, and the very next day it was three quarters of an inch long. I seized that instant to lay in channels made in the hot-bed, both the seed and the mould in which it had sprouted: I then smoothed the surface of the bed, and two days after, all the rows appeared distinctly. This method likewise saved me a weeding, which I had generally found to be necessary as soon as the seed which had not been made to sprout before-hand had risen. The growth of the young plants was so rapid, that instead of

letting them remain there all the winter, as I first intended, I ventured to transplant them into open ground on the 14th of last September. Frost is a little to be feared for this last plantation; the event will be a lesson for the future.

"Eight days before these plants were taken up, I laid another parcel of seed to sprout, in the same manner as before, and therewith immediately replanted my hot-bed. It has risen well, and will pass the winter there. I hope (by thus using sprouted seed) to be able next year to raise at least six crops on the hot-bed. I likewise sowed at the same time some of this sprouted seed in a bed of my kitchen-garden, where it rose in four days. I intend also to venture some of it about the end of next April, in a spot with beans; and I presume that as this already sprouted seed will rise sooner than them, the plants of madder will be able to bear the first weeding and stirring necessary for the beans; in which case the expence of culture will be much less than the charge of removing the young plants, and both the hazard and the delay of their taking fresh root will be avoided. If this trial succeeds, it will be the greatest inducement that can be for the farmer to adopt the same method, since it will require only one ploughman, a woman to sow the beans after the plough, another to lay the sprouted madder in the furrow, and a person to cover the whole over with a rake.

"The gathering of the seed is expensive when one has but little of it, because, for fear of losing any of it, it is gathered almost seed by seed. I thought myself rich enough this year to try another way of doing this work. I caused all the tops to be cut off with a reaping hook; when there remained upon them but a few seeds that were not ripe, and the whole was then laid upon cloths in the sun. In two or three days the stalks and leaves became so brittle, that a few strokes of a switch reduced them into dust. Two turns of a winnow blew away their dust, and with it the unripe seed, which after they had been dried, were found to be lighter than the black or purple ones, in which the horny substance was formed. I hope next year to be in a condition to proceed with still less precaution, that is to say, to mow at once all the branches and stems, and then to separate the seeds from them in the same manner as before. It generally is during the whole of the month of September that the seed of madder is fit to be gathered.

"After the seed has been thus separated from the stalks, and winnowed clean, it must be exposed to the sun till it becomes perfectly dry; for if there remains the least moisture in the black pulp which surrounds it, a fermentation will ensue in the winter, or at least a mouldiness, which will destroy the germ. It must afterwards be put up in bags of thin cloth, and these should be hung to the ceiling of a dry and airy place, as well to preserve the seeds from all moisture, as from mice, which are very fond of them.

"If it be intended to sow wheat after the crop of madder, the roots of this last must be taken up in the beginning of October. It is not possible for me yet to point out a better method of doing this, than to begin at one end of the field, and trench the whole ground two or three feet deep, whilst women gather up the roots as the men pursue their digging. The ground is then so well prepared for wheat, without using any dung, that two-thirds, or at at most three-fourths, of the usual quantity of seed will be sufficient to sow it.

"The madder now taken up might become burthensome to the planter, if the consumer thereof should seek to take advantage of the ease with which it corrupts: for the husbandman would in such case be forced either to dry on kilns whatever he takes up in this season, or to sell it at whatever price the buyer should be pleased to offer. These inconveniences seemed to me the greatest obstacles to the progress of this branch of cultivation, because they necessarily required, in the common way of proceeding, either that kilns should be built for drying the madder, or that its roots should not be dug up till they were to be sold. I therefore tried, as follows, to remove these disadvantages. On the sixth of October, 1761, I dug in my garden a hole three feet deep, into which I threw thirty plants of madder, then filled up the hole, and let it remain thus exposed to the air and rain. I caused it to be opened on the 30th of last March, and found all the roots in good condition. It was filled up again till the 15th of September, when, upon its being opened anew, even the vermicular

cular roots, the broken ones, and those which had been separated from the plant, seemed to me as firm and as sound as when they were first put into it; but to be certain whether they had not suffered some alteration imperceptible to the eye, I have dyed with them, in comparison with roots which I took up on purpose, and I have not found any difference in the liquor, or in the brightness and fixation of the colour.

"The husbandman may therefore, in case of need, keep his crop of madder a year in a hole made in his farm-yard, or in a pit dug at the end of the field; only observing to lay it in alternate layers of roots and of earth. He will thus be enabled to wait till he finds a proper opportunity to sell, and the buyer will no longer have it in his power to tyrannize over him by taking advantage of his necessities. The dyer, who will know his own interest well enough to adopt my method of dying with fresh roots, may also keep them equally well in the same manner, in a hole in his cellar, from whence he will take, whenever he pleases, whatever quantity of them he has occasion to use.

"It may not be amiss to repeat here, that when these roots are used fresh they need only be washed a little to clear them of earth, and that the quantity of them put into the dye should be after the rate of four pounds for each pound of ground-madder, which the operation would require. These roots are cut into middle-sized pieces, and pounded in mortars of stone or wood (iron absolutely excepted) till they are reduced into a kind of punnise, and this is thrown into the copper when the water (of which I have experienced that, in large works it is hurtful afterwards to increase the quantity) is a little more than lukewarm. The liquor is then heated to a degree at which a man can hardly bear to hold his hand in it, and whilst it is in this state the stuff or cotton is pushed down into it, and there worked about during three quarters of an hour, between hot and boiling, after which the liquor is made to boil during three quarters of an hour more.

"As this liquor remains, after the dying is finished, much finer than that which has been made with the Dutch ground-madder, I intend this winter to try whether it may not be put to some farther uses; and I shall in due time give an account of whatever I may succeed in."

M. Duhamel thinks the month of September the most proper time for cutting the stems of madder, in order to their being made into hay. The Flemings cut theirs in August; but that is when they do not intend to save the seed, of which indeed their madder yields but little, as was before observed. As Mr. Ray informs us that the madder which grows wild in England preserves its verdure all the winter, it will become a considerable addition to our winter and spring succulent food for cattle, and this will add greatly to its value; for this plant has been experienced to be an excellent fodder for cattle.

Cows fed with the tops of madder yield plenty of milk, which is a little tinged with red; and the butter of it is yellow and well tasted.

After the madder has been cut for hay, the ground should be gently stirred, especially in the alleys, and particularly if these are to be planted with madder the next year.

When the same ground is to be planted anew with madder, the whole of it should be thoroughly ploughed after all the roots are taken up, and the beds should now be made where the alleys were before. If the ground is sown with wheat after this second crop of madder has been taken up, the farmer may reasonably expect an abundant crop of corn: for besides that madder does not impoverish the ground, the weedings and frequent stirrings necessary for the culture of the plant prepare it well for wheat or any other crop. M. Duhamel confirms this by the following experiments.

A field of madder being dug up, he sowed it with spelt, which was harrowed in, and did not appear for six weeks, because the ground was very dry: and even after this, only a small quantity of it sprouted: yet, at harvest, this field yielded as many sheaves as others in the same country; but with this essential difference, that the straw of these was six feet long instead of four, and the ears were as long again as those in the other fields.

Another year, having sown spring-wheat after a crop of madder, there were, at harvest, twenty dozen of sheaves on an arpent (about an acre and one fifth) whilst the other fields yielded but eight or nine. Likewise, another year again, having sown oats on a piece of ground where the

madder had just been dug up, it yielded forty dozen of sheaves to the arpent. The common lands produced that year but five or six dozen.

The peasants about Lisle, being in too great a hurry to enjoy the fruits of their labour, take up their madder before its roots have attained a proper size. The Zealanders let their's grow larger. A medium should however be observed; for the roots which have remained longer in the ground yield less dye than those which have stood only till they have acquired the bigness peculiar to each kind.

This root, which is one of the best ingredients that can be used for dying wools and stuffs, gives them a red colour, not very bright, it is true; but which resists, without alteration, the influence of the air, the heat of the sun, and the effects of the ingredients made use of to try colours: it contributes also to make other mixed colours lasting: finally, a method is found out of giving cotton a very pleasing and lasting carnation colour with it. All parts of the root do not yield this red; the dye of some parts fades, and other parts are worth nothing at all.

In examining a well conditioned root of madder with a microscope, under the outer bark, in the flesh may be perceived some red particles, which certainly yield the colour which the root contains; but there is, besides this, seen a great quantity of woody substance of a fallow colour; and this substance probably impairs the first mentioned colour. According to M. de Tourniere, this fallow colour is not so good a shade as the red; and he imagines that leys, &c. give a brightness to the colours dyed with madder in no other respect than by abstracting this fallow colour. The sun and dews have the same effect on yarn dyed with madder, when it is exposed on the grass.

M. de Tourniere also imagines, that the part which yields the red, is, in the green root, dissolved in a mucilaginous juice; for the bark, and the other parts which contain most red, are also most succulent: by drying them in a kiln they lose seven eighths of their weight, and yet the roots are not perfectly dry; for they bend before they break; they are rather bruised than ground by the mill; and this unctuous powder is apt to clot: it is true, that in time they lose this unctuousness, and become dry; but at the same time the quality of the red particles is lowered. These observations are well deserving of attention; for they make it evident to us, that these valuable particles may be impaired by too great a heat: supposing it unctuous, were it too much dried, perhaps water would not dissolve and separate its parts. Finally, these reflections of M. de Tourniere agree very well with the experiments of M. d'Ambourney, and convince us that madder-roots may be used green with very considerable advantage. But green madder can never be used, except when the grounds lie convenient for the dyers: thus, when madder is to be carried to any considerable distance, it must of course be dried, and pulverised. I shall resume this subject.

1. As madder roots are very apt to ferment when they are brought green, it will necessary to examine carefully whether they are spotted, or have a musty smell: if the fermentation has given them a black hue, they are by all means to be rejected.

2. The roots to yield a fine dye should be fresh: such as are dusty on being broke must therefore be rejected, and with still greater reason those that are rotten and worm-eaten: on the contrary, such ought to be preserved as have a strong smell somewhat like that of liquorice: the ground-madder should be unctuous, and run into clots on being handled.

3. As madder is sold by weight, it is an advantage to the purchaser to have the roots quite dry; but he should be careful that they have not been kiln-burnt: such as have a strong smell have seldom this defect. Too hasty a drying wrinkles and splits the bark: and, as it then separates very easily from the wood, the most useful part is lost: the bark therefore should be smooth, entire, and adhering to the wood: but we must not confound the true bark with the outer barks or epidermis, which would only lessen the brightness of the colour.

4. The largest roots are not always the best: they are frequently yellow, and have but little of that red which alone yields the colour. The very small roots are of little value, as they have too much outer bark, which hurts the colour: but those of the best quality are from the size of a goose-quill to that of the end of the little finger.

5. In breaking the roots there may be seen, as I have already

already observed, two substances differing one from the other : that which inclines to a yellow only, hurts the dye : that of the deep red is the part really useful ; consequently the highest coloured roots should be preferred.

It would be a useful discovery, could there be a method found out of extracting the red particles without any mixture with the fallow or yellow part : I am of opinion the trials should be made on the green root, that the red particles, which are then in a state of dissolution, may be more easily extracted.

6. As the surest method of knowing the quality of madder is to make a trial of it on some piece of stuff, it will not be amiss if such as plant much of it accustom themselves to make this trial, that they may demonstrate to the purchasers the quality of their roots : the following process for doing it, is extracted from the works of M. Hellot :

To dye a pound of wollen-yarn, a bath must be made with five ounces of alum, and one ounce of red tartar, dissolved in a sufficient quantity of water : the wool that is to be dyed must be well drenched in this liquor : in about a week half a pound of ground madder root is to be thrown into water as hot as you can bear your hand in it : and, after having mixed the water and powder together, with a stick, the wool is put into it ; and the bath must be kept hot for an hour, but not boil ; for, if it did, the colour would be dull : but towards the end of the time the bath is made to boil ; but the yarn must be instantly taken out.

As very trifling circumstances will affect the beauty of the colour, it will not be amiss to make at the same time two trials with the same yarn ; one with the madder that is to be proved, and the other with the fine madder of Zealand, or azala : the beauty of the skains will determine which is the best madder.

As these trials may as well be made on two or four ounces of yarn as a pound, the baths may be made accordingly. I shall now treat of the methods of dying and pulverising madder.

We have observed that green roots are very apt to ferment : it is therefore necessary to abstract the great quantity of moisture that causes it. If the weather is very dry and hot, it is certainly adviseable to take the advantage of it, to dry the roots in part, and save wood ; but, if the weather is damp, the root must be spread under sheds, or on barn-floors, and often moved : for, if they were laid in heaps, they would soon heat, and change, more or less, according to the state of fermentation they were in. With care the fermentation of the roots may be greatly lessened ; and, according to M. d'Ambourney's opinion, they may even be kept good for some time ; but the roots cannot by these means be made dry enough to preserve them from any change. For small crops a common oven will serve ; but it must not be heated to above forty-five or fifty degrees of M. de Reaumur's thermometer. But this method is very tedious ; it would require very large ovens to supply the place of kilns. To save the expence of building a kiln, I would recommend the making a place over the roof of the oven, to put the roots in, that they may begin to dry : but, if we grow much madder, it is absolutely necessary to have a kiln proportioned to the quantity that is to be dried, not only of our own crops, but to those peasants that cannot afford kilns.

The kilns may be made of very different forms, many of which are of equal goodness ; but when a man proposes building one, he should be attentive, 1. That it may contain a large quantity of roots : 2. That it may be worked with ease : 3. That as little fuel as possible may be used : 4. And that it be so contrived as to retain an equal and moderate heat. To make these matters easy to planters, we shall describe the kilns that have been long in use at Lille for drying madder-roots : we shall point out their defects, as well as the defects of two kilns that were successively built at Corbeil ; and, lastly, we shall mention the attempts we have made to improve and perfect them.

Description of the Lille Kiln.

This kiln differs very little from that used for drying malt. To have a general idea of it, we must suppose there is a large furnace, in which a great fire is made : this furnace is made under an arch ; the hot air and smoke pass through a funnel over the furnace, and spread themselves in a space in form of an inverted pyramid, the bottom of

which is covered with a perforated floor, on which the madder-roots are spread. This is the general form of the kiln ; but we shall give a description of it according to the figures in the plate, for the use of such as intend to build one.

Fig. 1. Plate XVIII. represents the section of a building containing a madder-kiln.

In this building may be seen a vault, K, K, a ground floor, L, L, and a first floor, G, G, over which we are to suppose a granary, H. The foundation of the brick-work of the kiln, is somewhat lower than the bottom of the vault ; the walls terminate in arches, at the bottom of the first story ; the side walls of the building serve as upright supporters ; and the arches of the kiln are sustained by jambs, which are put into the side-walls. All this will be better understood by explaining the letters of reference.

A, an ash-hole two feet wide, three feet and a half deep, and two feet three inches high. B, the furnace with an iron grating, *b b*, at bottom. C, a pricked line, which determines the height of the furnace door : this aperture is sixteen inches wide, and seventeen high. D, the chimney, B, the perforated funnel, which disperses the heat, by means of the holes, *i i i*. It is to be observed, that this chimney is entirely covered at the top, to prevent any thing falling into it. I I I, holes two inches square, by which the heat escapes ; they are placed chequerwise. F, an empty space, into which the heat goes out of the funnel before it reaches the upper story. G G, a floor set with square tiles, on which the roots are to be spread one foot and a half thick. These tiles are fifteen inches long, ten or eleven wide, and two thick : they are perforated with conic holes, as here represented. H H, tubes four inches wide, by which the superfluous smoke escapes, and through which fall the dusky particles that drop through the holes in tiles of the floor G. These tubes are stopped by a little iron door, which is opened when the heat is too great.

K, the vault in which the fuel is kept. L places where the undried madder is safely kept. M, iron joists two inches thick, traversed by bars which bear the tiles that compose the floor. N, iron branches fixed to the beam P, to support the floor G. P, the beam of the second story. Q, a casement or window, to be opened at the beginning of every drying, to let out the smoke. When the madder begins to dry, these casements are shut, to keep in the heat. There are also in the second flooring two trap-doors, which are open to let out the smoke and steam.

Fig. 2. represents the plan of the furnace. The three iron bars which cross it, are each two inches and a half broad, and six lines thick ; they are let into the wall three inches ; the bars of the grating are one inch square, and riveted to the other bars. In this plan are to be seen the tubes marked H, to shew that they run the whole depth of the furnace. These tubes are very necessary to convey into the kiln the heat from the body of the furnace.

Fig. 3. represents the plan of the tiled floor, G : it is sixteen feet square.

As the furnace we have described resembles that used for drying malt, we were willing to observe in what manner it was dried, and remarked, that they lay it about nine inches thick, and that it is very hot at the bottom. When M. de Reaumur's thermometer was applied, it rose upwards of twenty-two degrees above Zero ; but the upper part being influenced by the external air, heats but little : the steam that rises, being condensed by the cool air, is reduced to water, which occasions the upper part of the bed of malt to be always wet : for this reason it must be often turned. In this method, by being often wetted with the steam, the bed of malt is much retarded in its drying. We imagined this inconvenience might be removed, by preventing the external air from affecting the surface of the bed : and this would be effected by making a covering for it : and, if this covering could be fixed within a foot of the malt, another advantage, which we shall mention, would result.

It is well known in physics, that the vapours which arise from heated matter, have a great power of penetrating and heating the matter whence they proceeded, provided they are collected, and in some manner reverberated on the matter to be heated : it is on this principle the machine was constructed in which the bones of animals could be dissolved ; and we know, that in an equal degree

degree of heat water has eight hundred times more volatility than air; and vapours or steam contain a great deal of water.

This induced us to think, that it would be of great use to reverberate the steam on malt and madder-roots, by means of the covering above mentioned. M. Villot, brewer at Paris, who takes all opportunities of improving his beer, has made some experiments of this nature, and in part succeeded. It is only necessary then to contrive a method of putting this in execution in a large building, of which we shall in due time take notice.

One great defect of the Lisle kiln is, that the smoke, mixing with the roots, charges them with fuliginous matter, which probably hurts the colour, and is perhaps the cause of the difference betwixt the Levant madder and that of Lisle, these last being by no means fit for dying cotton, as done in the Levant; besides, in these kilns the workman cannot properly regulate his fire: these defects might be removed by making the middle close, and terminating it in a tube of cast or hammered iron, to carry off the smoke; the floor, supported by iron bars, might very well be dispensed with, and instead of it one of wood, lattice, wicker-ward, or iron wire, would do; for the funnel once properly secured, there will be no danger of fire. In order to enable every one to vary the construction of these kilns, we shall add some reflections and observations made with great care by M. de la Levrie, who superintended the building of the two kilns at Corbeil.

Remarks on the Kiln used at Lisle.

It will not be amiss to begin by relating the experiments made with two kilns, built one after the other at Corbeil, to dry madder, as thereby the advantages of that, herein after proposed, will be more evident.

The first of these kilns was twenty-one feet long, twelve wide, and ten feet high: within-side it was surrounded by three stages of hurdles, like shelves, four feet wide, and twenty inches one from the other: the first stage was five feet from the ground: on these stages the green madder was laid eight inches thick. In the upper floor was a trap-door, which opened to let out the steam of the root. The furnace, which was not without defect, went three feet within the kiln: it was supplied with fuel from without: within-side it was furnished with metal tubes, which passed through the fire: these tubes received at one end the outward air, which they discharged within, very hot, by an aperture two feet from the ground. The effect produced from this kiln was as follows: the three stages, being filled with roots, those on the upper stage became dry enough to send to the mill. It is true, they dried but slowly, because the steam, which proceeded, though in no great quantity, from the two lower stages, wetted the under part of the hurdles of the first stage, thereby retarding the work. The heat, which was not powerful enough to raise all the moisture of the madder-root on the lower stages in steam, made them sweat abundantly, so that the under parts of the hurdles were covered with drops of water as big as the finger's end, which fell from the second shelf on the first, where they wetted the root; and from the first shelf they fell to the ground. On the upper shelf were very few of these drops of water, except for a very small space of time after the kiln had fresh roots put into it, because at the upper part of the kiln the heat was powerful, and regularly dispersed, whilst at the bottom it was cold. At each stage was fixed one of M. de Reaumur's thermometers: after four days continual fire the lowest scarcely rose to eighteen degrees; the second, somewhat higher: and the uppermost never passed eighteen degrees, which is thought sufficient, when the drying is not retarded by any steam from below. When the dried root was carried to the mill, the root from the second stage, which had lost part of its moisture, was removed to the third, and that of the first stage, still wet, was laid on the second, the first stage being filled with fresh roots. The lowest thermometer then fell to fourteen degrees, and the uppermost to Zero: this induced them to dry all the roots that were at once put into the kiln, before they admitted any fresh; yet even in this method it was necessary to move the roots from the lower to the upper stages, where the last laying dried faster than the others. As this work was tedious and troublesome, it was

determined to take down this kiln and build a new one, now in use.

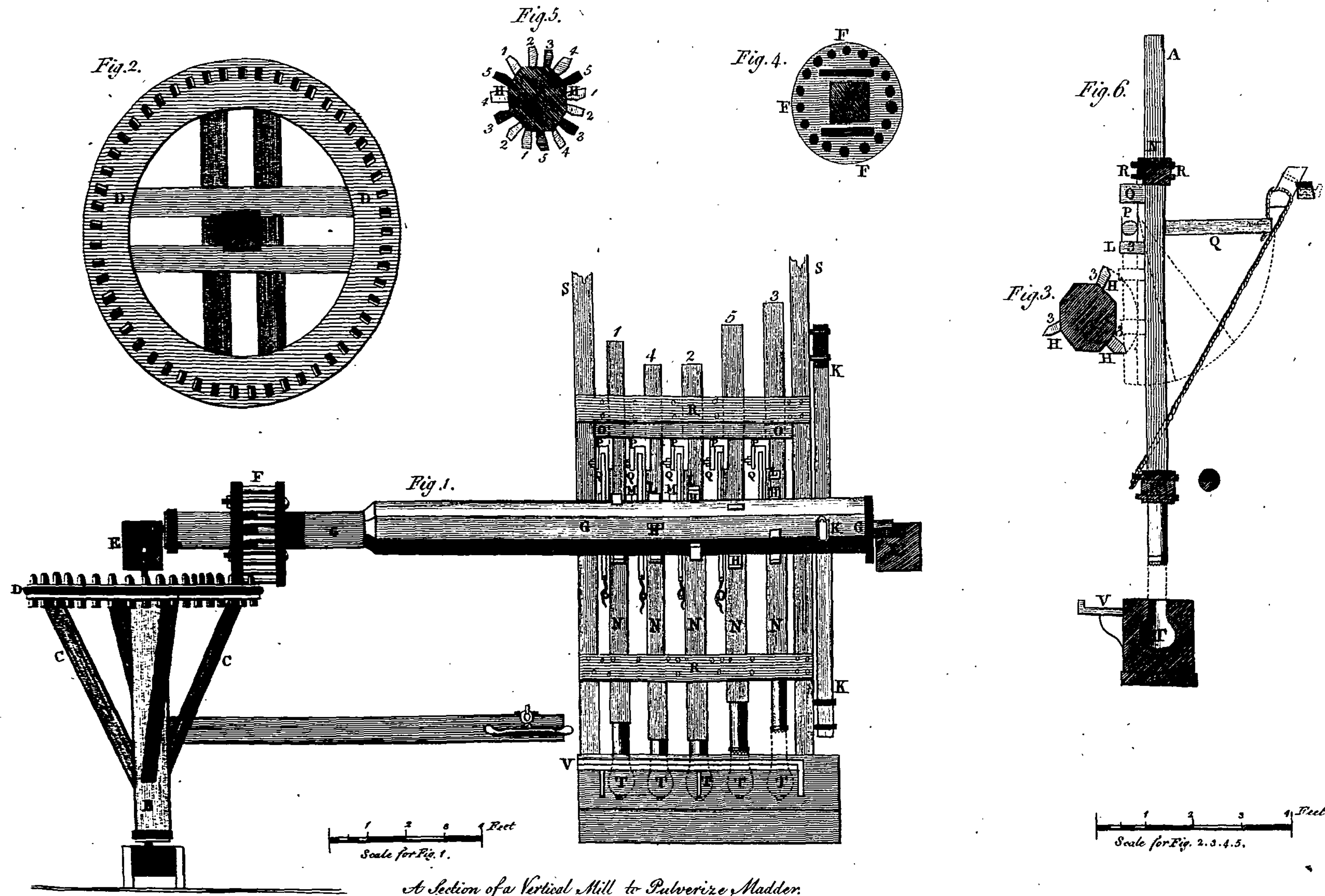
The second kiln is of the same length and breadth as the first; but the hurdles on which the madder is put are raised only six feet from the ground, and the apertures of the furnace, which supply the hot air, are level with the ground: they, besides, continued to avail themselves of the mistaken advantage of encreasing the furnace to contain more roots, by making, as in the first, three stages of shelves. The roots indeed dry in it faster, because the furnace yields more heat; but this heat is very unequally dispersed at the different heights, and in the different parts of the length of the kiln; because the same inconveniences still subsist, as they have made in it, like the other, three stages one above the other, and they have formed the kiln long, without letting the furnace extend through its whole length. They have besides placed the first stage too near the fire; but this may be remedied by taking it entirely away, and using only the uppermost stage, which is fifteen feet from the bottom of the kiln, and may extend over the whole of it: the heat will then be more regularly dispersed. The roots may be laid fifteen or eighteen inches thick, and may be much easier attended to than on the shelves, which occasion a great deal of trouble: there might also be two furnaces, one at each end of the kiln, and the tubes might be carried over the whole length of it.

From what has been said, we may conclude, that to dry a plant like this, which contains a great deal of moisture, no advantage can result from having a kiln with three stages, one hurting the other; since the heat tending always upwards, the roots must be moved higher, which cannot be done without trouble, loss of time, and expence; whereas, the same quantity may be dried in less time on a floor raised eighteen or twenty feet above the furnace.

It is certain that a peasant, who raises madder after a proper method, will always be a greater gainer than such as are obliged to hire day-labourers. But the peasant can not go to the expence either of a kiln, or a mill: it must be planters who raise large quantities of it, and can afford the expence, that have them: thus it is to be presumed, the peasants will be under the necessity either of selling their roots green to the dyers, or taking them up in the spring to dry them in the sun, or drying them in their ovens, when they have only a small quantity; or, finally, of carrying their roots to the kiln, as they do their grapes to the press.

The Lisle kiln, though built on a good principle, is too expensive for a young planter. There must be strong walls to support the arches, internal abutments, and bricks to build the arches with. In some provinces there is not a workman capable of turning an arch in brick-work. The floor requires many large iron bars. On the other hand, a kiln in the form of an oblong square, like that at Corbeil, will never heat equally in its whole extent, unless tubes be made to convey the smoke through various parts of the kiln, before it reaches the chimney, or there is a furnace at the end. All this is expensive, and subject to inconveniences.

Perhaps then a kiln somewhat resembling a malt-kiln would do; and this might any where be built at a small expence: such a kiln need not be above eighteen feet square, and eighteen or twenty-feet high from the ground to the floor. Underneath the floor should be a reversed pyramid somewhat obtuse at bottom, to receive the funnel and tubes that are to give the supply of hot air: this may be made with quarter-stuff covered with lath and plaster. This kiln does not require any large furnace. The new kiln at Corbeil is much larger, taken from the second stage to the bottom; yet has the heat been brought there to upwards of forty-five degrees. The floor of the kiln is to be made with joists eight inches by four, covered with laths, grating, or with hurdles as at Corbeil, where it has already lasted seven or eight years: there must be walls to support the roof and beams, and it should have two windows: there should be a plaster-floor eight or nine feet above the grating, with one or more trap-doors, as they let out the steam much better than the windows: lastly, the beams should be plastered. There is reason to think that such a kiln would cost little, and answer the intended purpose. It should have been observed, that over the grated floor should be had a large thin cloth, or rather a hair-cloth, rising round the edges, and fastened with nails:



this is particularly useful when small roots are dried, as it prevents their falling through. A foot above the roots may be put wooden traverses, over which may be laid straw-mats quilted on cloth: this will keep down the steam, and may be of great service, as has been already observed.

The Furnace of this Kiln.

The furnaces of the Lisle and Zeeland kilns are certainly neither of them proper for drying madder, any more than those of the malt-kilns: they have all the same defect, as they fill the kiln with smoke, which damages the roots. It was this inconvenience induced us to endeavour to contrive one that would give a great deal of heat without the above defect. This may be probably effected, by not letting the funnel be perforated, and carrying tubes from it which should run under the madder before the smoke was discharged; and by having other tubes run near the fire, to circulate in the kiln a warm air, which they should receive from without. We have made the trial of such a furnace, and confess it did not yield sufficient heat: the furnace should certainly have been made larger, but the expence is a continual objection, which, besides being considerable, is pure loss to one that makes experiments for the public good, without being in a situation of reaping any profit from them. We shall close then what we have to say on madder-kilns, by concluding, that malt-kilns seem well adapted to the purpose; but some method must be found to prevent the smoke damaging the roots.

Madder well dried and cleaned may be sold in that state to the dyers: but if it is to be pulverised, there will be occasion for a mill, which we shall now describe.

Description of a Mill, at Lisle in Flanders, for pulverising Madder.

Plate XIX. fig. 1. represents the part of a madder-mill; it is insulated, and covered only by a slight thatch. The figures 2, 3, 4, 5, and 6; are supplementary to the first: we must have recourse to them in our explanation of the parts of the mill; they are therefore distinguished by the same letters, and each piece is represented apart.

A is a lever, or pole, nine feet eight inches long, and six inches by four in magnitude. B, the axis of the wheel, six feet four inches six lines high, and nine or ten inches diameter. C, stays or knees, four feet six inches long, and four or five inches square. D, the cogged wheel, three feet one inch six lines semi-diameter, and furnished with fifty-seven cogs.

The fellies, or circumference of this wheel, must be eight inches by four large: they are secured by an iron hoop. The traverses are six inches by four thick, pinned and keyed. The cogs are made of apple-tree wood, and project three inches three lines: they are two inches and a half by two at their insertion, and two inches and a half by one at top: and beneath the wheel they are two inches long, and one and a half square: they act on the rounds of the trundle head about an inch and a half of their length. The pins that fasten them are also apple-tree wood.

E is a beam twelve inches square. F, the trundle head, thirteen inches semi-diameter, furnished with eighteen rounds, each a foot long, and two inches diameter; the ends of this trundle head are two inches and a half thick, and hooped with iron. There are also two iron bars pinned on to secure the joints of the wood.

G is another axle-tree, or turning beam, eighteen feet six inches six lines long, ten inches square near the trundle-head, and fourteen inches diameter in its octagonal part. H, lifters four inches nine lines long, five inches broad, two inches and a half thick. Hence it is apparent, that there are fifteen lifters inserted into the axle-tree, to serve five beetles; that is, three to each. For this reason the lifters, the catches, and the pestles, are distinguished by the same figure.

K, flyers four feet five inches long, and four inches square: they are loaded with lead at their ends. L, catches, which answers to the lifters, H: they project five inches nine lines, and are five inches broad, and two a half thick.

M, other catches inserted into the sides, or thickness of the beetles, N, and answer to the leavers. Q, N, beetles ten feet four inches long, and four inches square. They are round at the ends next the mortars, and shod

with an iron foot four inches diameter, which may be seen in figure 6. The beetles are numbered in this manner, 1, 4, 2, 5, 3, (fig. 1.) to shew the order in which they play when the machine is in motion. O, cross-bars six inches by four, which support the joints, P.

P, joints eight inches long, six wide, and four thick. An iron pin, keyed, passes through each joint, and supports a moveable lever, Q, which acts on the catch, M, when the pestle, N, is to be kept up. Q, levers, two feet three inches six lines long, three inches thick, by four wide.

R, keeps, six or eight inches wide, to prevent the beetles from being disordered. S, an upright post four inches square, in which the cross-bars and keeps are inserted. T, mortars cut in a single piece of wood sixteen inches square: they are eleven inches deep, and their greatest diameter is seven inches: the bottom is lined with lead three or four lines thick.

V, a trough to prevent waste, over which hangs a cloth, fastened above to the keep, whilst the mill is at work.

X, a beam twelve inches square; this beam, and that at the other end, marked E, rest on the timber work that supports the roof. The sockets and pivots may be so well comprehended by the plate, that letters of reference were thought unnecessary; the sockets are brass, the pivots steel.

We have purposely omitted giving the dimensions of every part to avoid confusion: but the machine may be easily constructed by attending to the description we have given, which is very exact.

But though the mill described above, is now actually employed in grinding or pulverising madder at Lisle; yet it labours under several imperfections which we shall endeavour to point out, and describe a mill constructed in a more perfect manner.

There will be, however, no occasion to describe the wheel-work of this mill, it being the same as that of Lisle: it will be sufficient to give the proportion of the parts which compose it. The pole, or lever, from the centre of the axis of the cogged wheel to the part where the links of the spring-tree bar are fastened, is nine feet long; the wheel is five feet semi-diameter, and has seventy-two cogs; the trundle head is ten inches semi-diameter to the centre of the rounds, and has twelve rounds; thus it makes six turns to one of the wheel. The horse, going three feet in a second, makes three rounds and a half in a minute, and the trundle-head twenty. The axle-tree having on its circumference three lifters to every beetle, each beetle makes six strokes in a minute, and the four two hundred and forty in the same space. The square part of the axle-tree, on which the trundle head is fixed, is made out of a piece of wood five inches semi-diameter; the other part of the axle-tree is larger, being seven inches semi-diameter. It is necessary it should be so large, that the tenons of the lifters may have a proper length and thickness: it is much better to be round than octagon, or any other faced form, as the mortises may be more regularly made. From the end of the lifters to the centre of the axle-tree is twelve inches; so that in their motion they form a circle two feet diameter: the upper face of these lifters is cut in a curve, the radii of which are tangents to the circumference of the above-mentioned circle; the largest of these tangents is twelve inches, and determines the greatest rise of the beetles. By the lifters being thus curved, the resistance is equal, at whatever height the beetles may be, as they are always in contact with the lifters at the same distance from their center of gravity. As there are on the length of the axle-tree twelve lifters in four parts, they form, one with the other, angles of thirty degrees, supposing them to be seen one behind the other, as inserted on the same plane; on this account, when the first beetle is raised to half its height, the second is about to rise; the first quitting the lifter, the third is on the point of rising, &c. We say, on the point, because we are to observe that the lifters go under the catches, or under that which supplies their place, five or six lines; and that the greatest tangent of the curve, being twelve inches, is less, by near seven lines, than the sixth part of the circumference of the circle, and give the first beetle time to quit the lifter before the third rises: this is necessary, that the power may never have more than two beetles to act upon.

The front of the frame-work is that side before which the axle-tree turns. The frame-work consists of two beams, ten feet long, and eight inches square; betwixt them, at each end, is a traverse quarter, six inches by four.

In the middle of the length and width of the beams, rise two uprights, which are mortised and pinned: they are twelve feet eight inches high without their tenons, fourteen inches wide, and six inches thick, supported by a brace mortised into the front at the height of two feet, at the back part four feet and a half. Betwixt these two uprights is the block on which the beetles fall: it is made of a piece of dry tough elm, four feet and a half long betwixt the upright, to which it is joined by a dove-tail two inches thick, and as much deep: it is twenty inches high, and eighteen broad: it rests the whole breadth of its ends on the edge of the beams, and betwixt them, on three pieces of wood, at equal distances, that lie on the brick-work, which supports the whole. The block is divided cross-ways, by a partition two inches thick, parallel with the uprights, and of the same breadth, fixed into the block by two tenons, and in a groove wide enough to receive its whole thickness; the same is observed in the back part of the first keep, which is fixed: the upper end is in like manner fixed to the upper keep: this partition divides the block cross-ways into two troughs, each twenty inches long, formed by two sloping planks; so that the troughs are four inches and a half wide at the bottom within, eleven inches and a half at the top, and twelve inches perpendicularly high: and to prevent the loss of the light dust that rises in the work, the space betwixt the edge of the trough and the first keep is boarded up; the boards at the back part, as well as the sides of the troughs there, are fastened with grooves and dove-tails in the uprights and partition; those before lift up in a groove like a sash, and are fastened by turn buckles; the fronts of the troughs take entirely off; the pulverised root is taken out with a wooden spoon, and a feather broom, and they let it fall on a shelf before, which has a ledge four inches high: the fronts of the troughs are then put on again, and are filled with branch-madder; the sliding shutters are pulled down, and the pestles are set at liberty to work, which had before been stopped whilst the troughs were emptied; this takes but little time in doing, and the mill continues going during the time they gather up the root, and bolt or sift it. There are two keeps, which serve to direct the beetles; the under part of the first is three feet, and the under part of the second ten feet: above the block they are three inches and a half thick; the first is made level in the front with the back of the groove, that the sliding shutters may rest on it when they are raised. Each keep consists of two parts; those at the back are let into the uprights and pinned to them, and strongly fastened to the partition; those in the front are made to take down, and put up, as occasion serves; they slide in the grooves of the uprights, and those that run along the middle of the partition: they have, besides, two pins, by which they are kept in their places.

The beetles are at the lower parts twelve inches wide, eighteen inches high, and four inches thick; so that their face or bottom contains forty-eight square inches: the upper part or stock of each pestle, is eight feet and a half long, four inches wide, and three thick; so that in the whole, they are ten feet long, without comprising the cutters, which are four inches long, and formed like a carpenter's chisel; the blades of them are two inches and a half wide, and the tongues three inches and a half long: there are seventeen to each beetle. There are no catches, because the lifters being in contact with their extremity, always at the same distance, five inches from the centre of gravity of the beetles, the resistance occasioned by the friction of the stocks in the keeps, would have been very considerable. To avoid this inconvenience, a mortise twenty-five inches long, and three inches wide, is made in the face of the stocks of the pestles, strengthened on the sides by cheeks two inches thick. The upper parts of these mortises are six feet above the block; that is, on a level with the centre of the axle-tree; this part is lined with a plate of copper, strongly screwed, well polished, and rounded at the edge, to facilitate the fall of the beetles. On the side of the beetle-stock, sixteen inches below the upper keep, are fixed catches a full inch thick, two inches high, and projecting four inches, to keep the beetles up while the troughs are emptying.

The levers, which serve for this purpose, are placed behind, and rest on shoulders fixed on a piece of wood, which bears by its two ends on two brackets, mortised and pinned into the two uprights, and supported by braces: these pieces are six inches square. The levers are made

of quarter-stuff, six inches and a half square, as well as the lifters of the axle-tree. The upper face of the shortest arm of the lever is rounded like the lifters, in a curve described by the original circle, the radius of which is the space from the middle of the catch to the centre of motion of the lever, which should be parallel to the bottom of the catch. The radius of this circle, as well as the greatest of the curve, should be fifteen inches; that the beetle, being raised thirteen or fourteen inches, may not slip off. That the levers may be stronger, the wood must not be cross-grained; and in the centre of motion, it should be traversed by a square iron bar projecting two inches on each side; these projections, being rounded into pivots, rest on the shoulders of brass sockets. A cord is fastened to the shortest arm, and the end of it is fastened occasionally to wooden pins at the back of the block, to keep the levers somewhat lower than the catches, whilst the beetles are at work. The longest arm lessens by degrees towards the end, till it is reduced to a square; at this part is fixed another cord, which is fastened to the same wooden pins, when the beetles are to be kept up. The above description, with figures on the copper-plate, will be sufficient for an ingenious mechanic to construct a mill of this kind, which will doubtless be of great advantage to this kingdom, as considerable quantities of madder are now planted, and some of it fit for use.

R E M A R K S.

The beetles of this mill weigh only one hundred pounds with their mounting; perhaps a few pounds more, which may be abstracted by taking off a few inches of the lower part: there are never more than two beetles raised at a time, and one hundred and thirty-three pounds and a half for the power to act upon. A middle sized horse is generally reckoned able to apply one hundred and eighty pounds of his strength to move a machine, working for four hours together, and going three thousand six hundred yards in an hour: he often goes faster, but so was this mill calculated: there remains then forty-six pounds and two thirds for the action, which is more than it amounts to in this machine: we may even venture to assert, that the friction of it is less than any other mill of the kind. A horse may bear this work the better, as every five or six minutes there are two or three minutes respite to empty the troughs and give them a fresh supply. This mill at Corbeil never pulverised above two hundred pounds of roots a day, because that was all the kiln could supply it with; but the time in which this work was done, induces us to think it could easily pulverise four hundred and eighty, or five hundred pounds. They say that the Lisle mill can pulverise five hundred pounds in twenty hours: we scarcely believe it, especially as we imagine it does not work in the night: thus we must suppose it really works only ten hours, like that at Corbeil. Be it as it may, the work of these mills should be calculated by the weight of their beetles, the number of blows they strike in a minute, and the superficies of their bases; that is, the Corbeil mill is to that of Lisle, as four hundred pounds, the weight of the four beetles multiplied by two hundred and forty, the number of blows they strike in a minute, and the product by one hundred and ninety-two, the superficies of the bases of the four beetles, is to three hundred and eighty-five, the weight of the five beetles, multiplied by one hundred forty-two and a half, the number of blows they strike in a minute, and the product by sixty-three, the superficies of the bases of the five beetles; or, after the numbers are reduced, is as sixteen to three; by which it appears, that if the Corbeil mill pulverises five hundred pounds in twelve hours, that of Lisle should pulverise no more than one hundred.

The indifference they discover in Flanders, with respect to the situation of the kilns and mills, is worthy of blame: they are, it is said, in separate buildings, which have no communication; nothing can be more inconvenient. It is well known at Corbeil, that the root, which they some time ago pulverised in a little hand mill, fixed in a barn, ten or eleven yards from the kiln, which had no influence to warm it, grew damp, and clogged under the cutters, by which it was much damaged. This work is always done in winter, and it is scarcely possible it should be otherwise: the fogs must therefore be guarded against.

The kiln we have recommended would contain four thousand pounds weight of green madder, which would yield

yield five hundred pounds of dry root when it had been there forty-eight hours: the mill can pulverise this quantity in a day. If one had a very considerable crop, for instance, four hundred thousand pounds, which would yield fifty thousand pounds of dry root, and this is as much as the mill could turn out in four winter months, working every day, it would be necessary to have two kilns. The buildings to contain the kilns and mill might be disposed nearly in the following manner: A building should be erected sixty-three feet long, and twenty-one wide, with a floor twenty or twenty-two feet from the ground, which should be a store room for part of the green root: the under should be occupied by the mill and its frame-work, so that at each end there would be a space of eighteen feet to the walls at the extremities: in the middle of this space the apertures of the furnaces to heat the stoves should be made, which should be so situated that the floors of the kilns should be on a level with that of the store-room: trap-doors might be contrived in the floor of the store-room, to throw the dried roots down; and as they ought to be kept dry till they go to the mill, they may be heaped round the furnace under the reversed pyramids of kilns; for they should be kept dry till they are barrelled up.

On a supposition that the produce of four hundred thousand pounds might be pulverised in the four winter months, some place should be provided to keep it in proper order till the last went to the kiln: it must be spread at most two feet thick, that it may every day be turned. Experience convinces us, that eight cubic feet of green root weigh one hundred pounds. The surface of the granary will give one thousand three hundred and twenty-three square feet, which, divided by four, give three hundred and thirty quintals and a quarter, or thirty-three thousand seventy-five pounds; but this does not come near four hundred thousand pounds. It is presumed, the best would be to erect some large building, four or five stories high, which might altogether contain, at least, twelve times as much as the store-room above-mentioned: but this expence might be saved, if the root could be taken up in small quantities during the autumn, winter, and part of the spring.

Explanation of the Figures at Corbeil Mill.

Fig. 4. Plate XVIII. is the frame-work of the mill seen in the front: fig. 3. is the same frame-work seen endwise, the upright and beam being taken off.

A, beams, eight inches square, seen endwise (fig. 4.) and the length of one of them, which is ten feet (fig. 5.) B, traverse quarters, which are fixed into the beams; the length of one of them is seen (fig. 4.) and the ends of both are seen (fig. 5.) they are six inches by four.

C, a flooring or stage laid on the grooved edge of the beams, and the traverse quarter.

D, uprights fixed to the beams: their thickness may be seen (fig. 4.) the top of one of the uprights only is perceivable (fig. 5.) over the upper keep, N; and the breadth of the bottom is distinguished by two pricked lines on the end of the block which covers it, as the remainder of it is concealed by the middle partition. These uprights are twelve feet eight inches high, six inches thick, fourteen inches broad, as high as the axle-tree, then reduced to ten inches.

E, braces which keep the uprights steady on the beams; those in the front are mortised at the height of two feet, those behind at four and a half: they are six inches by four.

F, the block on which the beetles fall; it is made of elm, four feet and a half long betwixt the uprights, and twenty inches high by eighteen broad: it has at each end a dove-tail two inches thick, and as much deep, which goes into the grooves of the uprights.

G, a shelf, level with the upper part of the block, of the same length, twelve inches wide, two inches thick, and a ledge four inches high: it rests on a groove at the edge of the block, and on the brackets H, fig. 4 and 5.

I, three pieces of wood, which support the block.

K, the brick-work, which is the foundation of the frame-work.

L, a partition which divides the block into two parts: it reaches from the block to the upper keep; it is two inches thick, and the same breadth and shape as the uprights; it has on the front, and two sides next the uprights, grooves which run up till it begins to narrow; there are other similar grooves in the uprights. This par-

tion consists of two parts; the lower part is fixed in a groove of the block, and above with a tenon, and is besides pinned to the back part of the first keep, which is fixed: the upper part is tenoned into the upper part of the keep, and the under part of the second: they go into grooves that cross the whole breadth of the front parts of the keeps, which are moveable.

M, troughs in which the roots are kept: they are four inches and a half wide at bottom, eleven inches and a half at top, and twelve inches perpendicularly: they consist of two boards sloping before and behind (fig. 5.); the space between their edges and the first keep is boarded up. In the front *d*, are sliding shutters. The front of the troughs take off. In fig. 4. is seen one of the troughs open, and the sliding shutter pushed up: two of the beetles are also visible; one quite, the other half raised.

N, are keeps, three inches and a half: their breadth consists of two parts: those behind are entirely fixed to the uprights: they are seven inches broad, notched half the thickness of the stock of the beetles, in the parts where they pass: the other two pieces take off at pleasure, and are notched in the same manner, to give the beetles room to work: they have each of them two keys, or tongues, four inches broad, four long, and one thick, which go into mortises in the fixed part of the keep, between the stocks of the two beetles belonging to each trough, where they are fastened by two large pins, *g*. They slide on the grooves of the uprights: the undermost is six inches broad, that the shutters may slide over it: the uppermost is four inches, consequently it projects an inch: the edges are rounded off. The under part of the first keep is three feet above the block; the under part of the second, ten feet.

O, beetles ten feet high: they are twelve inches broad at bottom, to the height of eighteen inches (fig. 4.) four inches thick (fig. 5.) with a stock eight inches and a half long, and four inches broad, by three thick. At an inch above the first keep, they are left seven inches broad, for thirty-seven or forty-eight inches, to make room for a large mortise, *b*, twenty-four inches long, and three inches wide. The upper part of the mortise is lined with copper, the angle being rounded off. Sixteen inches below the second keep, there are on the sides of the stocks catches, *i*, two inches high, an inch thick, and projecting four inches. The bottoms of the beetles are secured with an iron band, *m*, one inch and a half broad, and four lines thick, and armed with seventeen cutters, *n*. The order in which they are placed may be seen in fig. 7. and the shape of them in fig. 8.

P, (fig. 4.) is a bracket six inches square with its brace, both mortised and pinned into the upright (fig. 5.). There is another on the other upright, not visible in fig. 4.

Q, (fig. 4.) a piece six inches square, fixed to the brackets. The end of it might have been seen in fig. 5. but it was not pointed out, to avoid confusion.

R, shoulders, resting on, and pinned to the piece Q, notched at *o*, to receive the leaves, fig. 4; also at *p*, fig. 5. to receive their pivots.

S, levers which serve to raise the beetles, and keep them up while the troughs are emptied: they rest on shoulders, R, where they play: they are made of a piece of even grained wood six inches broad, and two inches and a half thick: the length of the shortest arm is fifteen inches; that of the longest sixty inches. The center of the point should be on a level with the under part of the catches. At the extremity of the long arm is fastened a cord, *g*, which is fixed to the pins, *r*, in the block, when the beetles are raised thirteen or fourteen inches. Another cord, *s*, is fastened as near as possible to the end of the short arm, which is tied to the same pins *r*, when the beetles are at work.

T, the turning axle-tree, seen endways, fig. 5. and in front, fig. 6. It is round, and fourteen inches diameter. It is furnished with twelve lifters, on four planes, so disposed, that, when it is at work, the lifters answer the mortises, *b*, fig. 4. by which they raise the beetles, without touching the sides: they may all be seen in fig. 5. Those that are on the same plane, are distinguished by the same figures, 1, 2, 3, 4, as well as here in fig. 6. They are made out of pieces of wood, six inches broad, and two inches and a half thick: their tenons, X, fig. 5. are two inches and a half by two, and as long as possible, without touching in the center of the axle-tree. From the center of the axle-tree, to the point of contact of the levers

levers with the mortises, *b*, is twelve inches : this point is five or six inches under the mortises. Great care must be taken, that the tenons of the lifters be not made of cross-grained wood.

V, V, (fig. 7.) the base of a beetle, to explain the manner of placing the cutters, which are represented by black lines, as if only their edges were seen. The prickled lines make the division of the superficies to arrange them.

Y, (fig. 8.) one of the cutters, marked *n*, fig. 4, and 5. The height from the upper part of the shoulder to the edge is four inches ; the tongue three inches and a half ; its largest part half an inch square ; the shoulder about eighteen lines diameter : the edges twenty-seven lines broad ; they should be steeled and short.

The fig. 7. and 8. are drawn by a scale, four times as large as the rest, that their parts might be the better distinguished.

MADS, earth-worms.

MAGGOTS. See SHEEP.

MAIZE, a species of grain so generally used for food in America, that it has obtained the name of Indian corn.

The size of its ears differs, greatly according to the fertility of the soil, and the warmth of the climate in which it is cultivated ; but, at a medium, it is about a span long, and commonly has eight or more rows of grain, each of which usually contains upwards of thirty seeds, of various colours, as red, white, yellow, blue, olive, greenish, blackish, speckled, striped, &c. sometimes in the same field, and the same ear : but the white and yellow are the most common : nor does this diversity of colours ever reach beyond the outside of the grain, the flour of which is always white, with a little tinge of yellow. These seeds, which are as big as large peas, are round at the outer surface, very smooth, and set extremely close, in straight lines. The ear is clothed and armed with several strong thick husks, which defend it not only from unseasonable rains, and the cold of the night ; for it does not ripen fully in some places, till towards the latter end of September ; but also from crows and other birds, which being allured by the sweetness of the grain before it hardens, flock to it in great numbers, suck through the top of the outer covering, and devour as far as they can reach. In the northern colonies, the stalk of this plant, which contain a remarkably sweet pith, and is jointed like a cane, does not grow near so high as in the southern parts. It has long leaves, almost like flags, at every joint, and at the top a bunch of flowers, of various colours, highly pleasing to the eye. The northern Indians, far up in the country, have a species of this grain, called Mohawk's corn, which never grows high, and, though planted in June, ripens in due season. The general time of planting it, is between the middle of March and the beginning of June, or more particularly, from the middle of April to the middle of May.

Mr. Ray was of opinion, that there are only two really distinct species of this plant ; but Mr. Miller is certain there are three, which do not alter by culture, and he enumerates them in the following manner :

"The first of these, with yellow grains, grows naturally in the islands of the West-Indies, and has a very large, strong stalk, which rises to the height of ten or twelve feet. Its leaves have a broad white mid-rib, are long, broad, and hang downward. The male flowers (for maize has both male and female flowers, situated at remote distances on the same plants) come out in branching spikes at the upper part of the stalks, and are from eight to ten inches long. The female flowers come out from the bottom of the leaves on the side of the stalk, and are disposed in a close, long, thick spike, which is covered closely with their leaves : out of the end of this cover hangs a thin long bunch of filaments or threads, which are supposed to convey the *farina fecundans* of the male flowers to the germ of the female. When the seeds of this sort are ripe, the spikes or ears are nine or ten inches long, and sometimes a foot : but these rarely ripen in England.

"The second sort, which has white grains, is cultivated in Italy, Spain, and Portugal. The stalks of this species are slenderer than those of the former, and seldom rise more than six or seven feet high. Its leaves are likewise narrower, are hollowed like the keel of a boat, and their tops hang downward. The spikes of the male flowers of this are shorter than those of the former sort, and the ears or spikes of grain are slenderer, and not more than six or seven

inches long. The grains of this sort do not come to maturity in England, unless the season proves very warm, and they are planted early in a warm soil and situation.

"The third species, which has a yellow and white spike, is cultivated in the northern parts of America, and also in Germany. The stalks of this are slender, and seldom rise more than four feet high. Its leaves are shorter and narrower than those of the two former, are hollowed like the keel of a boat, and their tops hang-down. The spikes of the male flowers of this sort are shorter than those of the others, and the ears, or spikes of grain, are seldom more than four or five inches long. This sort ripens perfectly well in England, in as little time as barley, and therefore may be cultivated here to advantage."

This plant is seldom cultivated in England for use, though it might probably turn to good account, as was lately experienced by a gentleman in Lincolnshire, who planted this corn in an open field, where it ripened perfectly, and yielded an abundant crop ; but very great quantities of it are raised in Asia and Africa, in several parts of France, in Italy, Germany, and North America : its culture in the latter is given in the following manner, by a very worthy and ingenious gentleman of that country, who speaks from his own knowledge :

"The English in North America plough the ground thoroughly before the grain is planted. They seldom, if ever, dung the whole face of the field, but sometimes put a little dung in each hill of corn, if they think the ground requires it. Where fish are plenty, in the planting season, they put two or three small fish into each hill, with the grain.

"In order to plant the corn, they make trenches, or furrows, with a plough, cross these with others of the same distance, which divide the field into squares ; and where the trenches intersect, the grain is put in and covered. Three or four grains are commonly planted for each hill. The intermediate ground is afterwards ploughed at leisure, as the plants grow, and want more loose earth for the roots to spread in. The hills are made at the time of weeding ; some loose earth being then hoed up over the roots, and round the stems or stalks of the corn.

"The corn is planted at different distances in different places. In the northern colonies, the Indian corn grows low, seldom exceeding four or five feet in height ; and the leaves being proportionably small, the plants do not require so much ground as in the southern colonies, where they frequently rise to fourteen or fifteen feet. The space generally allowed for the lowest plants, is three feet, and for the highest five or six. This distance may be more necessary in our manner of cultivating this corn, more ground being required to nourish three or four plants than one ; for I do not know that we ever pluck up any of the plants. An advantage attending this method is, that the labour is less in hilling ; three or four plants being earthed up in the same time as one ; and there is more room for passing between the rows when the corn is to be weeded.

"At the same time that the corn is weeded, the ground is loosened round the plants with a hoe, and the hills are raised and enlarged from time to time, by adding more earth. The morning, before the dew is off, and the evening, are reckoned better for this work than the middle of the day.

"The hilling of the corn, as it grows, has been the universal practice ; the design being to give the plant more nourishment, and to support it better against the winds : but of late, some planters have thought it better to plant in holes : the reason is, that this plant requires a good deal of moisture ; and indeed nature, by the form and position of the leaf, appears to have intended the receiving of the rain that falls around, and conducting it to the stalk, and by that down to the roots : but a hill round the stalk tends to throw the water off to a greater distance ; and as to supporting the plants, they say the hills do not effect it, because, by covering the stalks in that part from the air and sun, which would harden them and strengthen them, the mould around them keeps them soft and tender, and thereby rather weakens them.

"The panicles, or tassels, contain the *farina fecundans* of the plant, and therefore should not be cut off till the grain in the ear is filled. If the tassels of a whole field should be cut off before that time, there would be no grain at all in the ears. This has been proved by experiment.

"In

"In the more southern colonies, where hay is scarce, and the leaves of this corn are very large, they cut them off for fodder: but in the northern colonies, where there is plenty of hay, and the leaves of the corn are small, they generally neglect cutting off the tassels, and stripping off the leaves. They are left on the stalks, and the cattle, being turned into the fields, after the corn is gathered in, eat what they like of them: but they are not esteemed so good as what has been cut in season.

"An easy way of taking the grain out of the ears is to rub them against each other, holding one in each hand.

"When the ears are stript of their husks, they are reckoned in the best state of preservation: much better than when the grain is rubbed off from the ear: for then, they say, insects can get at the soft part of the grain, and eat into it, which they cannot do while the soft part is connected with the cob in the ear, and the hard flinty part of every grain is turned outward, and the grains close to each other.

"To preserve this corn, they make in North-America a sort of bins, or cages, which they call corn-cribs, fifteen or sixteen feet long, and five or six wide, widening upwards to the top a foot or more. They are made of sapling poles, three or four inches diameter, framed roughly together, by notching the ends where they cross the corners, at such a distance from each other, as but just to keep the ears from falling through, that there may be a free passage for the air. These bins stand abroad, and have a slight moveable covering, or thatch to keep out the rain. The Indians bury their corn in holes in the ground, lined with mats and dry leaves.

The manner of using this corn in America, is various. It has this advantage over wheat, that subsistence may be drawn from your corn-fields long before the general harvest: for the green ears roasted, are delicate food; and as the corn ripens and grows harder, the ears boiled are good eating, with butter and salt. When it is ripe, the corn parched and ground into meal, is the hunting and war provisions of the Indians, being light to carry, and affording good nourishment. They mix a little of it with water, and it needs no other cooking, having already passed the fire in the parching. The grain soaked in water, will part with its skin when beat in a large mortar with a wooden pestle: then it is boiled, and eaten with milk. Being pounded coarsely, dry, it is also boiled, and eaten as rice. Bag puddings and baked puddings made of it properly, are very good. The meal is also boiled with water, to make what they call a hasty pudding, which they eat with butter and sugar, or with milk. This hasty pudding, or boiled meal, being mixed with twice as much dry wheat flour, and worked into loaves, makes much better and pleasanter bread than flour alone. All creatures fed with Indian corn have firm and fat flesh: the pork of corn-fed hogs is reckoned the finest in the world for taste and goodness; their fat is milk-white, and as hard as butter. The horses of Virginia and Maryland, whose chief fodder is the leaves and stalks of this corn, are reckoned the hardiest of the species, bearing most labour, and requiring least care, and the people of those countries where it is the common food of men, are healthy, strong, and hardy."

This corn is thought to keep better than wheat, and has frequently been of infinite service in many countries in times of scarcity of other grain; it answers all the purposes of the white pea, of about the size of which its grains are, and would certainly be a better substitute for the poor than bean-flour, or some other sorts, which have been used even in England, where maize may doubtless be cultivated to advantage in light sandy lands, in which beans and peas do not thrive well. It is excellent for feeding poultry, either given whole to the larger sort of fowls, or broken a little for the smaller. The Breseians, in particular, who are remarkable for the fatness of their capons, use a great deal of it for this purpose. The Indians reckon it a good remedy in all acute disorders; and it has been observed, that those people are very little subject to the stone, which some ascribe to their living upon this corn. They extract from its stalks, when green, a sweet syrup, which answers all the ends of sugar; and when the stems are divested of their ears, and dried, they make excellent fences, coverings of sheds, &c.

The Indians, and some English, particularly where the ground is good, and has been well manured with fish,

plant with the maize, in every corn-hill, a kind of French beans, which run up the stem of the corn; and are supported by it: others plant potatoes, gourds, or pumpkins, and others again sow turnips; in the intermediate spaces between the hills.

Some curious persons, by way of experiment, have planted seeds of only one colour in the same field; without any other coloured seeds near them; and their produce has been entirely of the same colour: but when the rows have been planted alternately with grains of different colours, they have interchanged, and produced a mixture of all the sorts in the same row, and frequently, as was said before, on one and the same spike. It is even affirmed, that they will mix with each other at the distance of four or five rods, if no tall fence or building stands between; so as to intercept their communication.

Mr. Miller, who mentions this, very rightly recommends the horse-hoeing husbandry; as, in all respects fittest for the culture of maize; and gives the following as a method in which it has succeeded beyond expectation:

The land, which was very light and sandy, and far from being rich, was ploughed deep before winter, and laid up in high ridges till the spring, when it was broken fine with the harrow. It was ploughed again in April, laid level, harrowed smooth, and then sowed in drills four feet asunder, into which the seeds were dropped at the distance of about eight or nine inches from each other. When the plants were about three inches high, they were thinned with a hand-hoe, by cutting up some of them where they grew too close, and the intervals between the rows were ploughed shallow, to destroy the young weeds: but when the stems were advanced, the ground in the intervals was ploughed deep, and the earth laid up to the plants on both sides; and when the weeds began to grow again, a third ploughing was given, to destroy them. This kept the ground pretty clean from weeds till the corn was ripe; as the season did not prove wet; for otherwise a fourth ploughing would have been necessary. Each of the stalks of these plants produced from three to six spikes of grain.

Sir Richard Bulkeley, who planted some of this corn in Ireland, from seed which grew in Brandenburg, had, from each of his grains, which were set a foot asunder in rows about a yard distant from each other, from three to six stems, and upon each stem three spikes or ears of corn, with two hundred and forty grains in each spike. An amazing increase!

Some good husbandmen in France have cultivated this grain upon nearly the same principles as those which Mr. Miller points out: The little differences in their methods may not be uninteresting: for which reason we shall here give the substance of M. Duhamel's account of their management of this corn:

"Maize thrives better in a light and sandy soil, than in stiff and clayey land. It cannot do without dung; and the ground intended for it should receive two good ploughings in March. A third ploughing, which is given towards the end of April, makes the furrows for the seed; and what clods remain after this, are broken by hand, furrows then preventing the use of a harrow.

"A fine clear day is chosen in May, to sow the seed, which is done by making at the bottom of the furrows, with a stick or other instrument, small holes, into each of which two grains of maize are dropped. The furrows are a foot and a half asunder; and the holes at the same distance from each other, are disposed in such manner that they form a kind of quincunx.

"When the corn is risen, the weakest of the two plants is plucked up, where both seeds have sprung; and where neither of them had grown, two new grains are planted.

"Towards the middle of June, the ground is hand-hoed round each plant; and as they stand in the bottom of a furrow, the mould which crumbles down, from time to time, lays fresh earth to their roots, and helps to support them. About the end of July, a slight hoeing is given them, which is the last; and in so doing the earth is laid towards the roots of the plants.

"The panicles of the male flowers, which grow at the top of each plant, and are well known not to contain any grain, are cut off about the middle of August. But care must be taken that the grain be impregnated before they are cut off; which may be known by the then turgid appearance

pearance of the outward covering of the ears : nor should the panicles be cut off from all the plants at the same time ; because some of the ears are not impregnated till a fortnight after others. These panicles are excellent food for cattle. When they are cut, or shortly after, all the leaves are stripped off the stalks, together with all the blighted and smutty ears : for it is said that the good ears would not grow so large, nor the grains be so well nourished, if they should be left upon the stalks. All these leaves and ears are given as fodder to oxen ; and it is remarkable, that those creatures are fonder of the smutty ears than of all the rest.

" The time for reaping maize is towards the end of September. The ears are then gathered by hand, and put into baskets, in which they are carried and laid in heaps from space to space in the field ; after which they are loaded in carts, carried home, and spread upon an even floor prepared for that purpose. They are then taken out of their sheath or hood, and dried in the sun before they are laid up in the granary ; or else the grain is taken out at that time. Maize which has been well dried in the sun will keep several years, and not be the less fit for sowing. The granary should be very dry, and the corn laid up in it should be turned at least every three months, to prevent its growing musty, or being attacked by insects.

" There are two ways of taking out the grain. The first, which is the most expeditious, is by threshing it with a flail : but in this method a great deal of the corn is broken or bruised. The second, and more common, is by rubbing the ears hard against the edge of a flat piece of iron. This easily separates the grains from the spike, or cob, without hurting them, and this remainder of the ear is very good food for oxen.

" As soon as the ears are gathered, the stalks remaining in the ground are plucked up, and laid by for winter fodder, for oxen. The field is afterwards ploughed up as soon as possible ; it being the general opinion of farmers, that the roots of the maize would otherwise continue to suck up the rich particles of the earth. Whether this be true, or not, their notion is, that if this ploughing should be deferred, the next year's crop would certainly suffer by it.

" When maize is planted only for fodder, particularly of cows and oxen, it is sowed very thick, and harrowed in, or covered with a rake, in a good soil, which has been ploughed twice, and well dunged : but it is observed, that in these thick sowings, all the female flowers are barren, and produce no grain : and it likewise is so great an impoverisher of land, that though the ground be dunged every time it is planted, wheat never does so well where this corn has grown, as in the neighbouring fields where it never was."

M. Aimen, M. D. in the province of Guyenne, where great quantities of this corn are raised, observes to M. Duhamel, 1. That it is important to sow maize rather in the beginning than at the latter end of May ; because, if it is sowed early, the plants will have acquired sufficient strength before the great heats, to shoot out then with vigour : nor will their ears be burnt, or liable to that barrenness to which they are subject when this corn is sowed late ; besides which, the stalks will be stronger, and their ears larger, and fuller of grain. 2. That the ears of maize are greatly hurt by cutting the panicles too late ; and that they ought to be cut before the hoods are open. By leaving a plant with its male flowers at every twenty feet distance, all the female ears will be impregnated.

In two different, but successive years, this gentleman singled out two rows of maize, the plants of which seemed to him equally strong. He cut off the panicles of the male flowers of all the plants in the first row, before their hoods opened, and let the panicles of the other row remain till the usual time of performing this operation : the consequence was, that the female ears of the first row were much the largest, and the best filled with grain.

He likewise sowed a row of maize at a distance from any other field planted with that corn, and cut off the panicles of that row before the hoods were opened ; leaving only one plant with its male flowers at every twenty feet distance. At harvest he observed, 1. That all the female ears of all the plants were impregnated. 2. That the female ears of the plants which had lost their male panicles early, were thicker, longer, and fuller of corn than any others. 3. That the female ears of the plants whose

panicles had been cut late, were smaller and shorter ; and that in some parts of them the grains were abortive.

To satisfy himself whether it be best to sow maize thick, or thin, he planted three different spots of ground with this corn, on the third of April, 1753. The seed used for the first, where the grains were placed about a foot and a half asunder, according to the common practice of the country, in which experience had instructed the husbandman, weighed one ounce and one penny-weight : the second in which the grains were only a foot asunder, was sowed with two ounces and two penny-weights of seed : and the third, in which they were but six inches apart, was sowed with four ounces and a half. The first of these spots produced eighteen pounds and four ounces of grain : the second fifteen pounds seven ounces : and the third, eleven pounds two ounces. A manifest proof, as M. Duhamel observes, that some sorts of grain will not thrive unless they are sown very thin ; and that, for want of this precaution, a great deal of corn is often lost, and the crops are considerably diminished.

As maize is a large plant, and requires much nourishment, it would certainly be right to try the culture of it with the horse-hoe : to this end, it will be proper to plant the rows two feet asunder, and the grains in them twelve or fourteen inches apart. All the necessary hoeings may then be given with the cultivator drawn by one horse ; and I believe, with Mr. Miller, M. Aimen, and M. Duhamel, that the corn will thrive the better for it, and the land be afterwards fitted for other grain. It is worth the while of those who live in the countries where maize is cultivated, to try what will be the effect of this method.

MALANDERS, cracks in the bend of a horse's knee, that discharge a sharp indigested matter ; they are often the occasion of lameness, stiffness, and the horse's tumbling.

This distemper is cured by washing the parts with a lather of soap warmed, or old chamber-lye ; and then applying over the cracks a strong mercurial ointment spread on tow, with which they should be dressed, night and morning, till all the scabs fall off : if this should not succeed, anoint them night and morning with a little of the following, and apply the above ointment over it :

Take of Æthiops mineral half an ounce ; white vitriol one dram ; soft green soap six ounces : anoint with this often, but first clip away the hair, and clear the scabs. On their drying up, it may be proper to give a gentle purge or two ; or the nitre-balls may be taken advantageously for a fortnight or three weeks. *Bartlett's Farriery.*

MALT, is barley prepared, to fit it for making a potable liquor called beer, or ale, by stopping it short in the beginning of vegetation.

It is said, that the soil on which barley grows makes a considerable difference in the grain, and that the barley fittest for malt is that which grows on a rich, light, or gravelly soil, and which has been raised from seed brought from a farm yard of a different soil and situation. The fullest and largest grains of such a crop should be chosen for making malt. It should be heavy, and perfectly sound, and such as has not suffered any accident in the field. Its being a little heated in the mow, is by some reckoned an advantage, because the grain will be the more equally dried, and will consequently the more equally imbibe water. If it has been so much mow-burnt as to look blackish when broken at the root end, or, as Mr. Combrune says, if it has suffered a heat of 120 degrees, it is unfit to make good malt. It is also found by experience, that barley taken immediately from the field does not malt so kindly as that which has been some time in the house, or mow. Special care should be taken that it be free from the seeds of weeds ; for these, in the malting, are apt to give the grain a bad taste, which cannot be afterwards got rid of.

By germination, all the principles of barley are put in action. The heat which it undergoes in malting separates and divides its parts ; and the viscosity which it before possessed, is removed by the looser texture of its oils, and their intimate union with the salt, which gives

gives malt the sweetish taste that distinguishes it from barley.

In order to its being malted, the barley is put into a cistern lined with lead or stone, and covered with water about six inches deep above the barley, to give room for its swelling. All the good grain will sink in the water; but, after stirring it, the imperfect, or distempered grains, will rise to the surface. These should be skimmed off, and given to poultry, or hogs, for they will never make good malt. By the water's gaining admittance into the barley, a great quantity of the air is expelled; as appears from the number of bubbles which rise on the surface.

The barley is left in the water two or three days, more or less, in proportion to the heat of the weather and the dryness of the barley. A judgment is formed that grain is fully saturated with water, from its appearing turgid, and easily giving way to an iron rod dropped perpendicularly into it. Or, take a corn from the middle of the cistern, and hold it steadily, by the two ends, between the forefinger and thumb: press it gently, and if it continues firm when so pressed, and the skin does not break, it must soak longer: if it crushes together and feels mellow, and the skin crack, it is watered enough. Nicety in this is a material point, and can be learnt only by experience. If the grain should be suffered to remain too long in the water, it would begin to lose part of its sweetness. When it has been steeped sufficiently, the water is drawn off.

The water used for this purpose should be that of a clear running stream, or rain-water; or, if such cannot be had, pond-water, provided it be sweet and clean, will do very well; or pump-water, which should be rendered soft, if it be naturally hard. If the water made use of is any way tainted, it communicates to the malt a taste which it never loses. Mr. Combrune advises the adding of lime to the water in which the barley is steeped; but this seems to be improper, because it appears from Dr. Home's experiments that lime renders water hard.

From the cistern, the barley is laid in a regular heap, or couch, where it must remain thirty hours, or till it contracts a heat. It must then be worked in one or more heaps, and turned every four, six, or eight hours, according as the weather is cold or hot. When it begins to spire, it should be turned every three or four hours, according to the temperature of the air; and as it comes (for so its spiring is commonly termed) the heap must be spread thinner to cool it, lest it be heated too much, and the germination be carried on too fast, by which the oils would be too much consumed. The turning of it must be continued in proportion as it is more or less slow in growth, so that it may be brought tolerably dry to the skin. When the roots begin to deaden, the couch must be thickened again, and often turned, that the growth of the roots may not revive. At this time, the spire should be near piercing through the outer skin of the barley: for if it grows quite out, the strength of the malt will be too much consumed. After the malt is made thus far, the common practice is to lay it at once on the kiln: but the best way is to gather it all up in one heap, to let it lie in that state twelve hours, and then to turn it every fourth hour, during the space of twenty-four hours.

No person should be suffered to tread on the malt with their shoes, while it is on the floor; because many grains are inevitably bruised thereby, and these, vegetating no longer, afford the roots of the other grains a substance into which they extend their fibres, and are by that means entangled in bunches; and besides this, the bruised corn acquires a degree of putrefaction which taints the liquor made of the malt intermixed therewith. Equal care should also be taken, that the grain be not bruised by any other means.

Mr. Combrune thinks, that the time most proper for malting is when the temperature of the air is such that barley begins naturally to germinate, at which season the thermometer marks from between thirty-two feet to forty degrees. How far that time may be extended, experience alone can determine. The warmer the weather is, the greater must be the disadvantage under which the maltster labours; because the motion of the fluids is then so strong, that the process goes on too quick, and the finer parts are apt to fly off; the consequences of which is, that instead of a sweet, the malt inclines to a bitter taste, the oils being turned rancid. This is so universally experienced, that brewers carefully avoid purchasing what is termed latter made malt.

The grain thus prepared for drying is spread on the kiln; where, meeting with a heat greater than is suited to vegetation, its farther growth is stopped. It is spread on the kiln three or four inches thick, and turned every three or four hours. The laying of it thicker is attended with inconveniences, among which is particularly its being unequally dried; and therefore that should be avoided. The strength and duration of the fire is different, according as the malt is intended to be dried, pale, amber, or brown. The pale malt requires more leisure, and less fire, than the amber or brown.

Pale and amber malt are dried with coke or culm; which not emitting any smoke, give the malt a brighter colour; and do not communicate that bad relish which malt has when dried with wood, straw, &c. the smoke of which taints it. Coke is best, because its fire gives a steady and constant heat, whereby the malt is dried uniformly. If wood, or any vegetable fuel is used, it should be extremely well dried, in order that, being as free as possible from moisture, it may yield the less smoke.

The size of the malt-kiln is generally proportioned to the quantity of malt for which it is intended. Some build their kiln square, and others make it round; but this last is undoubtedly the best form, because the heat of the fire is more equally diffused therein, and the grain is of course more equally dried. Various substances have been made use of for covering the kiln, such as tiles, plates of tin; and wire: of these, the wire is to be preferred, because it does not contract so great a degree of heat as to parch the grain in contact with it: but, for this very reason, hair-cloth is preferable to any other covering; because when any part of the malt is in immediate contact with a substance much more solid than itself, and therefore capable of receiving a proportionably greater degree of heat, the malt in contact with that heated body is parched or burnt, by heat which is not equally diffused through the whole mass; which mass cannot therefore be all equally heated. The hair-cloth is spread upon small wooden rafters, and these are supported by bars of iron laid across the kiln.

An ingenious and attentive maltster marked the degree of heat in the malt whilst on the floor; and the result of his observations in this respect is as follows: During the first ten days that the malt was on the floor, the heat in it was between 50 and 60 degrees. During the next three or four days, the heat was increased from 60 to 65 and 67 degrees; and during the last days of its lying there, to 80, 84, and 87; which last was the degree of heat when the malt was put on the kiln. There cannot be any absolute rule as to the difference of heat during the different times in the process of malting, because it must be suited to the heat of the air: at least we have not yet sufficient data whereon to found such a calculation. The heat of the malt on the kiln when fit for pale malt was 120 degrees, and when it was fit for brown, the heat 147.

This intelligent artist's observation, that the malt was fit for what is called pale malt, when its heat was at 120 degrees, suggests a caution which should be more carefully attended to, namely, that whatever colour it be intended to give the malt, the heat at first should always be the same: thus, for example, malt which is dried to the degree of high brown, should first be rendered pale malt, then amber, and so on progressively; not by a sudden increase of the fire, but by a longer continuance thereof. In this manner the whole body of the grain is equally and gradually dried; whereas a strong and quicker fire would parch, or as it were singe the outside, while the internal parts remain moist; and as that moisture is afterwards evaporated, it must crack the surrounding hardened crust, whereby the grain is again damaged in another respect.

As soon as the malt is dry, it must be removed from the kiln, and spread thin, that it may cool to the temperature of the air. It cannot be supposed that any of its parts are capable of retaining the fire in such manner as not to suffer it to escape; though some have conceived that they do. In proportion as malts are dried, their particles are more or less separated, and coming in contact with water, they strongly attract from it particles which fill up their interstices. In mashing, this action between the malt and the water generates a small degree of heat, but no way durable; though from hence arose the opinion, that brown malt is full of fire.

Barley may, at a medium, be said to lose, by malting, one fourth part of its weight, including what is separated from it by the roots screened off; but this proportion varies, according as it is more or less dried.

The condition of the barley, as to its greenness or ripeness, at the time of its being gathered in, is clearly discernible when it is malted. If it was gathered green, it rather loses than gains in quantity; the malt becomes of a smaller body, appears shrivelled, and often is unkindly hard; whilst, on the contrary, that which was cut at full maturity increases in malting, appears plump, bright, and clear, if properly carried through the process, and, on being cracked, readily yields that fine mealy substance so much desired by the brewers.

Malt which has not had a sufficient time to shoot, so that its plume, or acrospire, as the adepts in malting call it, may have reached to the inward skin of the barley, remains charged with too large a quantity of its unattenuated oils. All those parts which have not been put in motion by the act of germination, will, when laid on the kiln to dry, be so hardened, as not to be soluble in water, and consequently will be lost to the strength of the drink.

When malt is suffered to grow too much, or until the spire has shot through the skin of the barley; though all that is left be malt, yet, as too large a portion of its oils will have been expended in vegetation, the malt will be greatly diminished in proportion to what it ought to have been, and what remains cannot be fit to brew drink for long keeping, because of the loss of the oils.

Malt which has been duly worked on the floor, will, if it has not been sufficiently dried on the kiln, be apt to germinate or sprout afresh; perhaps to conceive so great a heat as to take fire; and should it continue long with a moderate degree of heat, the least evil that can be expected, is, that it will grow mouldy and have an ill flavour.

Malt well worked, but over-dried, will be so hardened, or its saponaceous quality will be so destroyed, that it will not imbibe from the air that moisture which is necessary to mellow it, and render it fit for brewing: for when it has been previously softened by the moisture of the air, it mixes more easily and more intimately with the water, and by that means yields a more copious extract than it would otherwise do.

Malt just or but lately taken from the kiln, remains warm a considerable time. Until it becomes as cool as the surrounding air, it does not mellow by the addition of a due quantity of moisture from the air; and the wort made of such malt requires a much longer boiling before it breaks, than that which is made of malt some months old.

The practice of those maltsters who sprinkle water on malt newly taken from the kiln, to give it the appearance of having been made a proper time, or, to use their own expression to plump it, is highly blameable. It is, in fact, a downright fraud, practised chiefly because less grain then fills the bushel: but a farther evil is, that if it be not used speedily, it heats, soon grows mouldy, and suffers great damage.

Malt dried on a kiln not sufficiently heated must require a proportionably longer time for it to receive the due effect of the fire: for want of which it will be in the same state as malt not thoroughly dried. Or if the fire be too quick, or too fierce, instead of gently evaporating the water from the corn, it scorches the outward skin, and separates it from the body of the grain. The malt to which this happens is called brown malt; of which Mr. Combrune observes, that, by the internal expansion of its parts, it occupies a larger space than it ought to do. He adds, that if such a fire be continued, it changes some parts of the grain into so brittle a substance, that the malt is said to be glassy. The particles which are thus hardened will not dissolve, or but in small proportion; so that they frequently occasion an almost total want of extract, which, in the phrase of the art, is termed, setting the grist.

The goodness of malt may be known by the following marks: Bite a grain of it asunder, and if it tastes mellow and sweet, breaks soft, and is full of flour from one end to the other, it is good. If it has a round body; and upon putting some grains of it into water, they swim on the surface, it is good. Barley sinks in water, and malt that is not well made will do the same: but it is to be observed that this is not an invariable proof, because, if the malt be

broken, or in the least cracked, it will take in water, and sink. Malt that is rightly made will not be hard, but of so mellow a nature, that if drawn over an oak board, across the grain, it will leave a white line upon the board, like a mark of chalk. Its smell also may be consulted; for malt, though otherwise good; may have contracted an ill scent from the fuel, or from the water used in the steeping.

Before malt is ground, it should be freed from the tails and dust, which would otherwise heighten the colour of the wort, render the liquor muddy, and give it a bad taste, which could not afterwards be got rid of. The cylindrical sieve will be of excellent use for this purpose.

The malt must be broken, in order to its communicating its virtue to the water. If it be ground too small, its flour will mix too freely with the water, and cause the wort to run thick. Many are of opinion that the best way is only to crack it, so that none of the grains may come out whole: for the intent is, that the water should draw out an extract, but not be mixed with the mealy part, in the manner of a paste or gruel. Some think that malt is better ground by a stone mill, than by a steel one, because the former bruises it, and the latter only cuts the grains.

After the malt is ground, it should lie some time to mellow in a cool room where no sun comes. The time for this is different, according to its kind. Brown malt may be ground at from three to fourteen days before it is used, in order that the corn, which is rendered uncommonly hard by that degree of drying, may be gradually softened by the moisture in the air; by which means it will become the more soluble in water. The pale malts require only one or two days. After lying thus in the air, less mashing suffices; the strength of the malt is more perfectly extracted, and the beer will be considerably stronger than it would be with the same quantity of malt taken directly from the kiln. Care must be taken that it get no damage in lying.

Mr. Combrune observes, that malt imbibes moisture more readily by being ground and exposed for some time to the air, than it does when whole; and that as the dampness thus absorbed by the grain is in reality so much cold water, malt which has been long ground requires to be mashed with hotter water than it would otherwise be necessary to use. See the article BREWING.

The reader is obliged for the following useful observations on the art of making malt to a very ingenious gentleman, who has practised the art many years.

Experience, and a constant observation on effects and their causes, have, says he, made me master of some pieces of knowledge relative to this subject, which your farming readers may probably think worthy their attention: the result of this experience I shall lay before them.

The first thing I shall mention, with regard to malt, is the benefit of changing the water whilst it is steeping.

Some maltsters think this change of water no ways necessary; others, on the contrary, approve of it, but do it indiscriminately in the same proportion during the whole season. They are in both respects wrong; for the times when the water requires to be changed ofteneft are at the beginning and latter end of the season, in autumn and spring, when the weather is warm; for in the middle of the winter the weather is too cold to admit of the water being at all changed to any advantage. Suppose the barley to be left in steep forty-eight hours in the spring: if the weather is inclinable to be warm, the water may be in that space of time changed three times; in other cases twice may be enough; but the best rule to go by, is that which follows.

Every maltster must know, that in the autumn and spring, if barley is left too long on the steep in the same water, the water will grow slimy, and sometimes sour: now I would advise the maltster to watch the changes of the water, and when he finds that it is smooth and oily to the touch, and that it is inclinable either to smell, or taste sour, let him by all means have it instantly changed; but he must observe, if he regards his interest, a particular method even in doing this.

The usual way of changing the water is, first to draw off that in which the barley was steeping, and afterwards by pails full, or by pumping, fill the cistern again.

This

This I do not approve of, because the barley when the water is drawn off lies closer, and is apt, in a very short space of time, to heat : this is a great damage to the commodity, and, without precaution, a considerable loss ensues. Now my method has always been, first to get a hoghead of water in readiness near the cistern, which I cause to be thrown on the barley the instant the first water is drawn off; and as a hoghead of water is sufficient to wet eight bushels of barley, I add afterwards as many hogheads, save one, as my cistern will wet quarters. By these means I avoid the danger of the barley heating in the cistern.

The consequences of not changing the water whilst the barley is steeping, are often fatal to the malt.

I have already observed, that in the spring and autumn it is necessary to change the water often in which the barley is steeped : it should likewise be remembered, that in these seasons the making of malt, in all its parts, is a very critical business; particularly it is then necessary that the beds, or couches, should be frequently turned, or the malt will not come kindly : but the tap-root will be apt to shoot forth vigorously, starving the other roots, and preventing them from accompanying it in its growth : this must be checked, and the remedy is, to turn the couch often, spread it thin, and give it a sufficient quantity of air, at the same time keeping it cool and temperate. This will stop the progress of the first root, give the others time to sprout, and the barley will malt kindly and regularly.

A thin skinned fine-coated barley is best for making malt, and is not the worse for not being very full bodied; yet would I by no means recommend a lean, half-starved, unripe grain.

Barley, which has grown on lands highly manured, is not so good for making malt, as that which has been produced by land of a moderate richness without any manure : in fact, a luxuriant soil, whether naturally so, or enriched by art, is not, in general, best for yielding barley for the maltster's use.

For the reasons above mentioned, never chuse to buy barley from the farmers who have large crops, as it is mostly a full bodied grain they have to sell. I prefer, for malting, a grain which is the produce of the soil that is rather poor than rich, rather light than strong, and more inclined to a gravel than a clay.

This grain is clean coated, taper, and elegant in its form, is full of flour, almost transparent when watered, and will be sufficiently wetted in forty-eight hours.

This grain increases in the malting, fills the bushel well, and makes a fine, sweet, wholesome, clean, full-bodied malt, from which the best of beer may be brewed, either brown or pale, according as the malt has been dried higher or lower.

Now I have mentioned drying of malt, a few cautions on that head may not be amiss.

My practice has been to give my malt as much drying as I could on the floor : this is not only a great saving of fuel to me, but is also attended with several other advantages.

I find that my malt, by being thus gradually divested of its outward moisture, does not shrink so much when it comes to be laid on the kiln; of course it measures to more advantage : it is besides of a better quality, having acquired no foreign taste in drying.

It may very easily be observed, that if malt is laid very damp on the kiln, a thick mist, or smoky vapour, will immediately arise from the surface of it, which being repelled and condensed by the cold circumambient air, falls again on the malt, where, by the heat from the furnace, it is a second time rarefied, and ascends in clouds of steam.

This alternate rarefaction and condensation of the moisture is of great disservice to the malt, giving it often a disagreeable musty flavour, and making it besides more unfit for keeping.

Now, by my method of suffering the malt to receive a part of its drying on the floor, this inconvenience is, in a great measure, avoided; for the gross moisture is already evaporated before it is laid on the kiln, and that which remains creates no great degree of steam, provided the fire in the furnace is not at first made too fierce.

With this precaution I have often made pale malt as fine as I have any where seen, such as some gentlemen, who long dealt with me, frequently say, constantly praised. In drying this malt, I took care that there was, during the whole time it was on the kiln, but a very moderate, yet equal, fire in the furnace.

If I had an inclination to have any malt high dried (for

some like brown malt better than pale) when the moisture was nearly evaporated; I caused the fire to be gradually increased till it roared again in the furnace, taking care that the malt should be properly stirred, lest it proved kiln-burnt; and by this method I had a fine, sweet, brown malt, fit for making harvest beer, such as some farmers are very fond of brewing.

Many are of opinion, that brown malt, used in the same proportion with the pale, will make the strongest beer; but this is certainly a mistake; for I have often made the experiment with great precision, but could never find any material difference, and what difference there was at any time, seemed to me to be rather in favour of the pale than the brown malt : this may easily be accounted for, as the flour in the pale malt always remained sound and uninjured in the drying; whereas the brown malt would sometimes, notwithstanding all the care of the maltster, be injured or parched by the fire, and that part which was parched had of consequence lost its spirit and virtue.

I must, however, on this occasion, make one necessary remark, which is, that some pale malts are slack dried; these, I own, make a raw, unwholesome liquor, which will not keep well; but if the pale malt is gradually and slowly dried by an uniform gentle heat, it will certainly answer the character I have already given of it, and will, besides, (I have experience for my voucher) keep as well as any brown malt whatever.

Maltsters in general are too little nice in the barley they buy. I have already said something on this head, to which I shall add, that I would by no means have them ever bargain for mixed grain : what I mean by mixed grain, is barley grown on various soils and in different fields. There is a sure disappointment in buying such grain, as the kerns will spire at different times, and some of them not at all; so that, after the couch is dried, some part of it will not be half malted, and a great deal of the remainder not malted at all.

In order to avoid this misfortune, for such it is, as the maltster's customers will, with too much reason, find fault with his commodity, let him by no means attempt to buy the barley, for that he is sure is mixed : I experienced myself, many years ago, a great loss by a purchase of the kind. A neighbouring farmer, with whom I was well acquainted, brought a sample of barley to market : I looked at it, and though it was not very fine, I bought it, on account of his letting me have it six-pence a quarter cheaper than I could then buy of others : the lot consisted of one hundred quarters; but when it came home, and I had tried some of it, I think about ten quarters, I was greatly surprised to find the malt so bad; when examining the barley with great attention, I soon discovered the reason of it. Meeting the farmer, of whom I had bought it, within a day or two afterwards, I asked him how he came to sell me mixed barley, adding, that I always thought he kept his grain with more care separate : he soon unravelled the mystery, by telling me, that it was the parson's barley, not his own, which he sold me.

When I heard this, I was not a little displeased; however, resolving to make the best of a bad bargain, I carried a sample of it to market the next day, and sold it to a hog-feeder for eighteen-pence a quarter less than I gave for it. This was some loss; however I was glad to get off so well, as I would not have made the whole into malt, and have imposed on my customers, for an hundred pounds.

To shew that I am not self-interested, I will inform your readers of a method by which they may discover whether malt has been made of mixed, or in part unripe barley. Take a bowl of water; throw into it a couple of handfuls of the malt; give it a gentle stirring, and the barley which has not been malted will sink to the bottom; the half-malted grains will have one end sunk, being in a vertical position; and the true good malt will swim. This experiment I have often made, and never found it deceive me.

The same barley, though ever so good, will not malt alike well at all times : for instance, take it as soon as it is housed, it comes well, but whilst it is in its sweat, by no means; yet after it has done sweating, it comes well again.

In the same manner, barley which has been got in early in a very dry season, makes but indifferent malt; whereas the same barley, if it is left broad till rain falls on it to loosen the husk from the kernel, malts very well, and yields a large increase.

Also, old barley, mixed with that of the last harvest, does not malt well, for the reasons above mentioned; it does not all spear, or put forth its beard, at the same time.

These I know are niceties which few maltsters attend to; yet I am certain that an observance of them, and some few more particulars, would increase their profits nearly ten per cent.

A great many maltsters in the counties of Hertford and Essex, make prodigious quantities of malt for the London market; and there are often disputes happen between the maltsters and the factors and buyers at Mark-lane about the malt not holding out measure; the reason of which many of the country dealers are unacquainted with, and therefore know no other way of guarding against it, than by throwing in a bushel or two extraordinary: this is some abridgment of their profits, and is besides often unnecessary. One reason for this deficiency is, the avariciousness of the maker, who is willing to have as large an increase as possible, to the amount of six pecks in eight bushels; whereas, if the malt is intended for the London market, four pecks is all that can, with propriety, be allowed; for it must not be drawn too long, and this malt requires more cleaning by the screen, &c. than that sold in the country.

Malt, if it is not thoroughly cleaned, will heat in the hold of the vessel that carries it; and the tails, being loosened, will fall off, the necessary consequence of which must be a deficiency when it comes to be measured a second time at the wharf or ware-house: now, to prevent any altercation or dispute, let the maltster always cause his commodity to be well screened before it is measured into the sacks to be carried on shipboard: he need then put up no more than the measure; he will gain himself a character as a clean, good workman; and I will answer for it, that the factors, if he makes his malt according to sample, will readily give him one shilling a quarter more than his neighbours.

MALT-DUST, the dust, &c. that separates from the malt in the act of drying.

The following observations on the benefit of malt-dust, as a manure for a stiff soil, with a relation of some experiments made to ascertain its virtues, appeared in the Museum Rusticum, Vol. III. p. 277.

For the benefit of your farming readers, says this gentleman, I shall communicate a few experiments I made some time since, in order to try the virtue of malt-dust as a manure for a crop of wheat.

I had often heard it asserted, that malt-dust was much better suited, as a manure, to barley than wheat; for the latter lying a whole year in the ground, and the malt-dust being sown with it, the virtues of the manure were exhausted long before the summer, when the corn principally wants nourishment; being advanced in its growth, and served chiefly to make the wheat winter-proud.

Others, contradicting this assertion, said it was best for wheat, and made it appear, that it often caused very good crops of corn, particularly after a hard winter.

Being determined in my own mind to try some experiments, in order to ascertain this matter, I pitched upon a field of ten acres, which had borne a good crop of horse-beans; after which it was sown with turneps, which being fed off, it was summer-fallowed, being intended for heat.

The soil was a stiffish loam: it was in good heart and tolerably clean.

I divided this field by deep furrows into ten equal parts, each containing one acre, numbered 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10:

The whole field during the course of the fallowing had four ploughings which reduced it to a fine tilth.

When wheat seed-time came, I sowed number 1. broadcast, with three bushels of wheat, and ploughed it in, laying on no manure whatever.

Numb. 2. I sowed with the same quantity of wheat, after which I strewed over it ten quarters, or eighty bushels of malt-dust, and ploughed that and the seed in together.

Number 3. I sowed also with wheat in the same manner, except that I deferred strewing on the malt-dust, till the latter end of January.

Number 4. had a dressing of dung in the ordinary way

and was sowed with three bushels of wheat like the other parts.

Number 5. was dressed by sheep-folding, and was also in like manner sown with wheat.

Number 6. was sown with wheat in the same quantity; and in February, after sowing, received a half dressing of very rotten dung, which had been several times turned and mixed:

Number 7. after receiving a ploughing in the spring, was sown with ten pecks of barley, which was harrowed in, and no manure at all applied.

Number 8. was sown with barley, as above, but had ten quarters of malt-dust laid on it.

Number 9. had in the winter a good dressing of dung, and was in the spring sown with the same quantity of barley.

Number 10. was sown with barley, like number 8. only it had five instead of ten quarters of malt-dust laid on it.

It may be necessary perhaps to observe, that all the pieces of wheat were sown the first week in October, and all the barley the second week in March.

Soon after Christmas I went to take a view of my wheat, when I found that the acre marked number 2. looked most forward and flourishing; though I must own there was in appearance but little difference between that and number 4.

The numbers 1, 3, and 6. neither of them looked so vigorous as those already noticed; and number 5. seemed rather thin on the land; but the wheat plants were in good condition and healthy.

In May I took another view of my wheat crops, and found number 1. tolerably clean, and promised well.

Number 2. gave me hopes of a large crop, and was surprisingly clear of weeds.

Number 3. was greatly improved since the laying on of the dressing of malt-dust.

Number 4. looked very vigorous and strong, but was very foul, having several sorts of weeds not to be met with in other parts of the land.

Number 5. was thin of plants, and they did not branch much; however they still seemed healthy and strong.

Number 6. was like number 3. greatly improved; but it was foul, and what appeared strange to me, had many weeds of a nature quite different from those with which number 4. was infested, though the dung laid on both these parts was taken from the same heap.

I at this time also looked at my pieces sown with barley, when I found number 7. promising and clean.

Number 8. was forwarder, and flattered me with the prospect of a large crop.

Number 9. was forward and fine, but foul with weeds.

Number 10. bore much the same appearance as number 1. and promised as well.

At harvest, number 2. of the wheat was first fit to reap, after which succeeded number 4. the rest were ready nearly at the same time.

Of my barleys, number 8. and 10. were first ready to mow.

I suppose it is unnecessary to observe that those crops which were cleared of weeds were the soonest fit for carrying.

I ordered these crops to be all laid separately; and as I was obliged, just after Michaelmas, to go up to London, about some particular business, I left orders with my bailiff, that they should all be separately threshed and dressed as early as might be in the winter.

The produce of the several crops was thus distinctly noted to me, for I had ordered that particular care should be taken not to mix one with the other, and my orders were, I found, on enquiry, punctually carried into execution.

	Bush.	Pecks
Number 1. unmanured, yielded of wheat	20	1
Number 2. manured with malt-dust when sown	28	3
Number 3. manured with malt-dust after Christmas by way of top-dressing	41	0
Number 4. manured with dung in the ordinary way	32	2
Number 5. folded with sheep	29	3
Number 6. dressed with rotten dung in February	30	0
Number 7.		

	Busb.	Pecks
Number 7. unmanured, yielded of barley	32	3
Number 8. manured with ten quarters of malt-dust when sown	48	0
Number 9. manured with dung in the winter	40	2
Number 10. manured, when sown, with five quarters of malt-dust	44	0

I must, with your leave, trespass upon your reader's patience, till I make a few observations on the above state of the produce of my crop.

First, I conclude, that when malt-dust is used as a manure for wheat, it is the best to lay it on by way of top-dressing after the corn is come up, as the crop of numb. 3. yielded above twelve bushels more than that of numb. 2. and I am apt to think that the virtue of the malt-dust laid on number 2. was exhausted before it could be of any essential service to the crop; whereas, in number 3. the manure began to yield forth its virtues just as the wheat plants began to be in want of a fresh supply of nourishment. It was also observable, that the grains of wheat which grew on number 2. were thinner, and had less substance, than those of number 3. the grain of which was fine, plump, and heavy.

The produce of number 4. convinces me that malt-dust is, in many cases, a better manure for wheat than dung, not only as it gives a larger increase, but also because it does not stock the land with destructive and devouring weeds.

The wheat grown on number 5. was as fine as that of number 3. but considerably less in quantity, as appears by the account.

I do not much approve of the method pursued in number 6. yet is it a good alternative, if the farmer happens to have too little dung to dress all his fallows.

I judge also malt-dust to be a very good and profitable manure for a barley crop; but the yielding of number 10. being forty-four bushels, and of number 8. only forty-eight bushels, which last is not an increase in proportion to the additional quantity of manure laid on, I thence judge that eight quarters, or sixty-four bushels, of malt-dust, is the proper quantity of malt-dust to lay on an acre for a barley crop, and that at the time of sowing.

When I speak of malt-dust, I mean the kiln-dust which falls from the malt in drying: as to the tail-dust, which falls through the screen whilst the malt is cleaning before it is put in sacks, that may be applied to a better use, being generally given to pigs, and often to cows, in which last case it makes them give a great deal of milk.

It has been suggested that the virtue of malt-dust, as a manure, lasts only for one crop; but this is a mistake, for when this manure is laid on in January or February, a good crop of barley may be had after the wheat.

It (I mean malt-dust) is of a very warm nature: this has induced many farmers to think that it will burn a crop; and I will not answer for it but it might do so on a hot gravelly soil; but on clay land, or a stiff loam, it seldom or never does any damage: and indeed the only danger is a dry time ensuing after it is spread on the land, for the first shower of rain washes it in, and secures the crop from all hazard of being burnt.

Many of my acquaintance, besides myself, have found that malt-dust is for a stiff soil a better manure than dung; but the dispute among them was, whether it was most profitable to lay it on when the wheat was sown, or by way of top-dressing in January or February: however, since I made the above experiments, they are all converts to my opinion, and are determined in future always to dress their heavy wheat land with it after Christmas.

One thing more in recommendation of this my favourite manure let me add before I conclude, that nothing surpasses it when laid on cold grass grounds, to the amount of about eight quarters or sixty bushels on an acre, but not less.

Such as have not seen its effects in this way applied, would be surprised at the large increase of sweet feed which it occasions: in short, whoever finds it necessary to dress such land, and can get malt-dust in a sufficient quantity, will do well to use it, as they will be puzzled to find any thing in the extensive circle of manures better adapted to the purpose.

MANGE, IN HORSES, is caused by over heat or cold, hard riding or labour, by which the blood is corrupted; or it may be occasioned by eating unwholesome food.

The distemper may be easily known by the staring of

the hair, its coming off from the skin in many places, and a scurf arising thereon.

When the distemper is caught by infection, an ointment composed of flour of sulphur and hogs-lard, will effectually cure it, if rubbed in every day immediately after the misfortune is perceived. In the mean time sulphur and antimony should be given with his feeds, and continued for some weeks after the cure is performed, in order to purify the blood. If the sulphur ointment should not be thought agreeable, a liquor made by steeping tobacco in stale chamberlye, will answer the same intention; but the sulphur and antimony should be given with his feeds.

But if the distemper has been of some continuance, or if it owed its origin to low feeding, and a poverty of the blood, other methods must be pursued, the diet must be mended, and the horse indulged with a sufficient quantity of hay and corn, and the following ointment rubbed into the parts affected every day: Take of sulphur vivum, half a pound: of crude sal armoniac, one ounce: and of hogs-lard a sufficient quantity to make the whole into an ointment.

Give him every day a feed of scalded bran, and when the disease begins to disappear, the following purge:

Take of succotrine aloes, ten drams; of diaphoretic antimony, half an ounce; and of fresh jalap in powder one dram: make the whole into a ball, with a sufficient quantity of Bardadoes tar, with sixty drops of chemical oil of aniseeds.

If the case prove very obstinate, wash the mangy parts with sublimate wash, and give the brimstone inwardly.

If poor feeding and hard work is the cause, the cure will be obvious;

Sublimate Wash.

Take of sublimate mercury, half an ounce; lime-water, a pint; mixed.

When the horse is thoroughly cured of this distemper, it will be necessary to wash the floor of the stable very well with soap-suds, and fume it well with burning pitch or charcoal. His cloaths also should be laid in scalding water, washed very clean with soap and thoroughly dried, before they are used again; for if these precautions are not used, other horses will be liable to the infection.

Another method of cure is: Take staves-acre seeds, two handfuls, infuse it in a quart of strong vinegar and hot ashes; wash the mangy parts with this liquor, and it will cure it in twice bathing.

MANGE in a dog, a distemper with which he is often affected, for want of fresh water to drink when he is thirsty, and sometimes by not being kept clean in his kennel, or by foundering and melting his grease.

For the cure: Take two handfuls of wild cresses, and as much elecampane, and also of the leaves and roots of roerb and sorrel, and two pounds of the roots of foderls; boil all these well together in lee and vinegar, strain the decoction, and put into it two pounds of grey soap, and when it is melted, rub the dog with it four or five days successively, and it will cure him.

MANGER, the place or vessel in which the horse's corn is put.

MANURE, a general name for soil of all kind laid upon land to improve it.

Mr. Marshall, in his Rural Economy of Norfolk, recommends the following method of manuring:

"For turneps, the stable-muck is usually carried out, from time to time, as it accumulates, or as the weather answers, in winter: and the par-muck, wanted for this crop early in the spring; and piled up in heaps in or near the intended turnep-closes; a bottom being previously formed of marl, or manure, about a foot thick, and neated up into a long square bed to set the pile upon.

"The method of carrying out farm-yard dung, when a farmer wants to get business forward, is generally this: Two fillers, a driver, and an unloader, with six horses and three carts, are a set, for a short distance: one of the carts being always in the yard, one on the road, and one at the dung-heap; it being an universal practice, which prevails throughout the district, to set the carts by the side of the heap and unload them with forks.

"The crime of drawing the load on to the heap is rarely committed in Norfolk. On the contrary, every lump is carefully broken, and the whole piled up light and even,

even, with almost as much care and attention as farmers, in some places, bestow upon their hay-ricks.

"The ordinary day's work of the set abovementioned is twenty-five loads; if the distance be very short, thirty loads are frequently carried out: in this case, however, an additional boy is required to assist in levelling and forming the heap.

"The filling is generally done by the load; another admirable practice: the price one penny a load; a striking instance of the low wages and hard work of this country.

"This practice ought to be copied in every country; for it would, in most places, be cheaper to pay even three-pence a load, than to have the dung cart filled by the day; in which case, the team is ever standing idle until the load be made up: whereas, when the filling is done by the load, that seldom happens. This accounts sufficiently for the extraordinary number of loads carried in a day, in Norfolk.

"For wheat, the remainder of the par-yard-muck is generally, in the spring, after the cattle are turned out to grass, turned up into piles in the yards, where it remains until the soil be prepared to receive it; the piles being by good farmers returned in the summer; an operation, however, which is too frequently neglected.

"Or, instead of turning the piles in the yard, they are sometimes carried, at leisure-times in summer, on to the land, and there piled afresh: in either case, the compost, by the time it be wanted to be set on, is thoroughly mixed and digested.

"The method of setting on dung is similar to that of carrying out: and from twenty-five to thirty loads are considered as a day's work for one team and two fillers: all set on in hillocks.

"The quality set upon an acre is, of course, proportioned to the quantity of land to be manured, and the quantity of dung to be set on: ten loads of good spit-dung, or twelve to fifteen loads of compost, is, perhaps, the medial quantity set upon an acre, for turneps:—for wheat a smaller quantity, and generally of a worse quality, is usually allowed.

"Some few farmers manure their clover-lays, but this is by no means common; the application of dung being, as has been said, in a manner wholly to the turnep and wheat crops.

"It may also be said, in general terms, that all the dung spread upon this district is plowed in; wheat is sometimes top dressed with it; but I have met with few instances of that species of management." See DUNG.

The following Letter, sent to Dr. Templeman, Secretary to the Society for promoting Arts, &c. to be by him communicated to the Committee of Agriculture, in Recommendation of a new Manure, is of too much Importance to be omitted here.

"S I R,

"As a farmer, like a chymist, should lose none of his materials, but make even his washings, runnings, and residuums, turn out to his advantages, I have sent you some account of an experiment I have made in manuring of land, which I beg you will lay before the Committee of Agriculture, that they may communicate it to others.

"I am possessed, sir, of a farm of near three hundred pounds a year, and have in my yard, what you usually see in most farmers yards, two recesses or pools, as reservoirs of dung and water. These reservoirs in wet weather are continually running over; and of course part of the matter contained in them is carried off, by the necessary drains, into the highways, ditches, and rivers.

"As much of the essential quality of the dung is lost in this manner, (for part of the salts, whether fixed or volatile, will be washed into the pools, and when they overrun will be conveyed into the ditches, &c.) I thought it a part of good husbandry to carry this superabundant water, or manure, (for so we may justly call it) on my land, which I did by means of a watering-cart, not unlike those with which the roads near London are watered in the summer-time to allay the dust.

"That the experiment might be the more obvious and certain, I first tried it (in the beginning of March, 1763) on a few acres in the middle of a large meadow, and on some lands in the middle of a large field of wheat, where, in a little time, I found a considerable increase, in growth, both of grass and grains; and at hay time and harvest, both the one and the other were much better crops

than what the same lands produced that were not so manured.

"As a man, or even a boy, with one of these carts, and one horse, may manure a great deal of land in a day, provided it be near the yard, I would recommend the practice to all my brother farmers; for the expence is nothing, but the value of the time of the boy and the horse; and the increase, by what I have seen, will be very great.

"This manure may be also laid, to great advantage on land that is fresh sown with barley, oats, or any other grain; but on grass it should be only laid in the winter time, when the rains will wash the salts off the blade; or in the spring, when the lands are laid up for hay; as the cattle will not feed on the grass, while the dung, or salt, adheres to the blade of it.

"This dung-water should likewise be carried on the land, not at a time when it rains, but in the dry weather, and at a time when the dung water in the pools is of a deep brown colour, and strongly impregnated with salts. By this means the land may be manured from time to time, and the pools kept almost empty for the reception of fresh matter every time it rains; and nothing will be lost."

MARE, the female of the horse. See the article HORSE.

Such mares as are designed for breeding, ought to be as free from defects as possible, and should, no more than the stallions, have either moon-eyes, watery eyes, or blood-shot-eyes; they should have no splint, spavin, or curb, nor any natural imperfection; for the colts will take after them; but choice should be made of the best and ablest, the most high spirited, best coloured, and finest shaped; and the natural defects that may be in the stallion, should be amended in the mare, as well as that which is amiss in the mare should be amended in the stallion.

As for her age, she may be covered when three years old; but the most convenient time is after four, when she will nourish her colt best; and though she may breed till she is thirteen, yet she is not fit for it when she is past ten, for the colt of an old mare is commonly heavy. Before a mare is covered, she should be in the house about six weeks, during which time she should be well fed with good hay, and oats well sifted; and in order to render her conception the more certain, near a quart of blood may be taken from each side of her neck, about five or six days before covering. Another method to bring a mare in season, and make her retain, is to give her, for the space of eight days before you bring her to the horse, about two quarts of hemp-seed in the morning, and as much at night; and if she refuses to eat it, to mingle it with a little bran or oats, or else to let her fast for a while: and if the stallion also eat of it, it will greatly contribute to generation.

Mares go with foal eleven months and as many days as they are years old; and therefore the properest time for covering them is in the beginning of June, that she may foal the May following, when there will be plenty of grass, which will afford the mares a great abundance of milk for nourishing their foals: but a mare should never be covered while she is bringing up her foal, because the foal to which she is giving suck, will be prejudiced by it, and she herself sooner spent. After covering, let her, for three weeks or a month, have the same diet as before, and kept clean in the stable till the middle of May, with her feet well pared and thin shod: take her in again about the latter end of September, if not before, and keep her to the end of her foaling. If she cannot readily bring forth, hold her nostrils so as to stop her taking wind; and if that will not do, dissolve madder, to the quantity of a walnut, in a pint of ale, and give it her warm. In case she cannot void her secundine, or after-burden, boil two or three handfuls of fennel in running water, then put half a pint of that liquor into as much sack, or, for want thereof, into a pint of ale, with a fourth part of sallad-oil, mixed together, and pour it lukewarm into her nostrils, holding them close for some time: otherwise give her green wheat, or rye, the last of which is best.

If the mare has but little milk, boil as much as you can get from her, with the leaves of lavender and spike, and bathe the udder with it warm, till the knobs and knots are dissolved. She should now drink only white water (which is bran put in water; give her also sweet mashes): and a month after foaling, let her have a mash with some brimstone or sarsine in it.

MARLE, a kind of dry, soft, siltie earth, used in manuring land.

Marle

Marle is either grey, blue, brown, yellow, red, or mixed, and is known by its pure and uncompounded nature: besides which, it is distinguished by several other marks, such as, its breaking into little square bits; its falling easily to pieces, by the force of a blow, or upon being exposed to the sun or frost; its feeling fat and unctuous; and its looking, when dry, after having been exposed to the weather for some time, as if it was covered with a hoar-frost, or sprinkled with fine salt. Even when mixed with the land intended to be manured by it, the whole surface of the soil will have that whitish appearance. But the most unerring way to judge of marle, and know it from any other substance that may resemble it, is, to break a piece as big as a large nutmeg, and, when it is quite dry, drop it into a glass of clear water, where, if it be the right sort, it will soon dissolve into a soft and almost impalpable pap, shooting up many sparkles to the surface of the water. Some marles effervesce but little with acids: but they should always be put to that trial; because the more they effervesce with them, the more valuable they are as manures. In hot weather, good marle will flake with the heat of the sun, like lime: especially if any rain follows a hot day.

The farmers in Staffordshire reckon the soft blue marle, which is most commonly found under clay, or low black ground, at the depth of seven or eight feet, the best for arable land, and the grey sort the best for pasture. That which is of a brownish colour, with blue veins in it, and little lumps of chalk or lime stone, generally lying under stiff clays, and very hard to dig, is most esteemed in Cheshire. The marle which is usually found at the depth of about two feet, or a yard, on the sides of hills, and in wet boggy grounds which have a light sand in them, is very fat and close, and reckoned the strongest of all marles; for which reason it is particularly good for sandy lands. This is commonly called peat-marle, or delving marle. The paper-marle, as it is sometimes called, frequently lies near coals, and flakes like leaves or pieces of brown paper, than which it is of a somewhat lighter colour. That which some writers call clay-marle, because it looks like clay, is very fat, and sometimes mixed with chalk-stones. Steel-marle breaks of itself into squares cubical bits. These two last kinds generally lie under sand or clay; sometimes about a yard deep under the former, but often much deeper under the latter.

Stone, slate, or flag marle, which is a kind of soft stone or rather slate, of a bluish colour, is generally allowed to be the best. It easily dissolves with frost or rain, is found near rivers and on the sides of hills, and is a very lasting manure. An ingenious gentleman, passing lately through Bedfordshire, observed; that the people employed to mend the highways, were laying upon them a bluish kind of stone. Struck with the novelty of the appearance, he stooped, took up a lump, and soon found it to be this blue marle, which the ignorant peasants were using instead of real stone. The consequence was, that when he returned the same way some time after, a heavy shower having fallen, the old road where this substance had been so injudiciously spread, was become a perfect quagmire.

Mr. Markham reckons four sorts of marle, in Suffex: viz. grey, blue, yellow, and red. The blue is accounted the best, the yellow next, and then the grey. The red is the least durable. A great deal of the marle in the north country runs much upon the loam; but that in Suffex is more like fuller's-earth, and therefore must certainly be the fattest.

Mr. Mortimer says, he saw a sample of marle from Derbyshire, which was very fat, though it contained so much sand, that when wet, it could not be worked into a ball, or be made to hold together. This marle did very well upon clayey land, because it was of an opening quality.

In many parts of most counties in England, marle discovers itself to the most negligent eye; particularly on the sides of broken hills, or deep hollow roads. Many rivers are bordered with a vast treasure, which is plundered by every flood. Boggy lands frequently cover it; and, in them, it seldom lies above three feet deep. It is somewhat lower under stiff clays, and marshy level grounds. The lowest parts of most sandy lands abound with it, sometimes at the depth of three feet, and sometimes at seven, nine, or more. The depth of the marle itself can seldom be found; for when the upper crust of the earth is re-

moved, all that can be seen or dug is marle, to so great a depth, that there are few, if any, instances of a marle-pit's having been exhausted.

Nothing is more common than to find the ditches which inclose a field, dug so deep that they have penetrated six or seven inches into a bed of marle, without the farmer's taking any notice of it; though the extraordinary shooting and increase of the grass which is put forth by the marle thrown up on the sides of the bank, might, one would think, be a means of discovering it. Where the marle is thus accidentally disclosed, it not only turfs the sides and tops of the banks, and thereby secures them against all injuries of the weather, but makes the grass grow so long and thick, that, when beaten down by winds, it hangs as if it thatched the earth which nourished it, and carries off the rain, without letting any great quantity penetrate through it.

The marquis of Turbilly, in his excellent directions for clearing and breaking up land, recommends, for boring it (in order to know what different layers of earth, ores, quarries, springs, &c. lie underneath, and at what depth, by which means the better judgment may be formed of the plants most proper for the soil), an instrument of his own inventing, as far superior to any thing that has yet been thought of for that purpose. A description of it may be of service to every ingenious improver of land. See the article BORER.

Marle is very common in Ireland, where it seldom lies above a foot or two below the surface of the soil; luckily for that country, which is extremely boggy. But in France, though they have marle in many places, they are often obliged to dig for it very deep, particularly in the province of Artois, where it generally lies eighty or ninety feet under ground, in beds about five feet thick, at the bottom of which frequently is water, which breaks in upon the workmen. On account of this great depth of the marle-pits there, extraordinary care is taken to set up marks, and rail them in, to prevent the fatal accidents which might otherwise happen. The same is, indeed, done in England; but not so strictly as it ought to be.

Authors differ widely both as to the quantity and the manner of using almost all the manures they treat of; points which must, in a very great measure, depend on the quality of the soil, and the strength of the manure, of whatever kind it be, in which experience will ever be the judicious farmer's surest guide. In marling, it is particularly necessary to find the true proportion which the land requires, and better to err in laying on too little, than too much; because more may be added at pleasure; whereas by over-doing it, the first year's crop often fails, because the body of the marle has not been sufficiently opened; and, in that case, it will sometimes be two or three years before the ground comes to a proper temper. The best directions that can be given to the farmer in the application of this manure to light soils, is to lay on the quantity which will give the degree of cohesion wanted in those soils. A general rule cannot be laid down in this respect, because, the quantity of marle requisite to effect the desired end, must be different, in proportion to the degree of lightness of the soil.

Pliny speaks of marle as a species of improvement known to the Greeks, but more peculiar to Britain and Gaul. He calls it, the fat of the earth, and compares it to the glands in the human body, which are lapped in a coat of fat. As this manure, so far as we can find, was not used, and probably not to be found, in Italy, it shews how attentive the Romans were to agriculture, wherever they carried their victorious arms; since, notwithstanding the continual alarms they lived in from the natives here and in Gaul, they found time to discover and perfect a means of improving land, particularly suited to the soil and climate, and, of all others, the cheapest and most lasting.

Before we quit this subject, we must observe, with Dr. Home, that a body very similar to marle in its appearance, but essentially different in its effects, is often found in the same bed with the best marle. It is of a darkish lead colour. Instead of fertilising the earth, it renders even the best soils incapable of bearing any kind of vegetables for many years after. I have seen, says that gentleman, the spots on which it was laid, entirely barren three years after; and have heard of its bad effects continuing in other places for a much longer time; nor is it certain when they will cease. A body so very destructive to agriculture, deserves to be well characterised, in order to its being shunned;

shunned; and should be thoroughly examined, that we may know whence proceeds this noxious quality, and how to cure it when it has taken place.

Marle takes a smooth polish from the instrument with which it is wrought. A piece of this taken up, when it has not been much exposed to the influence of the air, differs greatly in taste from marle. Instead of the smooth unctuous taste of the latter, it is acid, and remarkably astringent. It agrees with marle, in crumbling in water, but differs remarkably from it in not raising any effervescence with acids, nor in the least destroying their acidity. It turns the syrup of violets red; which shews that it contains an acid: whereas marle, like all absorbent earth, gives it a green colour. The trying of marle with acids, is therefore the more necessary, to guard against using this pernicious substance.

It appears from experiments made by the doctor, that this pernicious substance consists of an earthy body like clay, about an eighteenth part of salt of steel, and a small proportion of the vitriolic acid: from whence he concludes, that good marle is the proper cure where this noxious earth has been inadvertently used; because it corrects the acid, and decomposes the salt.

The following account of marle was sent by a very intelligent gentleman to the editors of the *Museum Rusticum*.

A short Dissertation on Marle.

It is taken out of the bowels of the earth at several depths, is of divers colours, as after named, and some sorts have often two or three colours intermixed. It is unctuous, of a slippery nature, and in goodness pure; soon relents after rain, and, when dry, flakes like lime, and at last dissolves into the finest powder.

I intend to leave with you some specimens of two kinds of marle (which you may give to the gentlemen or farmers who desire them): they are what I have collected in Middlesex, which county abounds with good marle; but it is not used by the gentry, or farmers, so much as it ought, because they have so readily dung, soot, ashes, and other composts, from London.

In order to discover marle, the best way is to use the auger, and observe the strata taken up from time to time by it.

I have found, after I have got through the surface, which is about a spade and a half deep, that the next earth was a very strong, coarse, bed of clay five or six feet deep; afterwards, getting through it, the auger brought up marle, viz. that which appears of a fine light-brown colour, and some of it mixed with blue veins (which I will here call pigeon-marle, by way of distinction): here was a bed of this pigeon-marle of five or six feet deep, and after that followed another kind of marle, which I will call toad-marle, by way of distinction; this is heavier, and without any veins of blue.

When either of these marles are dug out of the pit, the spade cut them like so much soap; and the last-named marle looks very blackish and dark, and may be, and I believe is, in some countries, called toad-marle, from its resemblance in colour to that animal; but this marle being exposed to the air alters the colour very much. This appears to me to be the strongest marle.

Marle may be discovered sometimes near the surface, by carefully observing the ditches and fences of your lands.

It is frequently found near rivers, or brooks, and sometimes may be discovered on the banks of such waters.

To know when you have found true Marle, try it by Air, Fire, and Water, or Vinegar.

First, by exposing a large lump of three or four pounds in the air, which, if true marle, will, in a little time, by the nitre, dews, &c. break into small parts; and there will be an hoary, or white congelation on that part of it which is exposed to the sun.

Secondly, when your marle is dry, break it into small particles, and put an handful into a hot coal fire, and it will crackle as if so much salt had been put therein.

Thirdly, place a piece of the dried marle in a glass, and thereon gently pour as much water as will cover it. If true marle, it will then gradually moulder, and dissolve into

a liquid soap. Let not the glass be shaken, that you may observe the ebullition (which is material); or you may, in like manner, try it with vinegar, where the effervescence, or struggling, will be much stronger than in water.

The Virtues of Marle.

It is the best manure for sandy, dry, gravelly, or light lands of any kind. It is excellent for mossy lands. It is, indeed, good for all other lands, of what nature soever, even clay, provided care be taken in laying on a proper quantity, and that the same be well dissolved.

Care must be taken in the quantity used; if too little, you may easily add; but if too much is laid on the land, you cannot take it away.

It is used in some countries for arable lands only: yet it is as good for grass or pasture lands, but does not the first, and seldom till the second year, shew forth its utility; and then you will observe the grass to shoot out a dark, or blackish colour, which afterwards turns to the finest green; and with it come up quantities of white clover-grass, which hath occasioned me some difficulty with the farmers to convince them I had not sown the clover seed.

If lands are properly marled, they will continue good for twelve or fourteen years for the plough: and for pasture, or grass-lands, much longer.

I would recommend that the plough be not suffered to enter into the land till the marle is thoroughly dissolved.

Fish thrive prodigiously, and grow fatter in marle-pits than any other ponds.

Quantities to be used.

A great difficulty is to ascertain the quantity.

In some countries they will tell you of laying three hundred loads to an acre, others more, others less; but they nowhere ascertain what is a load. In Cheshire and Lancashire the loads are scarcely six bushels, and they use a small cart made for the purpose, drawn by two or three small horses.

If the land is gravelly, sandy, or light, let as much be laid on it as will make a good thick coat to bind and stiffen the soil.

But let the land be what it will, so much should, in all events, be laid on as will make a thin coat over the entire surface.

Upon my lands, which are grass and pasture, of a tolerable mould, on a clayey soil, and which were left, about eight years since, in a bad plight, by the late tenant, I first attempted to lay ten loads to every acre (by a load I mean as much as three large, well fed, strong horses could draw); but found it was too little, and would not meet in the spreading.

I immediately doubled the quantity, and two years afterwards I added another coat of fifteen loads more to every acre, and find it answers very well for hay and pasture. I need not say horses and cows are fonder of this hay and grass than of that wherein the dung may be tasted and smelt.

A work of this kind should be set about by the end of August, or beginning of September; and the loads should be shot into small heaps, as the Middlesex farmers shoot their dung, viz. two or three bushels in each heap; and a man must be ready to separate it, that the nitre, air, dews, and rain, coming on the large pieces, may act, and cause them to break, as of themselves, into smaller parts.

After the marle has been laid upon the ground, and you see that the air, nitre, &c. have loosened the great lumps, and they are ready, on a slight touch, to fall into pieces, a person should be ordered (when the weather and marle are quite dry) to break and spread the pieces to complete your coat; and you should avoid as much as possible, leaving any large pieces to lie and dissolve without being spread on the surface, but cause them to unite therewith.

In the beginning of February, and in dry weather, I cause an old gate to be well bushed, and a heavy weight laid on it, to be drawn by one horse over the whole field, in order that every part may have its due proportion.

If you intend to plough your lands, the preceding cautions are not so necessary, as the plough and harrows will spread and intermix the marle with the soil sufficiently; but if you use the drill-plough, the above hints may be useful.

It would take a volume to give an exact and full history of

of marle, its virtues and uses, and to shew that it was used by the Romans, and many years discontinued; and especially till the houses of York and Lancaster were united, and then revived in some few counties; and the great benefits received by marling in Suffolk and Norfolk within a few years past.

We very well know that gentlemen and farmers are a long while ere they care to venture on the practice of marling from theory, and principally from not having seen or known what is, and what is not, true and genuine marle, and from being unacquainted with the rules or modes to judge and determine upon it: therefore, if this short account will obviate their doubts, and in any way contribute to the advancement of agriculture, vegetation, and pasturage, my design is answered.

There are variety of colours in marle, viz. blue, white, yellow, red, and other colours, which make no material difference, provided they be earthy and fat, or slippery as soap, and as free as possible from a mixture of sand, gravel, or stone.

Mr. Marshall, in his Rural Economy of Norfolk, says that "Marle has been so long in use in this district, that there are few farms without marle-pits upon, or near them; so that searching for marle is at present seldom requisite, and the art of discovering it not much studied. The herb colts-foot (*tuftilago farfara*) abounding on the soil, is considered as an indication of a jam of marle being situated near the surface. But, whether this is, or is not, an infallible guide, time and accidents or intentional researches have not failed to discover beds of marle in almost every estate, and, in some places, on almost every farm, situated sufficiently near the surface to be worked with advantage.

"Of the quality of marles, the Norfolk farmers are, in a great measure, uninformed. That which falls most readily, and "gets to work" the soonest, is in the best esteem; but, in general, the quantity of "uncallow" (namely, the coping, or covering of earth, which lies upon the head, or jam) is more attended to than the intrinsic quality of the marle.

"The depth of uncallow is generally very unequal: perhaps, on the same jam of marle it will vary from one or two, to six or eight feet deep, the surface of the jam usually rising into inequalities, termed heads.

"The depth of the jam is equally uncertain: I have seen one worked twenty feet deep; but in general, I believe, ten or twelve feet may be reckoned a middling depth.

"The bottom of the jam, being generally a white absorbent sand, no pump or artificial drain is requisite to free a Norfolk marle-pit from water, which no sooner touches the sand than it vanishes, as through the grate of an open drain.

"In working a marle-pit, the top-soil is thrown back for manure: the remainder of the uncallow thrown to the bottom of the pit, and levelled for the carts to stand upon. When the jam is low, the marle is thrown immediately from it into the carts; but if it be too high for this operation, piles are driven in a row a few feet from the face of the jam; and, as soon as a crack is formed, water is poured into it, more especially when the marle is dry and stubborn; and by this means many loads are thrown down at once; either to the bottom of the pit, or on to a platform level with the body of the cart; into which the marle, in this case, is thrown with great ease. Taking up the bottom of the jam is the most difficult part of the operation; the marle being first to be cast up on to the bottom of the pit, and afterwards to be thrown into the carts. But by thus bringing up the bottom, two valuable things are obtained; a drain for the water, and a most convenient receptacle for the next line of uncallow.

"The labour bestowed on marle previous to its being put into the cart, whether it be incurred by throwing down, loosening by pecks, crows, &c. or fetching up the bottom, is termed "casting"—the act of throwing it into the cart being called "filling."—The price of casting is three-pence to six-pence a load, according to the circumstances of the pit (the uncallowing being generally done by the day); and the price for filling two-pence to two-pence half-penny, according to the size of the loads carried. I have known three pence a load given for filling and spreading large loads: the price of spreading, alone, is about one shilling an acre. The number of loads carried out in a day by one team, varies, of course, with the dif-

tance to be carried: when the pit happens to lie in or contiguous to the ground to be marled, thirty loads have been carried: but five-and-twenty is, I believe, considered as a good day's work.

"The quantity set upon an acre is equally various; depending upon two things:—upon the judgment of the person who marles, and upon whether the land has, or has not, been marled heretofore.

"It is known, from common experience, that land which has been recently marled receives no apparent benefit from a second dressing of the same manure: but it is equally well known that, after some length of time has elapsed, a repetition of marling will generally answer.

"It is a notion, pretty generally adopted, that, in this case, the quantity ought to be greater than it was the first or preceding time: and it being formerly the practice to set on a great quantity at once, seldom, perhaps, less than forty loads an acre,—this notion has, probably, deterred many persons from doing that which would have been serviceable to themselves and their country.

"But there is not, I believe, any general rule known, respecting either time or quantity: I have had frequent opportunities of making observations on a farm which affords a striking instance on this subject. Two or three different tenants had failed successively on this farm; though by no means high-rented. The greatest part of it had, within the memory of man, been marled with not less, in all human probability, than forty loads an acre; and the tenants who failed, despaired of reaping any benefit from a second marling after so short an interval of time: but this farm falling into the hands of a more judicious tenant, he has, by marling, (and by other acts of good management) accumulated, in little more than twenty years, a farmer's fortune; during which time he marled upwards of one hundred acres; and has found, from long experience, that twenty-five loads an acre is, notwithstanding the recent marling, a sufficient quantity.

"I do not mean to intimate that the same management would every where produce the same effect; but I will venture to say, that no man having marle upon his premises ought to neglect to try its effect, by accurate and repeated experiments, upon every piece of land in his possession, without being led away by any received notion, or general rule.

"The quantity set on, upon land which is not known to have been marled, or out of which the marl is worn, is, at present, less than formerly.

"In the southern Hundreds, to which marle is obliged to be fetched a great distance, ten or twelve loads are considered as a dressing; six or eight are frequently set on.

"In the more central and northern parts of the district, where marle is common on almost every farm, twenty to thirty loads an acre are generally allowed, and sometimes forty loads.

"When it is known, from experience, or taken for granted without proof, that land, either through a recent marling or other cause, is not improveable by marle alone, a small quantity is frequently mixed up with dung; either by bottoming the farm-yard, or the muck-heaps, with it; or by mixing it layer for layer with the dung in the heaps. In either case, they are afterward turned up, and thereby mixed more intimately together. With this preparation, marle has been found to answer, where, in its natural state, it had no effect.

"The symptom, or indication, of a piece of land requiring to be marled, is taken from the plants which prevail upon it. "Buddle" (*chrysanthemum segetum*, corn-marigold) is considered as a certain intimation that the land it abounds upon requires to be marled. "Smartweed" (*polygonum Pennsylvanicum*, pale-flowered persicaria) is likewise an observable symptom. It is, I believe, an undoubted fact, that marle, in a manner, extirpates these plants from the soil; and that "quicks" (*triticum repens*) are considerably checked by it."

DICE-MARLE, a name given by the people of Staffordshire to a reddish marle, that breaks into small square pieces like dice, or into thin flakes, in the manner of lead ore, and looks smooth on the surface.

Marle is distinguished by several names, but principally by the four following:

1. Clay-marle, so called because it resembles clay, though a very different body.

2. Stone-marle, which approaches to the hardness of stone,

stone, and is therefore easily distinguished from clay-marle, which is soft, and is of slower operation.

3. Slate-marle; this lies in thin layers resembling slate, and is also harder than the clay-marle.

4. Shell-marle; which is a composition of earth and small shells. It is of a lighter substance than the others; lies near the surface of the earth, in low grounds, that have formerly been overflowed with water; and sometimes near the sea. This is a very rich manure, and of quicker effect than either of the former.

Marles are all compounds of the same kind of materials, in different proportions, viz. a calcareous earth, clay, and sand; and in some marles are found some shining flakes of foliaceous talc, unsoluble in acids, and very little altered by fire.

There are several kinds of earths that resemble marle, some of little use as a manure, and others that are pernicious to land, as before observed. The colour and appearance are no certain indications of the quality of marle, which the farmer should know, before he ventures to lay upon his land any earths as marle, the quality of which he has no experience of. Farmers having no certain rule of judging this, have been fearful of using marle; which has deprived them of the benefit of this excellent manure, which is to be found in many places, and might be of much more general benefit, did the farmers know how to distinguish it. The ingenious Dr. Ainslie has lately made very curious experiments upon the several sorts of marle, which are the more valuable, as farmers may themselves perform them; which they are advised to do, and to search for marle, by digging and boring; and when they find any earths resembling marle, they may discover with certainty, whether they or any of them is genuine marle, by the following easy process:

1. Put a little fresh dug clay-marle into a glass, and pour upon it as much water as will cover it; the marle will soon dissolve in the water, into a soft soapy substance. Or if exposed some time to the air, it will fall down into a fine powder.

2. Marle effervesces with all acids; a little of it put into a glass with vinegar, a brisk motion will immediately be excited; it will effervesce, sparkle and rise like wine or cyder, and air-bubbles will continue to rise, till the acidity of the vinegar is destroyed. Some other kinds of earth will fall down in water or air; but whatever body has this property, and also effervesces with acids, the farmer may conclude to be marle.

It will be of use to the farmers, not only to distinguish marle from other bodies, but likewise to discover, before they make use of it, what proportion any marle contains of calcareous earth, clay, and sand. This he may readily do, in the following manner.

Having dried and powdered the marle to be examined, pour upon any weight of it a small quantity of water. To this mixture, well shaken, add a little of the acid of sea salt, and when the consequent effervescence is over, add a little more of the acid. Repeat this addition at proper intervals, till no more effervescence ensues. Then throw the whole, with an equal or greater proportion of water, into a filter of brown paper, whereof the weight is known. When all the fluid parts have passed through, fill up the filter, again and again, with warm water. By this means the dissolved particles of calcareous earth, adhering to the residue, or entangled in the pores of the paper, will be washed away, and nothing but what is really unsoluble will remain in the filter. This residuum, with the filter, is then to be completely dried, and weighed: the difference betwixt its weight, and the original weight of the filter, gives you the weight of the unsoluble parts (the clay and sand) contained in the marle under examination. This being known, the proportion of calcareous earth therein is evident.

Here it is to be noted, that a vegetable acid, as vinegar, is not proper for this experiment; because all the calcareous earth in marle, cannot usually be extracted by it: for after the usual filtration, the residuum effervesces with acids. Neither is the vitriolic acid proper for this use: for though it effervesces with all marles, it does not dissolve their calcareous earths, but only forms with them a whitish coagulum, which will not pass through the filter. But all the other mineral acids may be employed to equal advantage; as the acid of sea-salt, nitro, &c.

The proportions of clay and sand, contained in the residuum, or unsoluble parts of this process, are discovered by

what is called elutriation, which is thus performed. Having weighed this dry residuum, mix and shake it well, with a sufficient quantity of water: and after allowing a little time for the grosser parts to subside, let the water, with the finest part of the clay suspended in it, be gently poured off; then add more water to the remainder, and after sufficient mixture and subsidence, pour off that likewise. In the same manner repeat this operation, again and again, till the water comes off perfectly pure; the substance that then remains is sand, mixed, perhaps, with some flakes of talc: and whatever this substance wants of the weight of the residuum employed, is the weight of pure clay, carried away by the water, in this process of elutriation.

This experiment, for discovering what proportion is contained in marle, of calcareous earth, clay, and sand, is not proposed as a matter of mere curiosity, but that the farmer, who will take the small trouble of examining marle in this manner, may thereby know for which of his lands the different sorts of marle is most proper: for though marles will fertilise all sorts of land, yet not equally. Those marles where he finds the largest proportion of clay are most proper to lay upon his sandy, light land; and those that contain the most sand, for his strong land: the calcareous earth fertilises both sorts of land, the light and strong.

It has been a common opinion, that all rich manures were so, because they contained much vegetable food. Hence marle was thought to contain a large proportion of nitre, or other salts; but when it was found, that it contained no salts, it was then supposed, that it attracted them from the air; but this is now discovered to be also an error: for from many accurate experiments upon all the marles, that have been long exposed to the air, no salts of any kind have been found in any of them, except in one experiment made by Dr. Ainslie, who found some muriatic salt in one bed of marle, that had been exposed for ages to the open air; but none in any other bed of marle, that had the same exposure.

It is singular that no vestiges of this or any salt appeared upon any of the beds of marle, but one, and this one had nothing peculiar, either in its composition or situation. It differed from the rest in this only, it was possessed of a greater degree of moisture; but whatever was the cause of this singular instance, it can be no foundation of the opinion of marle attracting salts from the air. And marles are found to produce the most remarkable effects on light exhausted soils, where they can find little or nothing proper for furthering a nitrous process, or the production of any other salt hitherto known.

Stone and slate marles, being harder than clay marle, are longer in dissolving; and therefore a larger quantity of them may be laid upon land than of clay-marle, whereof about thirty cart-loads has been recommended as a proper quantity to be laid upon an acre; of the harder sorts of marle somewhat more, but of shell-marle ten or twelve loads; this being of a more open texture, and sudden effect, much of it laid on at once would make the crops too luxuriant. And in general it is most advisable in laying on marle, to lay it rather sparingly at first, till the effects of it are seen, as it is easy to add more afterwards.

MARSHY LANDS, a sort of pasture or grazing grounds, lying near the sea, rivers, or fens.

As to lands lying near rivers, the great improvement of them is their being overflowed, which brings the soil of the uplands upon them, so that they need no other mending, though kept constantly mowed. The great inconveniency of these lands is their being subject to floods, which high hills near the sides of rivers, and the long course of them, bespeak to be frequent: and, though the richest land generally lies near such rivers, yet there is the greatest danger of the crops being spoiled, especially when they are not inclosed, and therefore cannot be fed with cattle. This, when feeding bears any thing of a price, would be the very best way of managing these uncertain lands; and inclosing them would be highly beneficial on this account. *Mortimer's Husbandry*.

The marsh-lands in Lincolnshire, and many other parts of England, produce a sort of grass, which feed sheep in a better manner than that of almost any other land, in regard to their size, and the quantity of wool. The sheep about Grimsby, and some other places in this county, produce such lustrous wool, or, as they call it, wool of so large a staple, that three or four fleeces usually make a tod of twenty-eight pounds weight. Several hundred loads of this

this wool are yearly carried from these places to Norfolk, Suffolk, and other parts of the kingdom, for the cloth manufactures. They send this in large packs, which they call pockets, each containing about five and twenty hundred weight. *Philos. Trans. Numb. 223.*

When marsh lands lie flat, it is necessary for the owner to keep all the water he can from them. The sea-water in particular is to be kept from them as much as possible; and this is usually done at a very great expence, by high banks and walls.

Two things greatly wanting in these lands, in general, are good shelter for the cattle, and fresh water. The careful farmer may, however, in a great measure obviate these by digging in proper places, large ponds to receive the rain water, and by planting trees and hedges in certain places towards the sea, where they may not only afford shelter for the cattle, but keep off the sea breezes, which often will cut off the tops of all the grass in these places, and make it look as if mowed.

These lands fatten cattle the soonest of any, and they preserve sheep from the rot. It would be of great advantage to them, if there were raised, in the middle of every large marsh, banks of earth in a cross, or in the form of two semi-circles, and these planted with trees; these would serve as a shelter for cattle, let the wind blow from what quarter it would, and would soon repay the expence of making.

There are, in different parts of England, very large quantities of land upon the sea-coasts that would be worth taking in, though no one has yet thought of doing it. The coasts about Boston, Spalding, and many other parts of Lincolnshire, give frequent instances of this, where the sea falls from the land, so that on the outside of the sea walls, on the owse, where every tide the salt water comes, there grows a great deal of good grass, and the owse is firm to ride upon when the water is upon it.

This owse, when taken in, hardly sinks any thing at all, and they dig the walls from the outside of it, all the earth they are made of being taken from thence, and the sea, in a few tides, filling it up again: and though the sea, at high water, comes only to the foot of the bank, yet once in a year or two, some extraordinary tides go over the banks, though they are ten feet high. These banks are fifty feet broad at the bottom, and three feet at the top; and the common price of making them is three shillings a pole, the earth being all carried in wheel-barrows, and face towards the sea, where the greatest slope is, being turfed. *Mortimer's Husbandry. See the article DRAINING.*

MATFELLON. See BLUE BOTTLE.

MAY-WEED, a wild species of chamomile, a trailing perennial plant, which puts out from its branches as they lie on the ground. By this means, and by scattering its seeds long before the corn is ripe, it spreads and multiplies greatly. It flowers in May, and thence has acquired the name of May-weed.

The means of extirpating it are, summer fallows, repeated good harrowing, and burning the collected roots, as before directed, in similar cases, or, which will be found still more effectual, the frequent hoeings practised in the New Husbandry. What escapes these clearings should be very carefully pulled up by hand; for the common weeding-hook will not go deep enough to take out the whole of the long slender tap root of this plant, of which every remaining bit that has a knot in it will produce new shoots. Nor ought the farmer to regret this small additional expence, to get rid of one of the most fatal enemies his corn can have. Mr. Little assures us, that as good a crop of wheat as one would wish to see all the winter time, was, to his knowledge, so destroyed by the coming up of May-weeds and poppies in the spring and summer, that it did not at last yield so much as the seed.

MEAD, a liquor made of honey, and held in great estimation by most of the northern nations, but perhaps not esteemed here so much as it might deserve, if due care was taken to prepare it properly.

All the writers who have hitherto treated of this subject, have given into a capital error with regard to the strength of this liquor, by directing too great a proportion of honey to be dissolved in the water. The usual practice of making it so strong as to bear an egg, is very wrong. The liquor is thereby rendered a meer stum, and this bad quality is still increased by the long boiling generally practised. It is scarcely possible to procure honey so pure, but that some bee-bread, wax, or other substance, is mixed with

it; and this cannot be perfectly separated from it, so far, as I know, but by boiling. On this account the boiling of mead seems indisputably necessary. In order the more effectually to separate these impurities from the liquor, it will be advisable to mix some whites of eggs with it before it is put on the fire, and it will be particularly necessary to skim off the thick scum that rises, the moment the liquor begins to boil; and this must be attentively continued so long as it boils. The only intention of boiling being here to separate the impurities, and to make a perfect union of the water and the honey, both which purposes are very soon obtained, it evidently appears, that the boiling need be of but very short duration. This becomes here more particularly necessary, because the liquor will be the less disposed to ferment kindly, the longer the boiling has been continued. It is perhaps owing to the single article of long boiling, that mead has hitherto lain under so great discredit; because it then never fermented sufficiently to take off its luscious sweetness; whereas, had it undergone a due fermentation, that sweetness would have gone off, and the mead would have attained a fine racy flavour.

Some notable housewives have added hops to their mead. This helps to take off its sweetness, and, as the bitterness of the hop goes off, gives it a pleasant flavour. A ferment is here, as in all liquors that are boiled, generally wanted to bring on a perfect fermentation: but as the least taint in the ferment is communicated to the whole liquor, particular care should be taken that it be very sweet and good. Mead, judiciously managed on these principles, will keep for years, and be improved by age. The racking, fining, &c. of this liquor, are the same as those of other white wines.

MEADOW, a general name for pasture or grass-lands, annually mown for hay; but is more particularly applied to lands which are so low as to be too moist for cattle to graze upon them in winter, without breaking the sward.

Meadows, being generally enriched with the fine mould washed down from the adjacent rising grounds, are usually of a good soil, and seldom require any other improvement, than the removing of temporary imperfections. But they may likewise be of such a nature as to stand in need of a more particular treatment: as is the case when their surface is a mossy, loose earth, or when it is of a binding or clayey quality.

If, through long neglect, a coarse strong grass, rushes, or other bushy plants, be suffered to remain upon the ground till they rot there, they will, in some years, form a loose, spongy substance, somewhat resembling moss. In this case, the first necessary step is to pare off and burn that loose surface, or at least so much of it as to enable the plough afterwards to reach the better soil underneath. The manner of doing this has already been explained so very amply, that it will be sufficient to add here, that this loose upper earth must be so strengthened as to afford sufficient stability to the roots of whatever plants are sown on it, by mixing it well, either with the better soil underneath, or with marle, clay, or rich loam, brought to it from the neighbouring grounds, or with the composts before directed for this purpose.

If the soil is clay, or a strong binding earth, the treatment of it is much the same, whether it be meadow or upland pasture. Such soils, by retaining water in every hollow place, become what the farmers call sour, and produce a coarse grass, composed, as Mr. Miller observes, of bad weeds, of which the several sorts of docks make no small share. Although many of the meadows produce a great burden of what the country people call hay, yet this is fit only for such cattle as, by hard labour and hunger, are driven to eat it: for horses which have been accustomed to feed on good hay, will almost starve rather than touch this. A plain proof of its being disagreeable to all cattle, is, that when they are turned in, after it has been mowed, we often see the ground covered with rank weeds, which they will not meddle with.

When a pasture is in the state above described, if there is a sufficient depth of soil to admit of it, the surface should be pared off, and burnt: and as such places are usually over-run with ant-hills, these should also be burnt; after which, by the addition of proper manure, and by the help of deep plowing, the land should be brought into fine tilth. The deeper this improvement goes, the deeper and more lasting will the grass be. We have been informed of a particular instance of the good effects of this method, by

which the gentlemen who practised it had grafs which continued for years in a strong state of vegetation, and was constantly near a month forwarder than that of his neighbours, whose soil and situation were exactly the same.

Let not any one be deterred by the expence attending this improvement for the crops of grain and other plants taken while the soil is thus preparing, will nearly repay all the charges, and the ground will afterwards yield much more plentiful crops of grafs; at least for a number of years. But as clayey lands require more frequent and more thorough repairs than other soils, the returns of tillage proposed by Camillo Tarello will be the most proper means of managing them.

He would have farmers divide their pastures in four parts, keep one of these parts under grain or pulse, during five years, and at the expiration of that time lay it down to grafs as before; and so proceed with every other part. He proposes, that the first breaking up should be by paring and burning, and thorough ploughing. But if we may differ from him in opinion, we think it is needless to keep the ground so many years in tillage, unless this should suit the husbandman's convenience for the culture of particular plants. In this case the pasture may be divided into five or six parts. After each part has thus been in tillage, Tarello advises breaking up again the spot first began with: though not by burning now, but only by ploughing, in order to sow it as before. "This, says he, will be profitable to the husbandman, and improve the pasture, will benefit the husbandman, because he will thereby raise a greater quantity of corn; and it will do good to the pastures, because nothing is more serviceable to them, than this renewal of their surface, as is attested by Columella. Let not the husbandman imagine that he will have less hay when only three fourths of his usual extent of land are under grafs: for, in fact, it is not the quantity of the land, but the care which is taken of it, that gives plenty of hay."

When a soil of this kind is laid down for meadow, great care should be taken to slope it down gently, from the middle, in such manner that no water may rest on any part of it. If the extent is large, small ditches should intersect the meadow into as many divisions as shall be necessary to form a sufficient drain for the waste water, and the spaces between these ditches may be gently raised. In an upland pasture on such a soil, ridges should be raised inclining a little from the horizontal, that the furrows may be so many drains, as before directed in the ploughing of such soils, to prevent their becoming spewy or wet: for as the rain cannot descend beyond the clay, it will glide along it, till, collected in such quantities as to form a small stream, it issues forth at the surface, usually loaded with some mineral quality imbibed from the earth underneath.

When the soil is a rich or light loam, the plough will not be so necessary; as such meadows or pastures may be repaired by the means which will be pointed out in the directions hereafter given for the improvement of the meadows already laid down to grafs. See the article GRASS and PASTURE.

Black, rich mould, requires but a moderate quantity of water: just sufficient to give action to the fertilising particles it contains. The watering here should be frequently repeated, rather than long continued.

It is a general rule, that sandy or gravelly soils require watering the most of any: because whatever moisture they receive, sinks through them too speedily. But it may be doubted, whether this very reason for watering them be not one of the greatest of objections against their being watered, at least so much as is generally directed: for the water not only passes rapidly through these soils, but it may carry down with it through the sand or gravel, the finer and richer particles of the shallow mould usually found upon such soils, and thereby rather impoverish their surface. It would therefore seem advisable, to let water in upon such soils only occasionally, to refresh the verdure, when their surface is too dry: and too give it a pretty quick current, that it may reach to a greater extent of surface: for if it runs slow, it sinks too fast.

It is a question whether pastures newly laid down to grafs, after having been arable land, ought to be watered at all during the first year. The judicious author of one of the ingenious dissertations in the Memoirs of the Berne Society consulted on this subject an intelligent farmer, who had experienced the effects of watering, and of not water-

ing, these new pastures, as some call them, and was answered, that they had yielded the greatest quantity of grafs the first year when they had been watered, but that the crops had always dwindled the succeeding years: whereas those that were left dry till autumn, and then only begun to be watered had made ample amends during the following years, for the scantiness of their produce in the first. This husbandman was therefore of opinion, that it is best not to water these meadows before the autumn; and he added a farther very sensible reason, namely, that as these new meadows still retain some portion of the manure laid upon the land the year before, when it was sowed with corn, the letting in of water upon them, while the mould is yet extremely loose and light, will be apt to carry off those rich remains of manure, which will otherwise incorporate with the soil, as it acquires more consistence.

A very wrong custom which prevails among our farmers, in general, with respect to low meadows, is, that of flowing them during the whole winter. The roots of all the sweetest kinds of grasses are thereby destroyed, and only such left as are natives of marshes, which are coarse and sour, and which no cattle will eat.

The method which Mr. Miller proposes for the management of these meadows, is never to flow them till the middle or latter end of March, excepting once or twice in the winter, when such floods happen, as bring down a great deal of soil from the upper lands; for then it will be of great service to let such water in upon the meadows, that the soil may settle there; but the sooner the wet is drained off after this is lodged, the greater will be the benefit done to the meadows. By letting on the water frequently, from the end of March to the middle of May, the growth of the grafs will be greatly assisted, and there will not then be any danger of destroying its roots.

River water, which is universally acknowledged to be the best for this purpose, cannot be so beneficial when the stream overflows its banks, and runs rapidly over the pastures, as when its course is slow; and still much less than when it stagnates. It therefore is adviseable to fence in every meadow liable to be thus overflowed, in such manner that it cannot be flooded, but at the owner's pleasure, by opening proper sluices. But as the produce of many meadows will not bear this expence, the proprietor, or farmer, should if possible, prevent the too hasty current of the water, by raising at their upper end, or wherever else it may be necessary, such fences as shall render the water which flows sidewise upon the meadow, rather a back, or standing water. Great advantages will arise therefrom. The finer mould will no longer be carried away by the strong current of the river, which, instead of robbing the soil, will then deposit a rich sediment, and thereby greatly fertilize the land.

The water of mineral springs should not by any means be brought upon pastures; because they are either destructive of grafs, or produce only a very harsh coarse kind of it.

We shall close this subject with the following remarks made by the judicious author of one of the before-mentioned dissertations in the Memoirs of the Berne Society, and which deserve the serious attention of every husbandman who would water his pastures with due care.

"Many people imagine, that the whole art of watering meadows consists in making good channels, and in opening and shutting the sluices at proper times. But this is not enough: for so long as the water flows in a meadow, the farmer should visit all his channels once or twice a day, with a shovel, hoe, or three-grained fork in his hand, and examine carefully whether any of them want cleansing or repairing. Sometimes he will find a channel choked with slime; in other places he will see the water spread too far, or not far enough; and in others again he will observe it not rise high enough to overflow its channel, so that the neighbouring ground is not watered at all. He will immediately endeavour to remedy these defects, according to the exigency of the case, whether by clearing away the muddy slime, heightening the banks of the channel, lowering them, giving a freer current to the water in some places, and checking its course in others, according to the nature of the soil: or by cutting new channels in some places, and laying sods or sluices across others, to divert the stream from such parts as are sufficiently moist, and turn it to others which want watering: for it very frequently happens that, even in the same meadow, though not a large one, there are very different soils, each of which requires the

the assistance of water, but in very different degrees. In short, the careful husbandman will not ever visit his pastures without noticing in them things which may be altered and amended."

The farmer who has improved his meadows according to the foregoing directions, may expect abundant recompence in plentiful crops of grass.

When grass is to be fed off, it should not be permitted to stand till it grows high, because the cattle will then trample under foot great part of it, which they afterwards will not eat. The prudent husbandman will also vary the kinds of cattle fed upon it. See the article HAY.

Meadows that are often mowed for hay, are thereby so much impoverished, that unless they are of an extraordinary rich soil, it is necessary to refresh them frequently with manure, which is commonly done by spreading the manure upon the land in the autumn or spring. M. de Chateaufieux invented a machine with three sharp coulters for cutting the land about 6 or 7 inches deep, that the manure laid upon it, might be washed into the incisions made by the coulters, which also cutting the old roots of the grass, many new roots were produced, and made a very great improvement, particularly, where the meadows were hide-bound, or over-run with moss; he called this instrument a cutting plough.

Mr. Wynn Baker added two coulters, and named it a *scarificator*, and not a plough, because, as he rightly observes, a plough is an instrument that raises and turns a furrow, but the *scarificator* does not; for it only makes parallel incisions in the surface, at about three or four inches distance one from another, but does not raise or turn the land.

This is a very useful instrument for the purpose of improving both meadows and pastures, which it does by cutting only, and without manure; but when the land is also manured at the same time, the improvement is very remarkable, encreasing the crops to a great degree, and also improving the quality of the grass; as has been experienced in several places in England and Ireland.

It is farther remarkable, and has been proved in practice, that if the land is first scarified, and then manured, the improvement is greater than scarifying the land after laying on the manure.

Dung is not so proper for this use, as compost beaten small; but ashes or dry powdered manure is best: for that is soon washed by rain into the traces made by the coulters.

The *scarificator* does not work steady in very stony land, the stones being apt to throw it out of its work.—In that sort of land, the spikey roller may be two or three times run over it; which if done when the land is moist with rain, the spikes will break the turf, and if also manured, will make a considerable improvement: though not so much as when scarified, because that goes deeper, and cuts the roots of the grass, by which they are multiplied.

It is an advantage, in this method of improvement, that a much less quantity of manure is necessary, than in the usual way, of spreading it all over the land without scarifying it.

MEADOW-FOX-TAIL GRASS, the *alopecurus pratensis*, Mr. Young, in his Annals of Agriculture, gives the following account of this grass, in a letter from his friend:

"In the month of June, 1786, I collected a small quantity of the seeds of the *alopecurus pratensis*, from a pasture of mine near St. Alban's, containing, by measure, seven pecks; with this, in March, 1787, I laid down a small field in this place, of three roods; the field had been a hop-ground, the soil excellent, and the seeds were sown (contrary to the usual method) without a crop of corn; with the grass seeds I sowed six pounds of the white or Dutch clover: in the course of three weeks the young grass made its appearance, and continued to grow with great vigour during the summer, and though, from the small quantity of the seed, it did not cover the ground till towards the end of autumn, yet I was able to mow it once, and the produce, inconsiderable as it was, proved excellent food to my horses; I cautiously rooted out the perennial weeds, and by the beginning of winter the ground was so completely overspread, as to wear the appearance of an old pasture. In the spring, 1788, the grass grew rapidly, and at so early a period as the first week in May, was in full ear; by the 14th of which month I might have mown it for hay; my object, however, was to collect the seed for a future, and more enlarged experiment, so that I suffered it to remain till the 27th, when the ears were reaped precisely after the manner of wheat, and carted home. The next

day the stubble (as I may call it), with the bottom of Dutch clover, was mown, and on the 3d of June I housed one ton of hay from the three roods; the seeds, on threshing, amounted to forty bushels. I now proceeded to lay down a field of seven acres (the soil a good earth, neither wet nor over dry) in the same manner as the former, and after the rate of four bushels per acre of the grass seeds, together with eight pounds per acre of the *trifolium repens*; this was effected on the 3d of July, 1788. The succeeding autumn proved moist, and favourable to vegetation, so that the grass and clover made so rapid a progress as to enable me to turn out, on the 8th of October, ten lean Scots, which remained constantly day and night, and ten horses at night only, for the space of three weeks. The great severity of last winter had not the smallest visible effect on the colours, and did not entirely check the vegetation of the grass; this degree of hardiness I must consider as a circumstance greatly in its favour, as other grasses seemed injured, especially the *poa trivialis* (rough stalked meadow grass), which appeared weak, discoloured, and in some places I observed that the blade had perished.

"From the unusual backwardness of the last spring, the grass was somewhat later than the preceding year, but with the clover was in perfect forwardness, early in June: observing a particular luxuriance in the latter plant, I determined to let the whole stand for a crop of its seed, being aware that, by so doing, I should leave time sufficient for the seeds of the grass to sow themselves, to the future benefit of the field; accordingly it was suffered to remain uncut till the 1st of August, at which time, the heads of the Dutch clover appearing perfectly ripe, the field was mown, and on the 6th of the same month I carted 11 tons of the most excellent hay that could be produced; the crop of clover seed will amount to 16 bushels. This field is now in the completest state, and leaves me every reasonable hope of its becoming a highly profitable pasture, preferable to what I might have acquired from the usual, but uncertain, method of laying down lands to grass, nor can I doubt that it will fully recompence the attention and perseverance I have bestowed on it.

"From these and other observations, made by me, on this grass, I am induced to make the following remarks:

"The *alopecurus pratensis* is likely to prove very useful to its cultivators, from its earliness, it being generally the second to flower of those grasses most esteemed for agricultural purposes, and, indeed I have not unfrequently remarked it to precede the *anthoxanthum odoratum*, which is usually the first.

"It is eaten, readily and with relish, by horses, cows, sheep, and swine.

"It produces a great burthen of most excellent hay, which, from its being so early in a fit state for mowing, leaves ample time for the ground to bring a plentiful after-crop to perfection.

"This circumstance, and its being considerably earlier than the *lolium perenne* (rye-grass), was the reason of my selecting it as a fit object of experiment.

"Though to a common observer, this grass, from the breadth and quantity of its foliage, might seem somewhat coarse, yet, on examination, it will be found by no means so as to prejudice the hay from it, or disgust the cattle when depasturing.

"The *alopecurus pratensis* is certainly subject to the depredations of a small maggot, which lodging itself in the seed vessel, destroys the seed; this has occasioned a surmise, that the grass in question could not be generally cultivated, but I presume I may, from the above experiments, venture to assert the mischief not to be so great as to exclude this useful grass from introduction on the most enlarged scale of agricultural practice.

"This grass delights mostly in soils which are inclinable to moisture, yet not so entirely but it will succeed perfectly on good uplands which are not absolutely acid.

"Upon the whole it may be reasonably concluded, that the culture of the *alopecurus pratensis*, would be no unworthy object of the farmer's attention; it is greatly superior to his *lolium perenne*, in being earlier ripe; it seems also more nutritious from the form and greater luxuriance of its foliage. Indeed its generally good qualities have been so strictly attended to by me for three years past, as to induce me fully to agree with the ingenious Dr. Pulteney, who says, that the *alopecurus pratensis* is amongst the most grateful of all grasses to cattle.

"I have sent, here with, 4 bushels of the seeds of the grass, grown

grown this year, of which I beg your acceptance, and if at any future time you should be led towards the Patrician Pile, close to which I live, I shall be made happy in shewing you the field in question, as well as any other attention in my power.

" Since writing the above, I find it in my power to present you with the inclosed small specimens of the seeds of the five other grasses; I have cultivated them for some time past in my garden, for amusement; they are all excellent, and are to be met with in many of the better sorts of pastures in Great Britain."

Mr. Young also inserts the following letter, in his *Annals of Agriculture*, vol. xvi. written by the same person.

" I took the liberty, some time ago, of troubling you with a few slight observations on the seeming propriety of attempting the particular selection, and separate culture, of the most useful sorts of our indigenous grasses; and at the same time, I entered into the detail of several experiments made by me, on the *alopecurus pratensis*, or meadow fox-tail grass, to the culture of which, on account of its peculiar earliness, and ample produce, I had given particular attention.

" These circumstances appear in No. 71. of your *Annals of Agriculture*.

" As more than a year and a half is now elapsed since the above communications, you may possibly not deem it altogether superfluous on my part, to resume the subject more at large; in order to lay before you the progressive success of my experiments and observations on this plant; which may serve to ascertain, with some degree of precision, how far the practical farmers (upon the supposition that by the industry of individuals, he is enabled to procure the pure seeds of the most useful grasses) may proceed to adopt the theoretical, yet natural system of Stillingfleet, with safety and effect.

" On referring to my preceding letter you will see, that my field laid down with the *alopecurus pratensis*, was mown on the 1st of August 1789, and that its produce was 11 ton of hay; the reason of its being mown so late is there fully stated, and the effects fully answered my expectations; for by the fully ripened seeds sowing themselves, the field improved in fulness of plant, whilst the sale of 16 bushels of the white clover seed produced 40l. The seed was very good, but a quantity raised by me last year was of so fine a quality, that my seedsmen informed me it was greatly superior to several cargoes just then arrived from Holland. Why are we to be almost entirely indebted to foreigners for a plant so generally indigenous with us? Several farmers in my neighbourhood have lately cultivated the *trifolium repens* as well as myself; and have remarked, that the wheats sown after it, wear a more promising appearance than those after the red clover, this is important, for if it becomes an established fact, it will be an additional inducement in favour of its culture, for the sake of instituting that change in the rotation of crops, so frequently insisted upon by many enlightened farmers.

" I shall now proceed to state to you the subsequent management and produce of this field.

" The lay was shut up on the 6th of August 1789, as soon as the above 11 tons of hay were carted off, in which state it remained until the 13th of October following, when nine large bullocks (purchased at Braintree and Woolpit fairs in the autumn of the preceding year, and which were at this time nearly fat) were turned into it, where they remained in the most plentiful after-feed until the 28th of that month; they were succeeded by five cows, which were also in the field 15 days, and four horses 11 nights only, and on the 27th of November the lay was cleared and finally shut up for the winter.

" In the spring 1790, the field was bush-harrowed and rolled; the grass had by this time acquired a greater strength of vegetation than in the former year, and assumed a very promising appearance at an early period, and being in high perfection in the second week in June, was mown on the 11th of that month; on the 17th of which the produce, amounting to 14 tons, was carted. The hay, both in flavour and colour, was of the most excellent quality; and the weather proving favourable, the whole was stacked without damage. Soon after this the field was dressed with a rich compost of farm-yard dung, rotten leaves, and some quantity of coal ashes, at the rate of 20 loads (of three horses to each) per acre, which being carefully and evenly spread, the lay was on the 26th of June shut up for the second crop.

" The grass made a rapid progress through the months of July and August, and on the 3d of September was mown, for the second time, and with the same success of weather

attending as on the first crop, seven tons and a half were carted; but here I must observe, it was not without reluctance that I permitted the field to be mown a second time, because, although the hay was well made, and as well got in, yet, even with these advantages, the inferior quality of rouen hay, at this season of the year, is well known to every farmer, and if the weather proves unfavourable during the making, though but for a very few hours, it would be damaged so as to become of little or no value. The hazard, therefore, attending this crop is great, whilst the produce at best can be deemed only of an inferior quality. On the other hand, the luxuriance of autumnal grass is the farmer's pride as well as profit, is of the greatest use to cattle, and best adapted to the purposes of pasturage. Nothing, therefore, could justify the above measure, but the satisfaction of ascertaining with accuracy the quantity of produce and the effects of a second crop on this particular grass; in respect to the former, the produce may fairly be deemed ample; as to the latter, the grass seemed to spring up after the second mowing with equal rapidity as after the first; indeed, this grass seems to me to possess a quality not common to many others, that of sustaining scarcely any check from the wound of the scythe.

" On the 11th of September, 1790, the field was again shut up, in expectation of the eventual advantage to result from the after-feed, which might yet arise before the winter. In this we were not entirely disappointed, for on the 5th of November eight Scots (purchased October 3d at Braintree) were turned in and remained fourteen days, which with eight horses six nights, and four horses eleven nights, conclude the produce of this field to the 2d of December last, on which day it was finally cleared from the stock.

" Concerning the merits of this grass, I am well convinced it will be found to answer every reasonable expectation from it, on soils adapted to its growth, either as hay or pasture; cattle relish the former entirely, and the bare state of the field on the 3d of December last, clearly shewed the avidity with which it had been cropped. In my experiments I have purposely omitted stating a few days during which sheep were occasionally turned into the lay, because the time was but short; but they depastured as freely as the larger cattle, and I have had sufficient proofs upon another pasture formed by me of this grass, that it is highly grateful to them.

" In forming this lay, my wish was to have sown it with a mixture of grass seeds, such as I was sure were suitable to the soil; but the absolute impracticability of procuring them pure, induced me to give up all thoughts of so desirable a combination, and to content myself with the seeds of this grass which I had separately cultivated. I trust, however, the time will arrive when it will be possible for the farmer to procure the seeds of the best grasses in quantities sufficient to enable him to form his combination of them upon just principles; first, by adapting the grasses to the soil intended to be sown; secondly, by selecting, as much as may be, such grasses as produce the greatest quantity of hay or pasture, ripen nearly at the same time, and which possess the greatest degree of perennity. By these means, the land will yield the greatest possible produce of the grasses, will establish themselves so as to extirpate others of a lesser degree of durability than themselves; for it may, I presume, be asserted, that a plant introduced on land of a nature to encourage its growth, will flourish in it, in proportion to its degree of perennity, whereby it is endowed with powers of establishing itself fully, and at the same time of extirpating all neighbourhood annuals, biennials, as well as such perennials as are of less degree than itself; thus it has appeared to me in practice, and this may serve to answer an objection made to the theory of Stillingfleet, that the natural grasses, or such as are the spontaneous produce of the soil, will in time overpower and destroy those imported, and thus defeat the labour and hopes of the cultivator.

" The *alopecurus pratensis* appears to me, from experience, to be intended by nature for moist situations, and though it will succeed well in good upland soils, that are not absolutely arid or bound, yet it will be found greatly more productive in the former situations: but to attempt the culture of this grass on mountainous places or on dry sands would be to no purpose.

" A gentleman, highly conversant in agricultural subjects, has suggested to me that it will be scarcely possible for this field to continue to produce so large a crop as that of 1789, and that perhaps one third of this great crop must be laid to the score of fresh soil; for that it is observable, that when grasses or any other plant have been long continued in one spot, they cease to be equally productive as when first sown or

or planted: with this idea I shall readily concur, and candour must induce me to suspend any final opinion on this subject, until a course of years shall enable me to speak with perfect conviction. Perhaps in no science is it so difficult to form experiments with certainty and effect as in agriculture; a combination of circumstances seems to step in between the cultivator and his experiment: and though he be strictly accurate in his report, a difference of soil, situation, and most of all, of seasons, will often prevent the establishment of his experiments into general principles.

"This however, far from deterring, should stimulate the industrious and practical agriculturist to persevere in his remarks, with the laudable hope that a due course of time, and strict attention, united to a frequent repetition of his experiments, may give a degree of stability to them. By this he will enjoy the satisfaction of having contributed something in his day, to the improvement of a science, at once delightful to himself and highly beneficial to the public at large.

I have lately cultivated another grass, the *festuca pratensis*, or meadow fescue grass, with some success; it is much relished by cattle, and makes excellent hay: it is somewhat later than the *alopecurus pratensis*, but possesses qualities little inferior to that grass. If it is agreeable to you, I will trouble you with some remarks upon it at a future period."

MEADOWS. See WATERING MEADOWS.

MELCERIDES, in *Horses*, tumours so called, from their resemblance to an honey-comb.

They attack the joints and send forth a gluey matter like honey.

The way to cure them, is to burn them with red hot irons, in order to bring away all the matter, and to heal the ulcers with wax melted and hogs-grease, and to wash them with cold, but rather with sea-water, if it can be got. Some recommend the burning them with brass-plates.

MELILOT, a plant of the trefoil kind, and grows in such abundance among the corn in many parts of England, particularly in Cambridgeshire, as to be a most troublesome weed; for it is hardly possible to separate it from the corn in reaping, so that they are housed together, and the seeds of the melilot, which ripen about the same time as the corn, are threshed out with it; after which, they being likewise heavy, it is very difficult to separate them. If but a few of these seeds are ground with the corn, they will spoil the flour; for the bread, or whatever else is made with it, will have a strong taste and smell like melilot plaster. The roots of this plant are strong and woody, and from them spring out several stalks, which rise from two to four feet high, according to the goodness of the land. These stalks branch out, and are garnished with trifoliate leaves, having oval sawed lobes of a deep green colour. The flowers are produced in long slender spikes, which spring from the wings of the stalks. They are of a bright yellow, shaped like the other butterfly flowers, and are succeeded by naked seeds, which ripen in August.

MELLIT, a distemper in a horse, being a dry scab growing upon the heels of his fore-feet, which may be cured after the following manner:

Take common honey, half a pint; black soap a quarter of a pound: mingle them well together, adding four or five spoonfuls of vinegar, and the same quantity of allum, finely powdered, soaked in a hen's egg, with two spoonfuls of fine flour. Let all be well mixed together, clip away the hair from the part affected, and apply it to the sore, after the manner of a plaster, and let it remain five days.

Then take it off, and having washed all the leg, foot, and sore, with broth of powdered beef, rope up his legs with thumbands of soft hay, wetted in the same liquor, and it will effect a cure.

Whenever you dress the sore, do not omit the pulling off the scab, or any crusty substance that may be upon the sore, and also to wash it clean.

MESTIN-CORN, wheat and rye mixed together.

MET, a strike, or four pecks.

METEYARD, or METERWARD, a staff of a certain length for taking measures.

MICE. See VERMIN.

MIDDING, a dunghill.

MIDGE, a gnat.

MILDEW, a distemper very destructive to corn.

"This distemper, says M. Duhamel, attacks the blades and stems of corn, which it covers with a powder of the colour of rust of iron, when at the height of their vegetation. This substance does not adhere strongly to the blades; for I have seen the hair of white spaniels full of this powder, after they have run through a field attacked with this disease. It is likewise known, that if the infected wheat is washed by a plentiful rain, the rust disappears almost entirely, and the grain suffers little from it. The French give it the name of rust, from the colour of the powder, and it seems to be the same distemper which the Roman writers call *rubigo*.

"The cause of this distemper is usually imputed to dry, gloomy weather, happening while the corn is at the height of its vegetation; and in effect I have many times observed, that when a hot sun has succeeded such dry, hazy weather, corn was rusted within a few days after.

"This distemper is not common in clear, dry, hot years: but when the spring is wet, the finest fields of wheat run great hazard of being destroyed by the mildew, which generally appears upon the breaking out of the sun in the morning, after close and sultry weather, during which there has not been any dew. The rusty powder then gathers upon the blades in such quantities as to cover the earth two feet around. M. de Chateauvieux cut off the mildewed blades, and found the trial answer: the same plants produced new blades, and throve much better than those on which this operation had not been performed: but this cannot be done except when the corn is very young.

"This distemper is very fatal; for the finest wheat is suddenly brought almost to nothing, when it is entirely attacked with it.

"If it attacks the plants while they are young, and before their stems begin to rise, the mischief is sometimes not very great, provided there comes on a season favourable to their farther growth. In this case, they are only weakened, as if they had been fed or mowed. They shoot out anew, and produce ears: though their straw is shorter, and those ears are smaller, than they would otherwise have been. But if both blades and stalks are mildewed at the same time, the farther growth of the plant is stopt, and the grain gets scarce any more nourishment; so that the crop is exceedingly diminished.

"This grievous distemper well deserves the serious attention of every inquirer into nature, who interests himself in the progress of agriculture; and I cannot too strongly exhort all such to endeavour to investigate its causes and remedies.

"Several authors have, very improperly, confounded this distemper with others to which corn is subject. M. Tillet imputes it to a sharpness in the air in dry, cloudy weather, which breaks the vessels interwoven with the substance of the blades and stem, and makes them discharge a thick oily juice, which, drying by degrees, is turned into that rusty powder. In effect, if we examine with a microscope, or only with a good magnifying-glass, plants of wheat, whose stems and leaves are covered with rust, we shall see distinctly small crevices in the places where this powder lies, and shall discern, from space to space, in the membrane of the plant, openings through which it seems probable that the juices, afterwards converted into this rusty powder, issues, and over which one may perceive some slight fragments of the membrane imperfectly covering those cracks and openings.

"In support of this opinion, M. Tillet quotes a memoir of M. de Rencéaume, published in the Transactions of the Academy of Sciences, on the extravasation of the nutritive juice of the walnut trees in Dauphiny: of the manna of Calabria, which is not a dew, but the extravasated juice of the leaves of a kind of ash; and what M. Muschenbroek relates in his Physical Essays of thick and oily juices which issue out at the excretory vessels of leaves, and stop there in the consistence of honey.

"However this may be, the rust of corn is the consequence of a distemper of which the first cause is not yet sufficiently known. It is a mistake to think, that the rust and mealy powder which may be seen on many plants are a collection of eggs laid there by insects, and that this is a source of other innumerable insects very fatal to vegetables. By admitting the extravasation of the nutritive juices, as the cause of these distempers, we shall conceive that the rust of corn, the honey-dew, the mealy-dew, and all the unctuous substances which are found upon gramineous

plants, depend on the quality of the juice concentrated in the plants, upon the outside of which it manifests itself by evaporation, and is converted sometimes into an impalpable powder, and sometimes into that thick substance which is red on garden-beans, of a rusty colour on all kinds of corn, greenish on the plumb-tree, yellowish on the ash, white on the larch-tree, &c.

"These observations and reflections still leave undoubtedly much room to wish for farther information.

They will, however, greatly help to point out the path to a careful observer, and ought to excite philosophers to exert themselves in a matter of so great importance to the public. We confess that we have tried to produce the same effects as the dry, hazy weather, which occasions the rust, by applying to the leaves of many plants, acid and corrosive liquors, to others alkaline or spirituous, and frequently such clammy glutinous substances as might stop the perspiration without hurting the texture of the plants: but none of these trials have produced any thing like rust. However, who can tell how far experiments may lead the judicious and attentive? Some little circumstances which may have escaped us, might perhaps, if duly remarked, have led us to the object of our search. The public welfare calls on all attentive observers to exert themselves on this very interesting subject.

"Count Ginanni, in a memoir printed in the *Journal Economique*, for October 1761, treats expressly of this distemper, and says, he has observed, with the help of a microscope, small worms lodged between the two membranes of the blades.

"If we had any certain knowledge of the causes of the rust, we should probably be enabled the more easily to find preservatives against it: but in the mean time it will be right to collect every observation made by lovers of agriculture; because they will certainly afford useful lights at one time or other.

"M. de Chateaufvieux observed, in the autumns of 1753 and 1754, that when the corn was rusted, the second crop of hay was so likewise. The grass turned from a fine green, to the ugly rusty colour of the corn: it was covered with the same kind of powder, and its quantity diminished sensibly every day; and as the whole of a field of corn is not usually affected at the same time, so this distemper extended only to some parts of the meadow.

"The cause of this distemper is undoubtedly the same in corn and in grass; but its effect is not exactly similar. It may destroy annual plants, such as corn, entirely; but in perennials, like grass, it destroys only the leaves or blades. May not the preservation of these last be owing to the taking off of those leaves or blades, when they are cut for hay? But this is only conjecture; for I own that I have not yet made any observation on this head.

"As the straw of smutty, mildewed, or rusted corn, and by the same rule, grass, in a similar condition, may possibly give diseases to cattle fed with it; it were to be wished, for the public good, that a parcel of fodder, the most infected with either of these distempers, should be set apart for the food of a certain number of beasts. If cows or oxen, for example, remain sound and healthy, after having been fed with this growth for two or three months, we may afterwards give it them with confidence and safety: but if, on the contrary, they are visibly disordered by it, the remedy is easy and at hand, by feeding them with good wholesome hay, which will carry off the disease then known to proceed from the bad quality of the food."

The air in England seldom is so dry as to exhale all the moisture of the glutinous exudations, and thereby convert them into the rusty powder above described. The extravasation of the sap seems to account for this distemper of plants in a much more rational manner, than the thick clammy dews which some of our authors speak of, as falling in close weather, stopping the perspiration of vegetables, and hindering their juices from ascending to nourish the flowers, &c.

Mr. Miller takes the true cause of the mildew's appearing most upon plants which are exposed to the east, to proceed from a dry temperature in the air when the wind blows from that point; in which case it stops the pores of plants, and prevents their perspiration, whereby their juices are concentered upon the surface of their leaves; and that concretion being of a sweetish nature, insects are incited thereto. Those insects, finding their proper nutriment, deposit their eggs, and multiply so fast as to cover the

whole surfaces of plants, and, by corroding their vessels, prevent the motions of the sap. He thinks it very probable, that the excrements of these insects may enter the vessels of plants; and, by mixing with their juices, may spread the infection all over them: for it is observable, that whenever a tree has been greatly infected by this mildew, it seldom recovers in two or three years, and many times never is entirely clear from it after. But he by no means allows these insects to be the first cause of this distemper, as some have mistakenly imagined.

It is observable, that mildews and blights frequently attack only one sort of corn, or fruit, and leave the other species unhurt.

Count Ginanni distinguishes two principal kinds of mildew, one of which spots the blades and stems of corn, and dries upon them, without ever producing any powder, but penetrates through their outward covering, and entirely dries them up. This is generally of a pale colour, either reddish, yellowish, purplish, or blackish; and sometimes a variegated mixture of many colours. The other speedily covers the plant with a moist and thickish substance, which afterwards becomes dry, and turns into a powder of one or other of the above-mentioned colours, but most commonly reddish or yellowish. This, says he, always fades, corrodes, and separates the outer skin from the plant. The former extends to every species of corn; but the latter is almost peculiar to wheat in the blade; though it is sometimes seen upon oats and barley. Some may perhaps reckon, as a third species of mildew, a yellowish substance, or powder, sometimes seen under the membrane of the blades of corn, where it raises blisters, makes many little holes and cracks, and corrodes the fibres; and perhaps they may not be wrong in accounting it such.

He is confident that this distemper is the *rubigo* of the Latins.

"For the vegetation of seeds," continues count Ginanni, "after they have been properly deposited in the earth, for their fecundity, their sprouting, and the increase and well-doing of the plants produced by them, it is necessary that the action of the fluid which pervades them be duly regulated: for that fluid is operated on in them by the same causes which affect the liquor in a thermometer and barometer, or influence the hygrometer; so that whenever its due course is obstructed or weakened, or its quantity too much increased or diminished, or its quality injured in any manner whatever, a distemper will ensue. This fluid is subject to two laws of motion; the one, simply as a fluid, which consists in an intestine agitation of its minutest particles; and the other, as a fluid whose progress is through the various ducts of the plant. By the first of these motions it assimilates to itself all the homogeneous particles, and expels the heterogeneous; and by the second it penetrates into the various parts where those functions are to be performed. When both these motions proceed naturally, equally, and justly, the secretions are duly made, and every part of the plant continues sound and healthy: but when that harmony is interrupted, the fluid degenerates from its natural state, and the secretion becomes vitiated and depraved.

"Now, if the several distempers to which plants are subject are owing to the various ways in which the regular action of this fluid may be hurt; and no one distemper can, in my opinion, happen to corn, which will not fall under one or other of these circumstances, we ought to search after and endeavour to discover them, in order to be thereby enabled to prevent, or to cure them, that mankind may be the less exposed to the injuries resulting therefrom. But as the knowledge of these particular things depends on an adequate conception of those which are universal; and as the universal causes of distempers are external or internal, and the distempers themselves seem particularly to depend on the constitution of the air, or an alteration of food, or on both; so when we have discovered the genus of the cause, it will not be very difficult afterwards to find out the species, and the efficient cause. So many and various have been my researches, observations, and experiments, and such the lights which they have afforded me, that, if the love of truth did not oblige me to be dissident of myself, and if I was not thoroughly persuaded, with that great philosopher and mathematician Galileo, that we cannot in general understand how Nature acts, because she makes use of means frequently beyond the reach of our comprehension, I should, perhaps, flatter myself with thoughts of having discovered the origin of

of some of the distempers to which corn is subject whilst in the blade."

He then gives his opinion of mildews, which is, that they come on very early in the morning, and cover the corn almost instantaneously, after a cold night, which has been preceded by a hot day; and that the sap or moisture which then issues out of the plant, is gradually exhaled, and forms the rusty powder which characterises this distemper.

After trying in vain all the boasted remedies of the ancients (highly commended by several modern writers) such as burning of straw and weeds in a serene night, when not a breath of air is stirring, or the wind, if any does blow, comes only from the west, sticking up branches of laurel &c. sprinkling the corn with tobacco, and with pepper; and strewing among it, as Dr. Hales advises, woollen rags steeped in a strong solution of salt of tartar, or sea-salt, or in good white wine vinegar, and afterwards well dried; even from which last he cannot say that he has found much benefit; the method long ago directed in this case by Mr. Worlidge, of making two men go at a proper distance from each other in the furrows, holding a cord stretched straight between them, and carried so as to shake off the dew from the tops of the corn, before the heat of the sun has thickened it, succeeded best of all; to which he adds, as an excellent preservative, keeping the ground perfectly free from weeds, and stirring the earth frequently between the plants. I ought not to omit here Mr. Worlidge's farther observation, that "the sowing of wheat early has been esteemed, and doubtless is, the best remedy against mildews; for by this means the corn will be well filled in the ear before those dews fall, and the increase will consequently be the greater. For curiosity sake, wheat was sowed in all the months of the year: that sown in July produced such an increase as is almost incredible. In France, they generally sow before Michaelmas.

"Bearded wheat is not so subject to mildews as the other, its awns keeping the dew from the ear."

MILKING. Mr. Young, in his *Annals of Agriculture*, gives the following account of milking:

"Having taken several large tea-cups, exactly of the same size, one of these tea-cups was filled at the beginning of the cow-milking, and the others at regular intervals, till the last, which was filled with the dregs of the stroakings: these were each weighed; the weight of each cup being settled, so as to ascertain that the quantity of milk in each was precisely the same, and from a great number of experiments, frequently repeated, with many different cows, the result was, in all cases, thus:

"The quantity of cream obtained from the first drawn cup, was, in every case, much smaller than from that which was last drawn; and those between, afforded less or more, as they were nearer the beginning or the end. It is unnecessary here to specify these intermediate proportions; but it is proper the reader should be informed, that the quantity of cream obtained from the last drawn cup, from some cows, exceeded that from the first, in the proportion of sixteen to one; in other cows, however, and in particular circumstances, the disproportion was not quite so great; but in no case did I find it fall short of the rate of eight to one. Probably, upon an average of a great many cows, it might be found to run at ten or twelve to one.

"The difference in the quality of the cream, however, obtained from these two cups, was much greater than the difference in the quantity. In the first cup the cream was a thin tough film, thinner, and perhaps whiter, than the paper on which I write; in the last, the cream was of a thick butyrous consistence, and of a glowing richness of colour, that no other kind of cream is ever found to possess. See *DAIRY and Cows*.

MILKNESS, a dairy. See *DAIRY*.

MILLET, the name of a plant, which grows naturally in India, from whence it was first imported into Europe, is greatly cultivated in Italy, Spain, and the southern parts of France, for the food of men as well as for that of poultry: and we also raise it in several places in England; though we have our annual supply of this grain from the East-Indies, which makes some people erroneously call it East-India wheat.

It delights in a light sandy soil, prepared in the same manner as for maize; and in such land it branches out into many stalks, sometimes thirty or forty, not unlike reeds either in their shape or leaves, of which there is one

at each joint. The top of each stalk is terminated by a large, loose panicle, which hangs on one side, with a chaffy flower, which is succeeded by a small round seed, about the bigness of turnip or cabbage-seed, of a yellowish white colour in one sort, and of a dark red, inclining to black, in another. The small millet, and the large, a distinction which some writers make, are only varieties of the same sort. It is likewise said to thrive extremely well in strong land: but will not do in stony ground, or where the bottom is either chalk or clay.

Mr. Miller directs sowing this grain in the beginning of April, which may be very right in this country; that it may be ripe in August: but in warmer climates, the general rule is to sow it either between the middle and the end of May, or at Midsummer. The former is reaped at the end of September, and the latter about the end of October.

The seed is sowed in furrows, very thin, and covered with the plough or rake. The largest sort should be sowed thinnest, because it branches most. When the plants are about a month old, the ground should be stirred round them with a hand-hoe, as well to lay fresh earth to their roots, for they require a great deal of nourishment, as to clear them from weeds, of which they will afterwards prevent any great increase, by over-topping them. At the same time, the millet should be thinned wherever it grows too close, so as to leave, in general, about six inches between each plant. The husbandman has nothing more to do to this grain till harvest, excepting that, when it begins to ripen, he must take great care to protect it from birds, which would otherwise soon devour it. If preserved from them, the returns are very great; for it is not easily hurt by drought or rain, nor is it subject to blight. Frequent showers of rain are of great service to it whilst growing.

When the millet is ripe, its panicles are cut off near the uppermost joint of the stalk, with a knife, and put into baskets or sacks, in which they are carried home, where they are then laid up in heaps, covered over with cloths, and after remaining in that situation five or six days, are spread upon the barn floor, threshed out with a flail, and cleansed like other grain. Great care must be taken to dry it well in the sun, before it is laid up in the granary: for it would soon spoil if the least moisture were left in it; this being of all grains the most difficult to keep, unless it be thoroughly dry; and, on the other hand, none keeps longer or better, after it has been well dried. It is not liable to the weevil: and though it should be turned from time to time in the granary, yet if that happens now and then to be neglected, it still keeps perfectly well.

It has been a constant observation, that the late sown millet, I mean so late as Midsummer, had always had the greatest number of abortive grains; that its panicles are smaller than those of the same grain sowed earlier; and that the crop was less plentiful.

The small white millet, which is by far the most delicate, and of which excellent puddings, &c. are made, is the sort chiefly cultivated in this country. The red, which is much larger and coarser, is not used here, except, perhaps, for pigeons, poultry, and swine, for which last it should be ground to meal: but the peasants about Bourdeaux, where a great deal of it is raised in the poor, light lands near that city, make of it a reddish, heavy, ill-tasted bread, difficult to digest. The culture of this sort, which is Mr. Miller's *forgrum*, is, in all respects, the same as that of the white; excepting that, as it grows much larger, the plants require more room.

Millet, either green, or after its grain is threshed out, is very good fodder for cattle, for which use it may be sowed thicker than for a crop of grain. Its many roots, large size, and quick growth, are said to render it a great impoverisher of the earth; for which reason some people pull up the roots, and plough the ground immediately, as soon as the crop is reaped: but others, more judicious, plough in the stubble and roots, which rot, and greatly enrich the soil: and indeed all other succulent plants, instead of being such robbers as is commonly supposed, return to the earth, by the inspiration of their leaves, and perspiration of their roots, even while they grow, perhaps as much as they borrow from it: for how should it be possible for them to pierce into the very driest and hardest ground, as we frequently see they do, unless they perspire moisture through their roots? As this plant requires a great

great deal of nourishment, it would probably thrive best in the horse-hoeing husbandry.

The following account of the culture and amazing produce of the African millet, was sent by the ingenious Mr. Burton, to the editors of the *Museum Rusticum*.

"I cannot help mentioning to you, for the sake of your practical readers, the African millet, *sorgum, millium nigrum*, the culture of which is strongly recommended by M. Tschiffeli, who has written a paper on the subject, published in the *Transactions of the Berne Society*. There is something so very extraordinary in this paper, that I am sure you will think a short abstract of it worthy to be inserted in your work.

"Mons. Tschiffeli observes, that this millet is a plant which merits the husbandman's utmost attention, and that for the following reasons: 1. It thrives in all sorts of soils. 2. It neither requires much dung, nor a great deal of tillage. 3. It is not subject to the depredations of birds, which are very fond of panic and common millet. 4. It yields very large returns. 5. Lastly, it does not exhaust the land in proportion to the largeness of the crops.

"He farther says, that the seed of this sort of millet comes originally from Africa, where it supplies the inhabitants with food; but that they are mistaken who thence conclude it will thrive only in hot countries: for Providence has endowed it with such excellent qualities, that it may, with success, be cultivated in countries much colder than Switzerland.

The first seed of it M. Tschiffeli received was from Mr. Engel, magistrate of Eschalens, who procured it from Pomerania, it being sent to him by the celebrated doctor Schreber, in the spring of the year 1760. M. Tschiffeli had from him about a spoonful.

"In the month of May of the same year, he sowed it on a gravelly soil, hard and stony, very much exposed to the north wind, and which the year before had borne some very indifferent bere. In the month of February preceding, some human ordure had been laid on this land: and in May the clods were all broken before the seed was spread: having so small a quantity of seed, he took care to spread it very thin; and to this does he ascribe the stalks running to the height of eight feet or more. The ears were above ten inches long; and if a shower of hail had not fallen on it, the spoonful would probably have produced him at least a peck. This accident occasioned the loss of half his seed: he had, however, enough left to divide with his friends in Switzerland, as well as elsewhere.

"In the month of May, 1761, he sowed about a quart of seed, or near a pound, on some land, from which he had first pared off the turf, and afterwards burnt it. The space on which the seed was sown might be about twenty paces long, and ten broad.

"Some time before harvest, M. Tschiffeli perceived he should have allotted three times as much ground for that quantity of seed. The stalks, which were very close, were interwoven one with the other, like the hairs of a brush. They were scarcely five feet in height, and the ears also were much shorter than the preceding year: this, however, did not prevent his reaping about seven pecks, or above fifty for one. In the year 1762, he sowed about four pounds of seed, or about half a peck, on some pretty good land, being in quantity about thirty square rods or perches. The year before, the same land bore potatoes; and as he had laid on no fresh manure for the millet, and had neglected to plough it before the winter (for it was only turned over with a spade before sowing) he imagined he had not sown the seed too thick; but in this he was greatly mistaken; the millet came up almost as thick as the year before, and as he had not the courage to thin it, which would have been right, the stalks and ears were shorter than the first year.

"Notwithstanding this, he was enabled to reap twenty bushels, being six hundred and forty pounds; of course, a return of a hundred and sixty for one.

"There can then be no reason to doubt, but that land of a moderate quality, sown thin, and properly prepared, will produce, one year with another, one hundred bushels of millet per acre; for our husbandman got as much in proportion, though his land was but slightly tilled, and he manifestly sowed his seed too thick. This is certainly a most wonderful increase, in what light soever we behold it.

"What grain is there which in the open field will yield a return of one hundred and fifty for one, and which, at the same time, will sell so well? for in price it is on a foot-

ing with wheat. It is true, it yields a heavy, crumbly, and indifferent bread; but if it is made into pottage, it is excellent, very nourishing, and of exquisite flavour. Not only M. Tschiffeli's servants and workmen were very fond of millet thus prepared, but he himself prefers it to the best rice, which will not grow in Switzerland, and comes at a much higher price.

"The millers in Switzerland, whose reputation is not of the best, return a good third of a bushel of millet-meal for every bushel sent to them, after deducting toll, bran, waste, &c. Now this ingenious writer knows by experience, that such a quantity, when made into pottage with milk, will serve at least fifty men for a meal. Surely they cannot be fed at a cheaper rate. In times of scarcity millet must be of great use, as with potatoes the poor might live comfortably.

"An acre of land requires, at most, but ten pounds of seed; and M. Tschiffeli says he can, from his own experience, venture to assert, that millet does not impoverish land in proportion to its produce. The land he sowed in 1760 and 1761, yielded the following year, fine plants of Dutch clover, and rye-grass in as great plenty, with respect to the crops, as the neighbouring land."

MILL-HOLMS, watery places about mill-dams.

MISLEN, the same with maslin, or maslin-corn. See MASLIN-CORN.

MIST, a meteor consisting of gross vapours floating near the surface of the earth.

The bluish mist, which we sometimes see on our fields and pastures in a morning, though often innocent, yet has been in some places found to be the actual cause of murrain, and other fatal diseases among the horned cattle.

Dr. Winklar gives, in the *Philosophical Transactions*, an account of a murrain affecting the cattle in Italy and other places, which was evidently seen to spread itself over the countries in the form of a blue mist. Wherever this was perceived, the cattle were sure to come home sick; they appeared dull and heavy, and refused their food; and many of them would die in four and twenty hours. Upon dissection there were found large and corrupted spleens, splaculous and corroded tongues; and in some places those people who were not careful of themselves, in their management of the cattle, were infected and died as fast themselves. The principal cause of this disease seemed to be the exhalation of some unwholesome steams from the earth; and it was observable that there had been three earthquakes in Italy the year before it happened. The method of cure which succeeded best, was this: as soon as any beast appeared to be sick, they examined the tongue, and, if aphæ, or little blisters, were found on it, they scraped it with a silver instrument made with sharp teeth at the sides, till it bled in all those parts where the aphæ were; the blood was then wiped away with a cloth, and the whole tongue washed several times with vinegar and salt. After this the following medicine was given internally:

Take of foot, brimstone, gunpowder, and salt, of each equal parts; mix these in as much water as will make them thin enough to be swallowed, and let a spoonful be given for a dose three or four times a day.

The cattle which were in health had this medicine given them, as well as the sick; and the consequence was, that very few died in Switzerland, while almost all died in other places.

It was very remarkable that the contagion, on this occasion, seemed to travel slowly and regularly on; it came at the rate of about two German miles in twenty-four hours: this it kept regularly to, during the whole time of its raging, and never appeared in very distant places at the same time.

The whole surface of the earth emitting these effluvia, no cattle escaped them in the course of their way; but those which were kept within doors at rack and manger, fell ill at the same time, and in the same manner with those in open fields. Dr. Stare was of opinion, that it was owing to certain insects which could not fly faster than at the rate of two German miles a day; and that they travelled regularly, and spread the mischief where they passed; but there wanted some judicious persons, versed in these observations, to have examined both the state of the air, and the beasts, on this occasion. *Philos. Transactions*, Numb. 145.

MIXEN, a dung-hill.

MIZZY,

MIZZY, a bog, a quagmire.

MOAR-LOVRE, a term used to express a peculiar distemperature of corn, generally comprehended under the common term of a blight. In this case the earth sinks away from the roots of the corn, and leaves the plant standing in great part above ground with naked roots; these being too weak to support the stalks, the plants fall, and the ears become light. This is a distemperature peculiar to corn growing on light and loose lands. *Tull's Horse-hoeing Husbandry*.

The remedy is this: turn a shallow furrow against the rows, when they are strong enough to bear it, and the mould is fine and dry; the motion of the stalks with the wind will draw in this loose powder, and it will spread itself equally among all the rows, settle about the roots, and cover them.

MOLE, a small animal too well known to the husbandman, from the mischief it does in the fields, by loosening of the earth, and destroying the roots of corn, grass, and other vegetables.

The common method of destroying them is by traps, made in the following manner:

Take a small board, about three inches and a half broad, and five inches long: on one side thereof raise two small round hoops or arches, one at each end, like the two hoops or bails of a carrier's waggon, capacious enough for a mole to creep through easily: in the middle of the board make a hole about the bigness of a goose-quill, and have in readiness to put into it a stick about two inches and a half long, fitted at one end to the hole, and a little forked at the other. Cut also a hazel or other stick, about a yard, or a yard and a half long, which will rise with pretty strong elasticity, when it is stuck into the ground; and to the end of this stick fasten a very strong noose of horse-hair, made so as to slip easily. Have likewise in readiness four small hooked sticks: then go to the furrow or passage of the mole, and after you have opened it, fit in the little board with the bended hoops downward, so that when the moles passes that way, it may go directly through the two semicircular hoops. But before you fix the board in this manner, put the hair string through the hole in the middle of it; place the noose in a circular form, so as to make it answer to the two hoops; put the small stick before-mentioned gently into the hole in the middle of the board, so as just to stop the knot of the hair spring, without entering so far as absolutely to tighten it. Then fasten the board down with four hooked sticks, and cover it with earth. When the mole, passing in its furrow, comes into this trap, it will displace the small stick that hangs perpendicularly downward, the knot will then be drawn through the hole, and the noose instantly straightened by the rising of the end of the hazel stick to which it is fastened, which will catch the mole round the neck.

Others, watching their motions in the morning and evening, which are their usual times of stirring, dig them out in a moment with a spaddle: and about March, which is their time of breeding, numbers of their young ones may be destroyed by turning up their nests, which are generally in the greatest hills; and the old ones who come to seek their young will presently be taken.

Some commend the pot-trap, which is a deep earthen vessel set in the ground with the brim even with the bottom of the mole tracks. The season for using this is when the moles couple, which is about the beginning of March, or perhaps somewhat earlier.

M. Worlidge says, they may be driven from the gardens, meadows, and other places where one would not choose to dig, by fuming their holes with brimstone, garlic, or other unfavourable things: and that the putting a dead mole into a common haunt, will make them absolutely forsake it: to which Mr. Mortimer adds, but only upon report, that white hellebore and the roots of palmar-christi, dried, powdered, and sifted through a fine sieve, then mixed with barley-meal and eggs, and worked into a paste with wine and milk, will kill them, if laid in little pellets under their hills.

The writers of the *Memoirs of the Society of Agriculture at Angers*, recommend hazel-nuts boiled in an infusion of hellebore, as a sure method of destroying moles. Two or three of these nuts are to be laid under each mole hill, and the creatures, by being fond of that fruit, will be poisoned by eating them.

The way to remove mole-hills and ant-hills, which are not only disagreeable to the sight, but detrimental to the

pasture, and a great hindrance to the mowing of the grass, especially where they are numerous, is particularly in regard to the latter, either to divide the turf which grows over them, into three parts, with a spade, or other instrument, then to pare it off each way, to dig out the middle or core of the hills, to spread this mould over the other ground, to leave the holes open all the winter, that the ants may be killed, or lay the turf down again in the spring, and to roll those spots after the reinflated turfs are settled, and their grass has taken fresh roots; or, which is a more expeditious method, to scoop them out at once, with what Mr. Bradley calls a scoloped mole-hill plough, made in the following manner:

From *a* to *a* (fig. 1. Plate XX.) is an iron plate, about five inches over, and above an inch thick at the back, *b b* is the scoloped spade, or tongue of the plough, and about a foot over at the widest part. This, from the sharp point, grows thicker by degrees, till it comes to the back, which should be a full inch thick. The iron must be well hardened, and very sharp at the edges. *c c* is the paring plate, which should be very sharp on the fore edge, and, with the scoloped spade, should be four feet long from *a* to *a*. *d d* are iron sockets, in which are fixed the plough handles, or stils, *e e*. At *a a* are foot-links to set the harness on, for one horse, or two horses lengthwise, to draw by.

When this plough is used, the point of the scoloped spade must be set to the bottom of the hill, by raising the plough stils, so that it may go into the ground; and when the hill is near cut through, the point should be raised up again, by weighing a little on the stils.

The hollow left by this plough will receive the rain as it falls, and this will drown the remaining ants.

After the mole and ant-hills, and other inequalities have been thus taken off, the best way is to carry them to a corner of the field, there to break them well to pieces, and mix them with a considerable portion of lime, or other manure suited to the soil, which will effectually destroy every remains of the ants, and convert the whole to good manure, which may then be profitably spread all over the surface of the ground. The spots on which the mole, or ant-hills stood, should be loosened with a spade, then mixed with lime or other manure, and afterwards be laid down with clean grass seeds.

This method is the most adviseable of any, because a fine grass will be raised in those places, instead of the coarse benty growth which occupied them before.

MOLES in the Fields, may be destroyed by taking a head or two of garlick, onion, or leek, and put into their holes, and they will run out as if frightened, and you may with a spear or dog take them.

Or, pounded hellebore, white or black, with wheat flour, the white of an egg, milk and sweet wine or metheglin, make it into a paste, and put pellets as big as a small nut into their holes, they eat it with pleasure, and it will kill them.

Blith, in his *Book of Husbandry*, says, if you have the conveniency to let water over your ground, it will destroy the moles as far as it goes.

The juice of wild cucumber, or the dregs of oil, poured into their holes, effectually kills them. Or having made a strong lye of water and copperas, early in the morning pierce holes in all the mole-hills with a large stick, and pour this water into the holes in the evening, and it will destroy them.

Make a paste of the powder of the bark of dogs-cole, mixed with rye, barley, or wheat-flour, and wine and milk; put small bits of this into their holes, and they will feed on it till they die. Marking-stone, mixed with wild cucumber-juice, will kill them, if poured into their holes. Some persons place traps at the mouths of their holes; and sometimes they are destroyed by cats and tame weasels.

By the sides of banks, in cart-ruts, in March and April, when the ground is soft, and they burrow but a small depth into the earth, having observed new-made hills, tread them down softly; and then at her customary hours of working, (which in spring-time is generally about six, eight, and eleven in the morning, and three, four, and seven, in the afternoon) she will raise up the earth in the trenches: you must then listen and watch carefully, and you will see or hear her move the earth in the trench. Then fix the broad end of your staff across the holes behind her, and place your foot before her, thus stopping up the way, both behind and before; and then take her up with your spattle.

About sun-rising moles generally go abroad : in moist weather they go out both morning and afternoon ; but in dry, hot weather, seldom but in the morning : they work under hedges, bushes, and trees, in frosty weather. In winter, and in wet seasons, they lie chiefly under the roots of trees, in hedges or banks, and go out every morning to feed, returning in about two hours : when the weather is dry, they go two or three hundred yards. Having remarked where they have been, make trenches, and chop down, with the broad end of your staff, the earth which the mole hath raised, or passed through, and tread it down with your foot lightly in trenches : make trenches in the most convenient places : if this be near their holes, it is best to take them going out, or returning. The most proper places for making trenches are by the sides of hedges, or near the banks, and roots of trees.

It has been said, that if, in gendering time, a bitch mole is drawn or led along the ground with a string, the bucks will follow, so that they may be caught, by a pot placed in the ground for that purpose.

In places you would not dig nor break much, the fuming their holes with brimstone, garlick, or other unfavourable things, drives them away ; and if you put a dead mole into a common haunt, it will make them absolutely forsake it.

Or, take a mole-spear or staff, and where you see them cast, go lightly ; but not on the side betwixt them and the wind, lest they perceive you ; and at the first or second putting up of the earth, strike them with your mole-staff downright, and mark which way the earth falls most : if she casts towards the left hand, strike somewhat on the right hand, and so on the contrary to the casting up of the plain ground, strike down, and there let it remain : then take out the tongue in the staff, and with the spattle or flat edge dig round about your grain to the end thereof, to see if you have killed her ; and if you have missed her, leave open the hole, and step aside a little, and perhaps she will come to stop the hole again, for they love but very little air, and then strike again ; but if you miss her, pour into her hole two gallons of water, and that will make her come out for fear of drowning ; mind them going out of a morning to feed, or come home when fed, and you may take a great many.

Mr. Marshall, in his *Rural Economy of Yorkshire*, says, that "a man whose examinations are seldom superficial, is clearly of opinion, that moles are useful to the farmer. And under this idea he has not had a mole killed upon his farm during the last twenty years. He believes them to be useful in draining the soil ; in communicating air to the roots of plants ; in raising fresh mould upon grass-land ; and in killing worms ; which, he conceives, feed upon the roots of grass and corn.

"That moles are useful to cold, strong-textured land, and to grass-land in general, is probably a fact ; and this may account for the opinion under notice, which was formed on soil of that description ; or on grass-land of a more loamy nature.

"But admitting the moles are useful upon cold, stony, grass-land, it does not follow that they likewise are useful on light, thin-soiled, arable land. Their mischiefs are, here, too obvious to be overlooked."

MOLTEN-GREASE, a fat or oily discharge with the dung, and arises from a colliquation, or melting down of the fat of the horse's body, by violent exercise in very hot weather.

It is always attended with a fever, heat, restlessness, starting, and tremblings, great inward sickness, shortness of breath, and sometimes with the symptoms of a pleurisy. His dung will be extremely greasy, and he will fall into a scouring ; his blood will have a thick skin of fat over it when cold, of a white or yellow hue, but chiefly the latter ; the congealed part, or sediment, is commonly a mixture of size and grease, which makes it so extremely slippery, that it will not adhere to the fingers, and the small portion of serum feels also slippery and clammy. The horse soon loses his flesh and fat, which probably is dissolved and absorbed into the blood ; and those that survive this shock commonly grow hide-bound for a time, their legs swelling both before and behind, and continue in this state till the blood and juices are rectified ; and if this is not done effectually, the sore, or some obstinate furfeit, generally follows, very difficult to remove.

In the first place, bleed plentifully, and repeat it two or

three days successively in smaller quantities ; two or three rowels should also be immediately put in, and cooling emollient glysters daily thrown up, to abate the fever, and drain off the greasy matter from the intestines. By the mouth give plenty of warm water, or gruel, with cream of tartar, or nitre, to dilute and attenuate the blood ; which in this case is greatly disposed to run into grumes, and endanger a total stagnation.

When the fever is quite gone off, and the horse has recovered his appetite, gentle aloetic purges should be given once a week, for a month or six weeks, in order to bring down the swelled legs ; but if the purgative ingredient does not exceed half an ounce, or six drams of fine aloes, it only opens the belly gently ; and, with the other medicines joined with it, passes into the blood, acts as an alterative, and operates both by urine and perspiration : as will appear by the horse's staling plentifully ; and the kindly feel of his skin. To this end give the following, which, repeated for some time, will entirely remove this disorder :

Take of succotrine aloes six drams ; of gum-guaiacum powdered, half an ounce ; of diaphoretic antimony, and powder of myrrh, of each two drams : make into a ball with syrup of buckthorn.

Or it may be prepared with an ounce of aloes, six drams of diapente, and a spoonful of oil of amber.

These will seldom take a horse from his business above two or three days in a week ; neither will he lose his flesh or appetite with them, which cannot be obtained by any other method of purging and gives this greatly the preference in many cases.

Two ounces of nitre mixed up into a ball with honey, and a dram of camphire, will also be found an excellent medicine for this purpose, as it will powerfully attenuate the blood, and promote the due secretions ; to which end it should be given every day for a fortnight, or three weeks. *Bartlett's Farriery*, p. 168.

MOLTER, the toll of a mill.

MOON-EYES ; a horse is said to have moon-eyes, when the weakness of his eyes increases or decreases, according to the course of the moon ; so that in the wane of the moon his eyes are muddy and troubled, and at new moon they clear up ; but still he is in danger of losing his eye-sight quite.

MOOR, a very fine black mould, sometimes found under a pretty thick sward of grass, but more frequently under moss, or straggling plants of heath.

It differs from peat, in that it does not stick together, nor has the fibrous roots, or bituminous viscous quality of this last. Peat, when dry, becomes hard and firm : this falls into powder. It cannot be better described, than by comparing it to that substance which is found in hollow, rotten willows, and other trees of that kind ; which gives room to think that it arises from rotten plants. It is of a spongy nature, and ready to imbibe moisture, which adds considerably to its weight. There is generally underneath it, as under most earths of this kind, a bed of clay, or some substance impervious to water : so that the particles of bodies decayed on their surface, not being admitted into the soil, remain upon that surface, dry there, and increase its thickness, according to the continuance of the cause.

If this kind of soil is collected in a place where running water, in rainy seasons, brings with it clay, or other fat soils, from the neighbouring grounds, it then acquires a greater degree of cohesion, hardens when dry, and resembles the cleansing of ponds more than the former.

The most considerable soil of this kind is the sort called peat. This is usually full of roots of weeds, and even of trunks and branches of trees and other plants. It always contains a bituminous oil, which renders it very inflammable when dry ; at which time it also becomes very hard, though it is quite soft when in the mine, if we may be allowed to give that name to the bed in which it lies ; for there it is easily cut in the form of bricks, as we see it when used for fuel.

"The whole mass and body of this soil, says Mr. Maxwell, is a dunghill, made up of rotten timber, grass, weeds, and often mud washed from the higher grounds about it, by the land-floods ; than which there are few richer composts : only by age, and its cold situation in water,

water, pent in about it by the neighbouring rising grounds, its salts are weakened, and its spirits become languid. The same will happen to the richest dunghill that can be made of any composition whatever, if too long kept. It will even become such as not to be distinguished by the eye, from ordinary moss; nor will it be more useful, as dung, except either in proportion to the shorter time it has been kept, or the better situation of the place where it has stood. I believe the qualities of mossy grounds differ very little from one another in any other respect, than with regard to the better or worse quality of the mud which makes a part of their composition. They are more or less spongy, in proportion as this rich mud fills up the cavities of the component vegetables, which are preserved from putrefaction by the acid in the water. The less spongy, and the more rotten the moss is, the fitter it is for the vegetation of any thing planted in, or sown on it."

The first thing to be done, in order to the improvement of moor, is to divide them into proper inclosures; not only to secure their future produce, but also to be a means of procuring rich earth to cover the otherwise insipid useless mould on the surface, and give root to the plants which may afterwards be cultivated in them. Then, as the natural produce of this earth is of no value, its surface should be pared off, in order to be burnt: but as this subject, of burning earth, has been before fully treated of, we shall only observe here, that the husbandman should be very careful not to make the clods too dry, or light his fires in too dry a season, lest they should extend farther and deeper than was intended.

If the depth of the moorish earth be not very considerable, the surrounding ditches, which make the inclosure, will afford the rich strong soil, which should be spread about three or four inches thick all over the surface. When the clods are burnt, their ashes should be mixed with this new soil. If no proper earth can be got from the ditches, sand or gravel may be used with success, as was practised by the ancients. Gravel is singularly beneficial to such lands; as has been shewn under the article Bog.

The Berne Society, who recommended this method of improvement as founded on repeated experience, very properly observe, that the good effects of the sand and gravel will be considerably increased by a moderate mixture of dung, and that, especially if the ground be intended for ploughing, this covering should be at least a hand's breadth in thickness. Dung alone would undoubtedly be extremely efficacious on all such soils, in which it is remarked to be of longer service than in any other; but the farmer can seldom spare a sufficient quantity of it to go far enough unmixed, nor indeed for mixing. In this case, other ingredients must be resorted to; though the sand, or gravel, will generally do great things without any mixture. Well preserved ashes will be of excellent service, and so will the rubbish of old buildings, or any other similar substance, when mixed with the sand or gravel, even of the coarser kind, and incorporated with this naturally rich earth, which, were its real value known, and the proper method of treating it rightly understood, might claim a preference before any other soil. Loam is still better than either sand or gravel. This should be brought on before the fires are lighted to burn the surface of the moss, and should remain in heaps till it can be equally mixed with the ashes. Lime, where it can be had, will also contribute to the meliorating of mossy grounds. The moorish earth, thus covered, is fitted for various kinds of crops.

Mr. King, who observed that the places and bogs in Ireland, where a little earth had chanced to fall as the peasants were carrying it to mend the ways across them, became a green soil, covered with a fine Scotch grass, does not doubt but that the same expence as sands or gravels land, would bring a dried bog even to be arable; and as to the common opinion that gravelling is bad for grass, the contrary, he says, is apparent; especially in bogs. Another method of reducing barren, boggy land, in Ireland, is by laying upon it a little dung or straw, and covering this with shells.

A strong proof of the propriety of covering moss with earth, results from a fact which happened to Mr. Graeme, near Stirling. Two years after this gentleman had earth his moss, which he had not yet sowed, it was as full of natural white clover, and other grass, as any field generally is in twice that time.

In the province of Groningen, they pare off the upper

surface of the soil, which is a light, loose earth, and lay it by till they have dug out the peat underneath, when they mix it with the sand which lies under the peat, and sow it with rye and hay-seed the first year; after which they let it run to grass, and have amazingly fine crops. In Sweden, a drained bog was remarkably improved by a peasant who burnt upon it a parcel of useless wood and lime-stones; and another converted his drained bog into a fine meadow, by covering it with lime and tanner's-bark.

Mr. Elliot, after draining a very remarkable swamp, sowed it with grass-seed such as red clover, spear-grass, fowl-meadow grass, and herd-grass; none of which came up so well as the red clover, which he found to be the boldest and most hardy. Though this came up well, yet, where the sward was strong, what with the toughness of the ground, and the over-topping growth of the wild natural grass, it made but slow progress till the fall of the year, and then it mended considerably. The other sorts of grass came up but poorly, the land being, as Mr. Elliot judges, too new and tough for them. In September he ploughed up a piece of this ground, where he had not sowed any grass. It ploughed very tough, and the cattle mired in some places; but he kept them as much as possible upon the grass; notwithstanding which there was a necessity of leaving many baulks. About a month after, he ordered these baulks, to be hoed up, and was agreeably surprised to find how easily this was done. He found the meadow rotted and mellowed more in one month in the fall, than it had been the whole summer; but thinks the ploughing would have been performed with much greater ease, if it had been deferred till a month later. In July he sowed a little piece with turneps, which came up, but did not grow well till the ground began to rot in the fall of the year, when they throve perfectly, and were good and sweet, instead of being rank, as he expected.

This gentleman found by experience, that such drained land must have one summer to ferment and rot, so as to become proper soil, before it will be fit for the grain or every sort of grass. "If, says he, I had sowed red clover instead of the other sorts of grass, I had saved five pounds in seed. Clover out-did my expectation, and the other sorts fell short of it. If others save where I lost, and mend wherein I was mistaken, it answers my design in writing.

"By a little experience which we have had of these drained lands, we find they will produce Indian corn, sixty or seventy bushels to an acre, and flax. If life and health be continued, I design to try liquorice-roots, barley, Cape-Breton wheat, cotton, indigo-seed, wood for dyeing, and the water-melon. But what I have principally in view is hemp. New-England doth not, I suppose, expend less than several hundred thousand pounds worth of foreign hemp yearly. If we can rise more than to supply our own occasions, we may send it home. It is not a mere conjecture, that the drained lands will produce hemp. I am informed by my worthy friend Benjamin Franklin, esq. of Philadelphia, that they raise hemp there upon their drained lands.

"Hemp requires such very strong land to produce it, that it would consume all our dung to raise it in any great quantities; so that we should not be able to raise bread-corn: therefore, how inviting soever the trade is, and how great soever the encouragements have been, both from home and by our own government, we have not as yet engaged in that affair. We have now a promising prospect of success in these drained lands: what may be the issue, time and experience must determine. A meadow of drained land, which could be laid under water, and this drawn off at pleasure, would probably be of great value. I have heard that a man in the Jerseys hath such a meadow, which though only half an acre in extent, yields him as much hemp yearly as sells for fifty pounds.—York money: but this seems incredible."

Whatever advantages are reaped from hemp, may also be received from flax, if rightly managed, upon mossy grounds. Some improvers in Scotland have already tried it with success, and, though a new attempt, doubt not its answering well in that kind of soil. The most approved method of cultivating and dressing each of these singularly beneficial plants, are given under the articles HEMP and FLAX.

"It is common in swamps, continues Mr. Elliot, to find the moss two or three feet deep. At first, I was perplexed how to get rid of it, and somewhat doubtful whether the land

land would be worth any thing, if this surface was removed. When the water was drawn off by ditches, the moss grew so dry, that in a hot summer season it would burn quite down to the ground. To burn this, or any other trash you would consume upon land, set fire to it when the weather is clear, the sun hot, and a strong southerly wind blows, which makes fire rage more fiercely, and do much more execution than a northerly or westerly wind. In a northerly wind the air is thin and light, so that the fire is not strongly compressed: the moist heavy south wind prevents the dissipation of the fire, and renders it more compact. Thus we see a smith swob and wet his coals, by which means the heat is greatly increased. Whether this reasoning be just or not, the fact is certain, and that is the chief concern of the farmer.

"Deep swamps are preferable to those which are shallow: for experience shews, that a deep soil bears extreme drought better than any other land, in the hot season. The cold drought in the spring will hurt such land, so that the first crop of grafs will be very great; but the second crop will be extraordinary good.

"The red clover in my drained land above-mentioned, looked in the cold drought at the latter end of the spring, as if it would not come to any thing: but it recovered a good colour, and grew up well, when hot weather came on, though the drought continued. This is such an advantage as will always recommend a soil eight or ten feet deep.

"Our ditching and draining dry only the top of the ground, not more than three feet deep in the hot and dry season; I suppose that the moisture from the mud and water underneath is drawn by the force of the sun, so that the roots of the grafs are furnished with sufficient moisture to bring forward the vast burden they frequently bear. But this is not to be expected till the land be concocted, changed, and altered by the sun and air: for at first, soon after it is drained, it is pinched with the drought more than any other land.

"Those swamps which are thick overgrown with moss, prove as good as any other drained land, when they are so far dried by draining, that the moss will rot, or burn off. I mention this, because it is best that the farmer may work as free from discouragement as possible.

"Our drained land, though in all other respects well adapted for producing Indian corn, is of so loose a texture, that the plants become an easy prey to the crows and other birds, which, if not prevented, will pull up a great part of them, and destroy the crop. To guard against this great discouragement in all such land,

"Take the roots of swamp hellebore (known in different places by the several names of skunk-cabbage, tickle-weed, bear-root) and boil them in so much water as to keep them covered an inch deep: by two hours boiling, the liquor will be of sufficient strength: strain it off; put your corn into it while the liquor is warm, and let it steep twenty hours. It will then be fit for planting.

"This is found to be an effectual security. The Rev. Mr. Todd observes, that after meeting with much trouble and loss, by having his corn repeatedly pulled up, he planted his ground with corn steeped in this liquor; but not having enough of that, he ordered the planting to be finished with unsteeped corn. The event was, that the birds pulled up but two or three hills of the soaked corn, but left not one in ten of those which were planted with unsoaked corn. He planted anew, with steeped corn, the hills where the plants had been thus 'pulled up, except a few of them in the middle of the field, which were planted a second time with unsteeped corn, upon a supposition that the birds would not find them out: but the result was as before: all the unsoaked was pulled up, and the hills planted with the steeped corn were spared.

"Upon the whole," says Mr. Todd, "I think this experiment a full proof that corn so prepared, when planted, is secured from the birds; the knowledge of which may be of great service to the husbandmen, as the preparation is cheap and easy, and our swamps seem to be the best land we have for Indian corn. My little swamp this year yielded after the rate of above ninety bushels to the acre, and was easier and cheaper tilled than the same quantity of upland." See the article Bog.

MORES, or *Mours*, hills.

MORGAN, the same with May-weed. See the article MAY-WEED.

MOSS, a name given to moory or boggy grounds, in many parts of England. These sorts of land consist of a turfy surface, below which is a black, moist, spongy earth, which being dug up with spades, almost in the form of bricks, and dried, is what they call peat, and used as fuel in several parts.

The shortest method of all for the improvement of moss, if the ground be designed only for grafs, and its situation be such as admits of it, is this: first drain the moss, and if there be heath upon it, burn that off, and make the surface even. Then make a dam at the lowest part, and a sluice, and work the water upon it through the winter. The mud which comes with the land-flood will bring a fine sward upon it in two or three years, and be afterwards a yearly manure; so that it will bear annual cutting, and, besides, be good pasture for cattle, after the sward is become strong enough to bear them.

Mr. Græne found that the improvement of moss may be endangered by draining it too much; for his crops were best where the surface of the water in the surrounding ditches was not above three feet lower than the level of the moss. It will, undoubtedly, be a vast advantage to an improved moss, if the farmer is able to flood it at proper times, by means of a sluice in the lowest part of the surrounding ditch, as mentioned before. This will greatly promote the growth of plants; but should be used with the caution of not letting the water remain too long at a time upon the ground, because, though there will be no danger of its re-converting the soil into a bog so long as there are channels to carry it off, it will be apt to chill, and thereby hurt the plants. See the article Bog, and Moor.

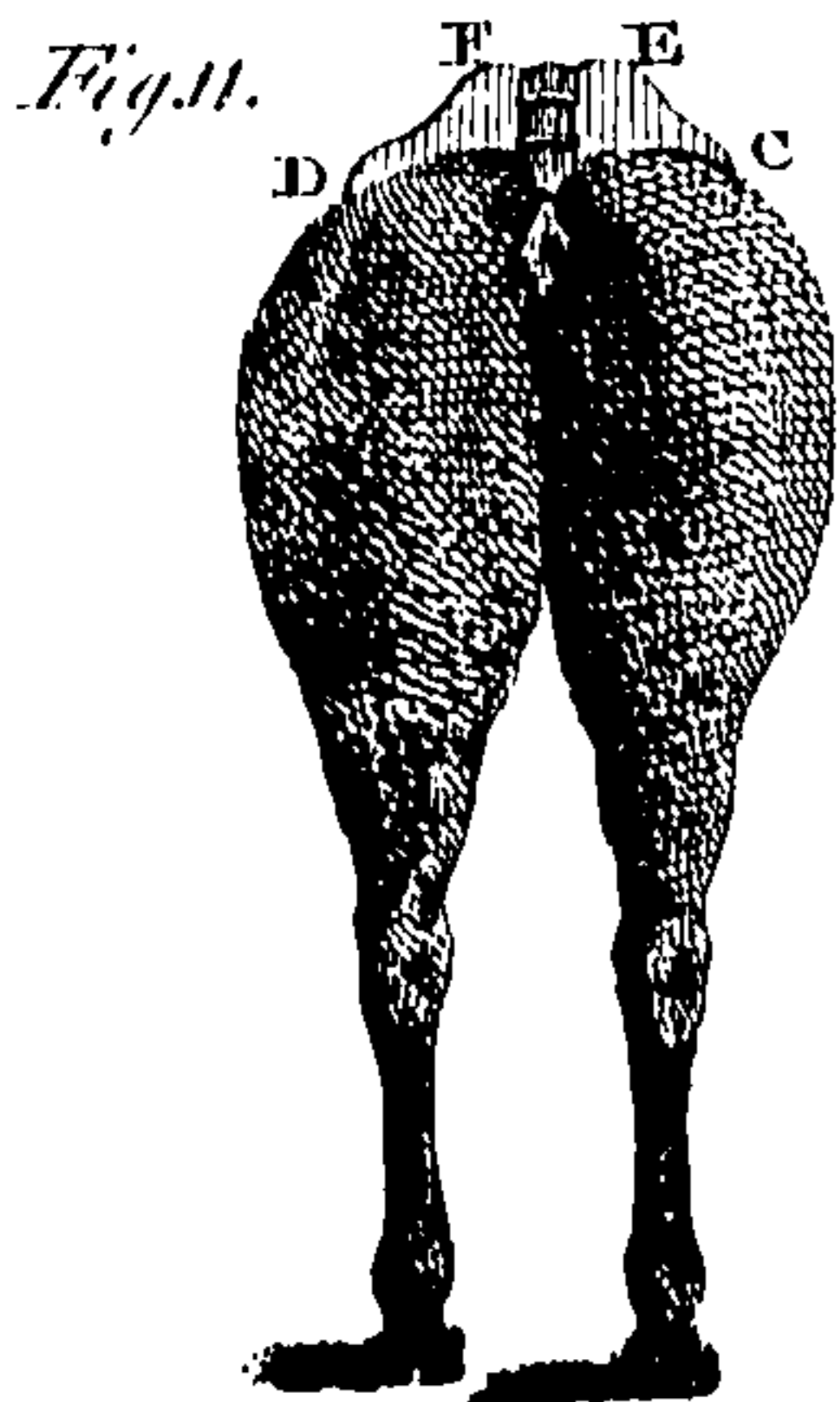
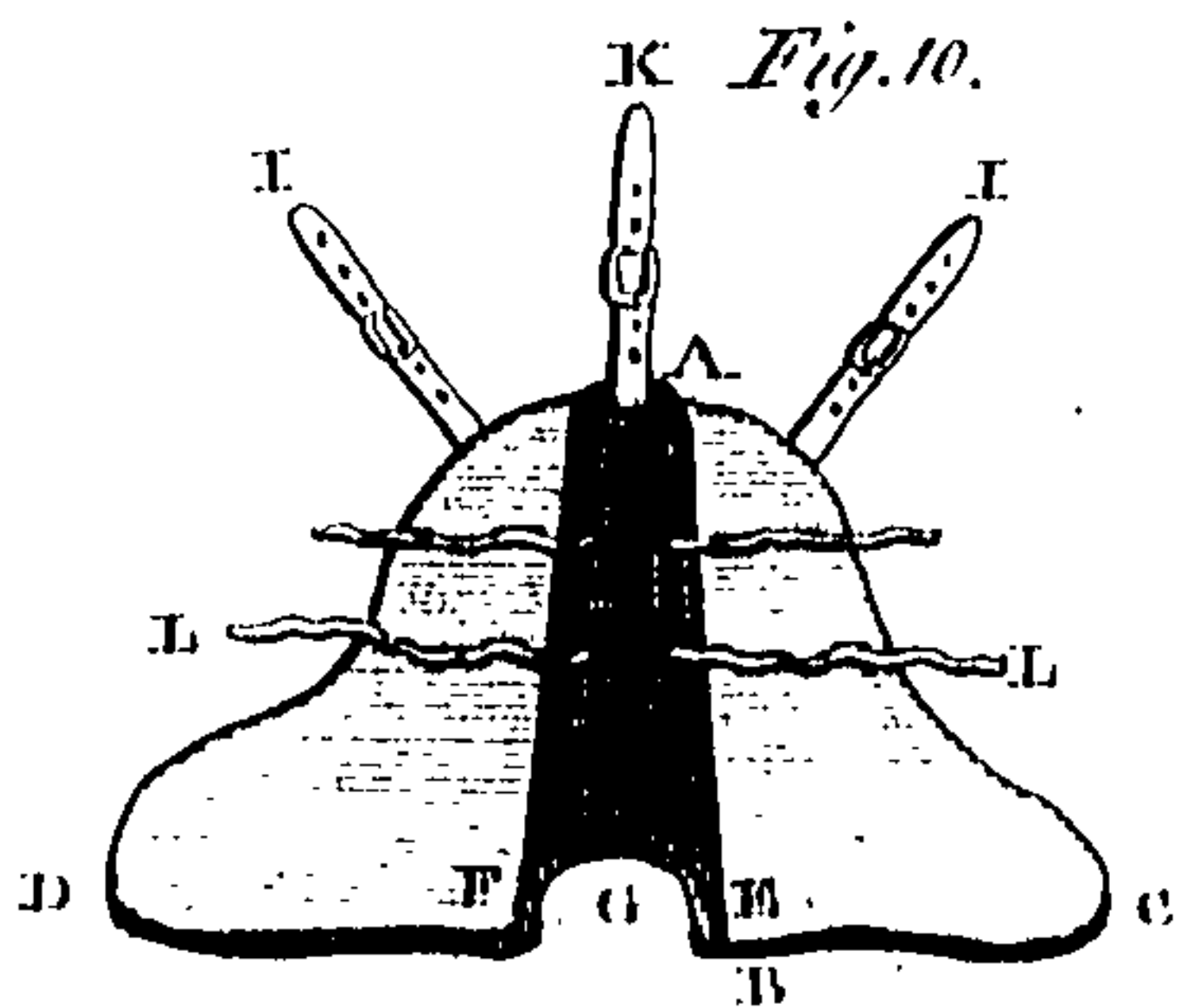
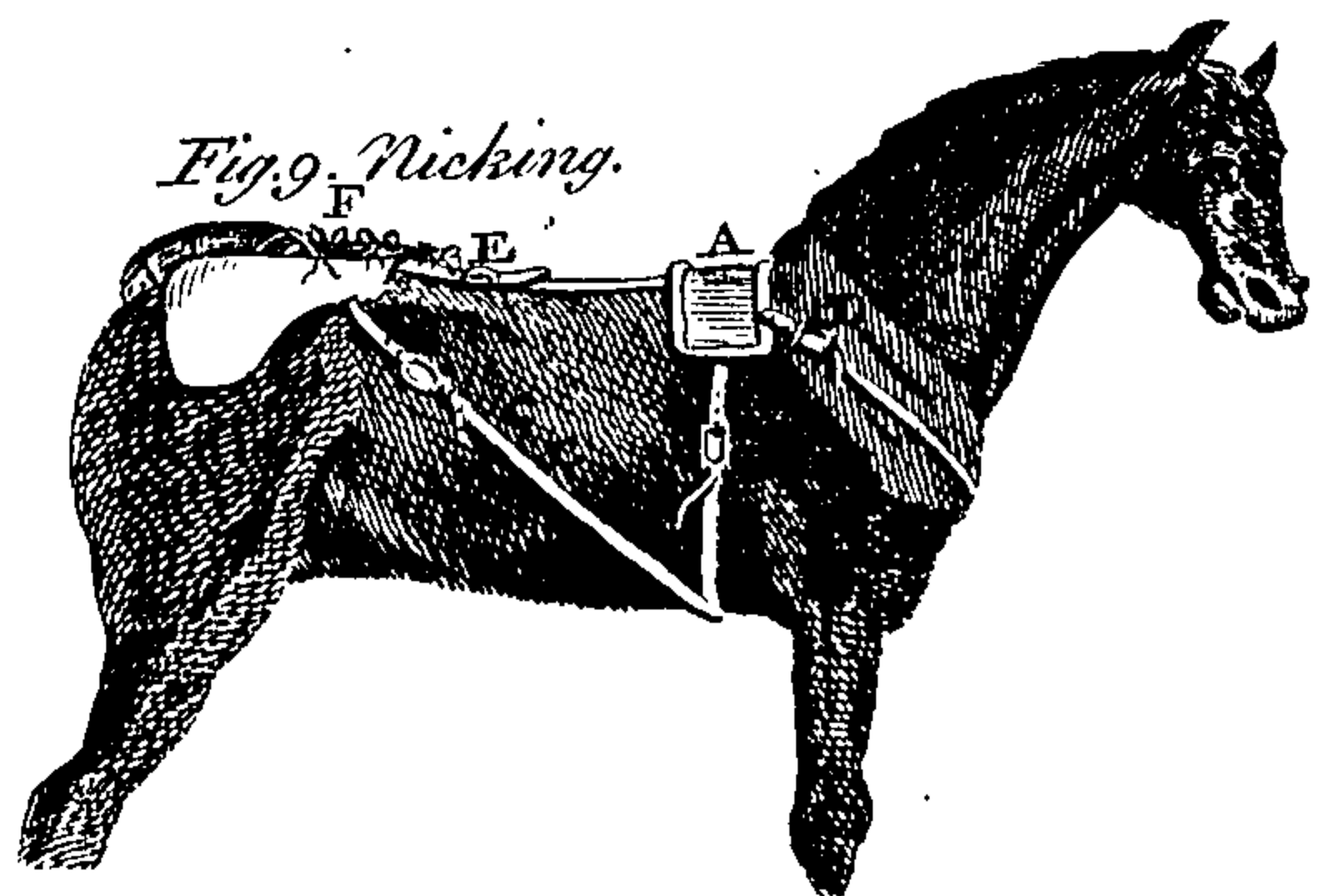
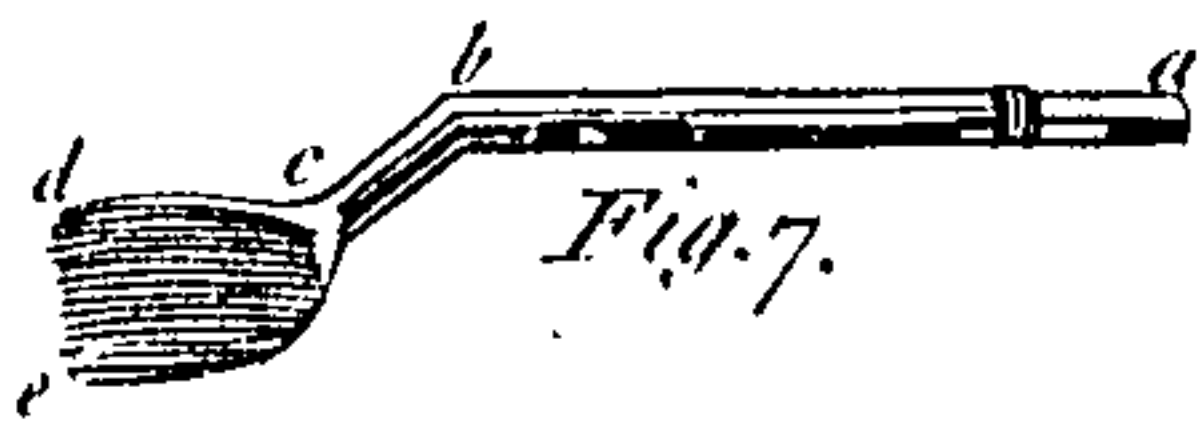
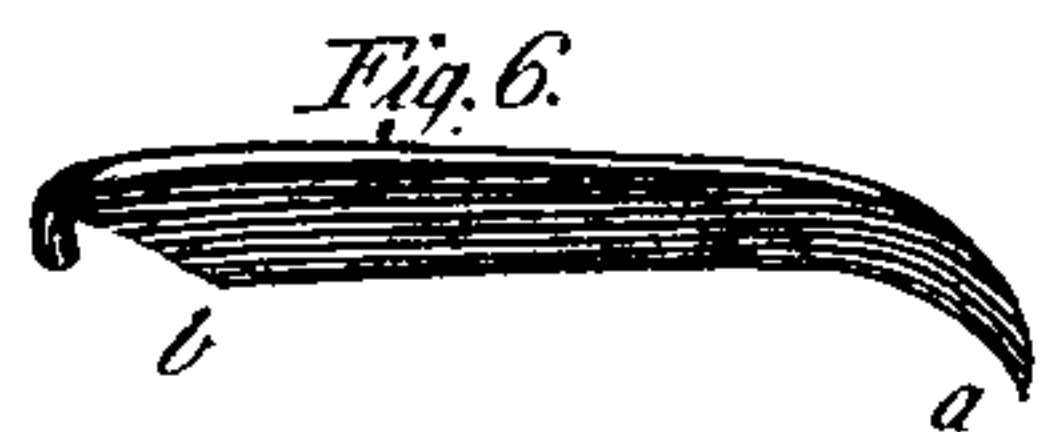
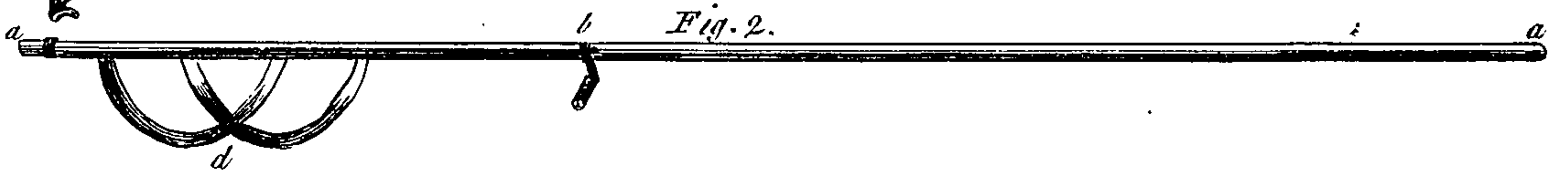
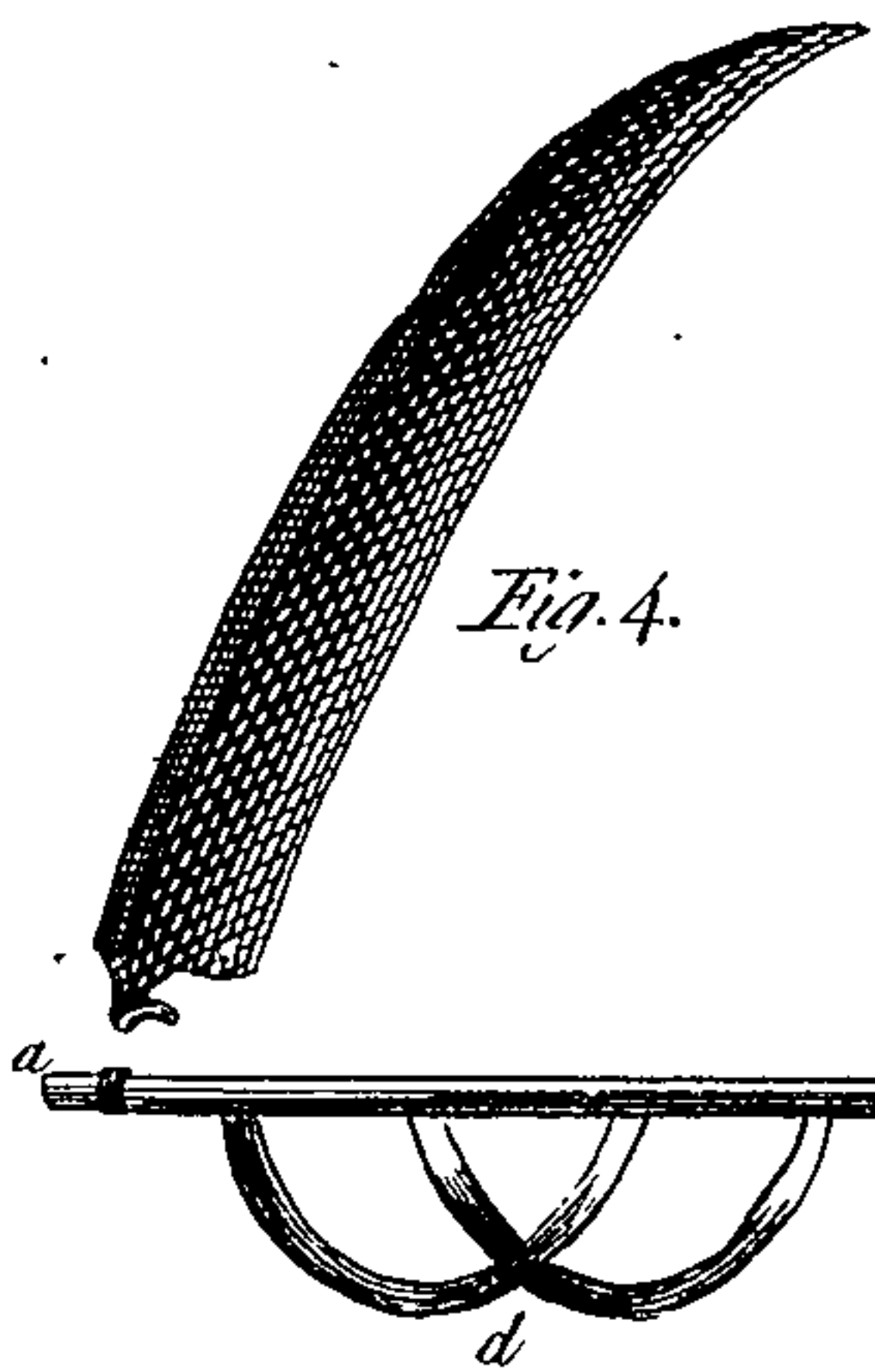
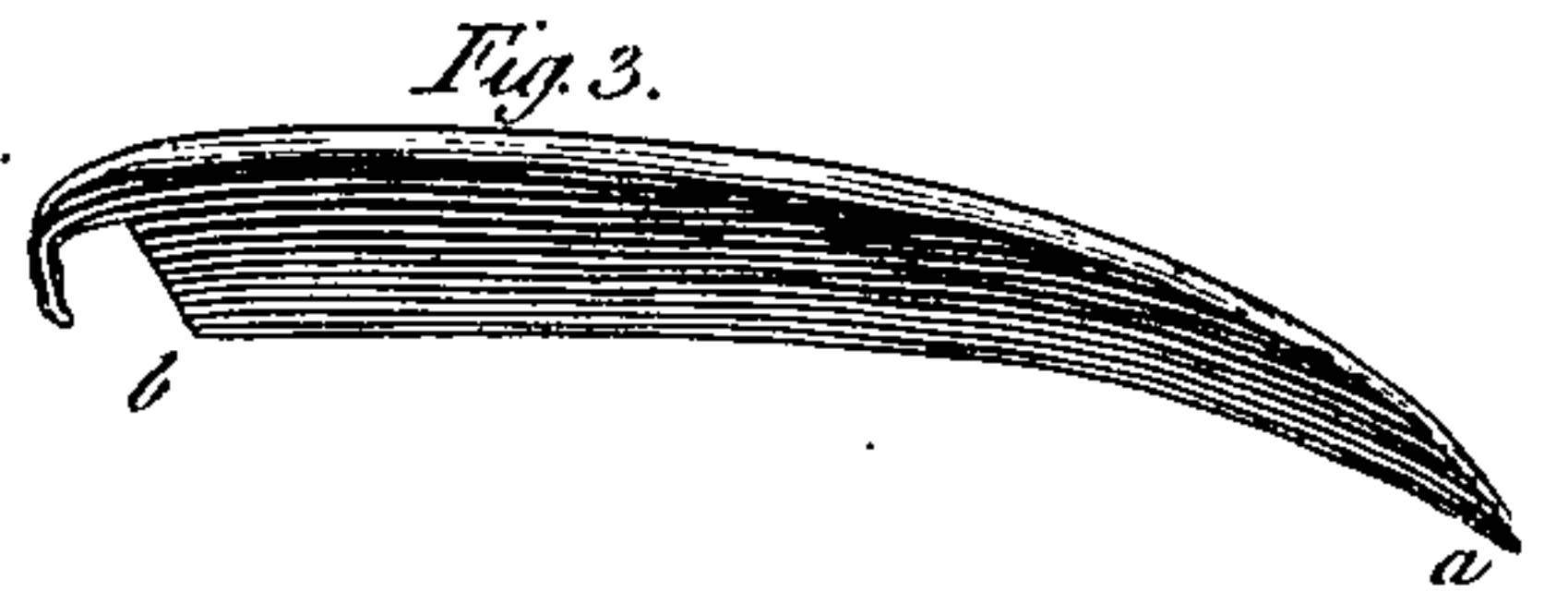
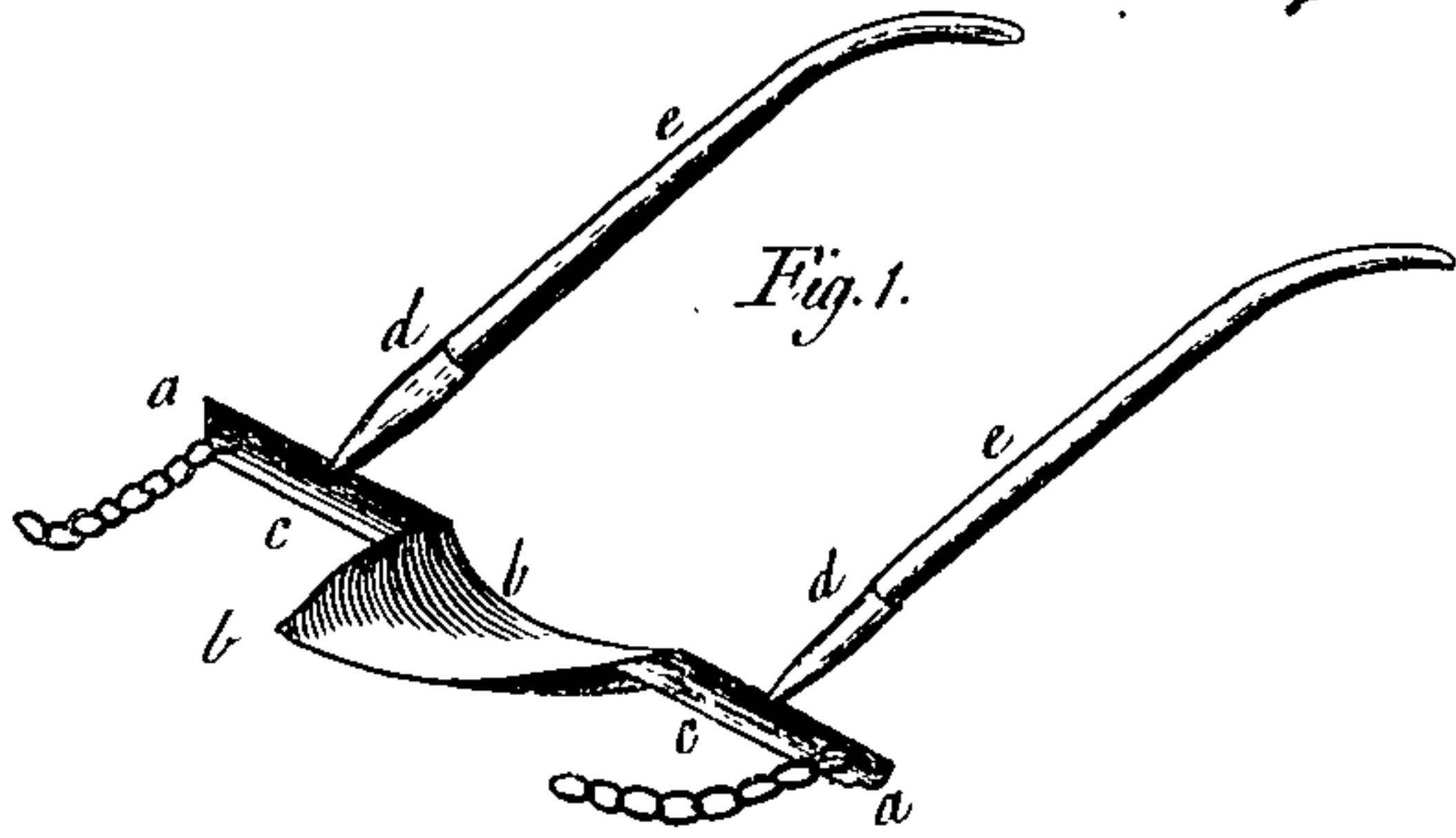
Moss on Trees, is a distemper of very bad consequence to their increase, and much damages the fruit of the trees of our orchards.

The present remedy is the scraping it off from the body and large branches, by means of a kind of wooden knife, that will not hurt the bark; or with a piece of rough hair-cloth, which does very well after a soaking rain. But the most effectual cure is, the taking away the cause. This is to be done by draining off all the superfluous moisture from about the roots of the trees, and may be greatly guarded against in the first planting of the trees, by not setting them too deep.

If trees stand too thick in a cold ground, they will always be covered with moss; and the best way to remedy the fault is to thin them. When the young branches of trees are covered with a long and shaggy moss, it will utterly ruin them; and there is no way to prevent it, but to cut off the branches near the trunk, and even to take off the head of the tree, if necessary, for it will sprout again; and if the cause be in the mean time removed by thinning the plantation, or draining the land, the young shoots will continue clear after this.

If the trees are covered with moss, in consequence of the ground's being too dry, as this will happen from either extreme in the soil, then the proper remedy is, the laying mud from the bottom of a pond or river, pretty thick about the root, opening the ground to some distance and depth to let it in; this will not only cool it, and prevent its giving growth to any great quantity of moss, but it will also prevent the other great mischief which fruit-trees are liable to in dry grounds, which is, the falling off of the fruit too early. Mortimer's Husbandry.

False MOTH, an insect which proceeds from a small caterpillar, the body of which is smooth and whitish. It has sixteen legs, does not lodge in the grains of corn, but contrives to fasten several of them together with a web which it spins, and with which it makes itself a dwelling-place, or sheath, in which the caterpillar of the false moth usually abides, is generally in the middle of the little heap of grains which it has collected for its food, but which distinguishes it from the caterpillar of the true moth: it can quit this sheath at any time, to eat the grains around it, one after another. It generally attacks several grains at once, and always without order, eating sometimes of one, and sometimes of another; so that several are gnawn, when not one is wholly consumed. When these insects are very numerous in a granary, all the grains upon the surface of the corn are linked together by a web, so as to form a crust, which is sometimes three inches thick. This caterpillar



pillar turns into chrysalis, or aurelia, in a grain which it has hollowed, or in the sheath of its web, and issues from thence, in the month of June, in the form of a butterfly. When a heap of corn is stirred, in which there are many caterpillars of the species of this false moth, those insects crawl up the walls; but they soon return to the heap, and, by the very next day, cover it all over with a new web.

In its state of moth, it is grey, has six legs, and is frequently seen in vast numbers fluttering about the eaves of the windows of granaries, in the spring and summer, when the weather is very hot. The females lay their eggs upon the heaps of wheat, and these eggs produce the caterpillars, or corn worms, as some call them, which feed on the grain, and envelop it with their silky web, so as to form over the whole surface a crust that is sometimes three or four inches thick. This entirely spoils the corn within that depth, besides communicating a bad smell to all the rest. These worms, or rather caterpillars, for they have sixteen legs, are smooth, whitish, and seldom exceed a quarter, or at most the third part of an inch, when at their full growth. Breaking of their webs avail but little, for they are woven again by the next day: for which reason some have been of opinion, that it is best to let them enjoy undisturbed the surface of the corn of which they have taken possession. But it should be considered, that three inches are a sixth part, and four inches upwards of a fifth, of any quantity of corn spread eighteen inches deep, which is the medium thickness at which it is laid; and that, independent of the bad smell with which the rest is tainted, this is a very considerable object, though it extend no farther. When this crust is broken, most of the grains which compose it are found to be either gnawn in their inside, or full of live worms, or of aureliæ, according to the season; or one sees only the empty sheaths of the caterpillars, if the aureliæ have been transformed into moths.

It is said, that strewing the corn with powdered lime, so as to form a crust over it, will preserve it from the ravages of these insects: but as the surface would still be spoiled, and as that surface may be a considerable part of the small provision of wheat allotted for a family only, M. Duhamel did not try this expedient. Covering it with hay, which he did try, answered no end whatever.

These observations, and the reflections consequent thereon, made him suspect that this insect, as it delights in none but very warm places, would not be able to live in the cold air of his ventilating granaries.

Accordingly, in the winter of the year 1746, he collected all the wormy crusts which these caterpillars had formed in his common granaries, where they were very thick, the moths having been extremely numerous the preceding summer. These crusts were broken and screened; and what grain could be got from them, which undoubtedly was impregnated with the eggs of the moths, was put into one of his granaries of preservation, which contained seventy-five cubic feet, and was ventilated from time to time during all the winter.

Towards the end of May, when the vent-holes at the top of this granary were opened, a prodigious number of moths flew out, which shewed that they did not like their situation.

When the wheat was thought to have been ventilated sufficiently, the holes were shut close, and nothing more was done to it for a month: for as this corn (which had not been stove-dried) was old and dry enough, it was but seldom ventilated.

In June 1747, this granary was emptied: all the moths and worms were dead, and there remained only a thin crust, not above the twelfth part of an inch thick, on the top of the corn, which had so far lost the bad smell it had when put into the granary, that it sold for the current market price.

Not satisfied with this single method, M. Duhamel tried the effect of the stove upon another parcel of wheat known to be full of these worms. A heat from 45 to 50 degrees of Reaumur's thermometer (from 115 to 124 of Fahrenheit's) killed them all. This corn was then laid up in a common granary, where it remained two years without being attacked by any of these moths; and even in the third, but very few of them appeared.

These experiments remove all doubt of the possibility of destroying the corn-moth, or worm, without hurting the grain, which would otherwise be spoiled by it; and as that grain generally is wheat, which the insect prefers to any

other, this discovery is of great importance to the husbandman as, well as to the public.

MOULD, a loose kind of earth, every where obvious on the surface of the ground, called by some, mother earth, and by others loam.

The goodness of a mould for the purposes of agriculture and gardening, &c. may be known, according to Mr. Miller, by the sight, smell, and touch. 1. Those moulds that are of a bright chestnut or hazely colour, are counted the best: of this colour are the best loams, and also the best natural earth; and this will be the better yet, if it cut like butter, and does not stick obstinately, but is short, tolerably light, breaking into small clods, is sweet, will be tempered without crusting or chopping in dry weather, or turning to mortar in wet. Next to that the dark grey and russet moulds are accounted the best: but the light and dark-coloured the worst, such as is usually found on common heathy ground: the clear tawney is by no means to be approved; but that of the yellowish red colour is the worst of all: this is commonly found in wild and waste parts of the country, and for the most part produces nothing but goss, furze, and fern, according as their bottoms are more or less of a light and sandy, or of a spewey gravel, or clayey nature. 2. All lands that are good and wholesome, will, after rain, or breaking up by the spade, emit a good smell. 3. By the touch we may discover whether it consists of substances entirely arenaceous, or clammy; or, as it is expressed by Mr. Evelyn, whether it be tender, fatty, deterfive, or slippery; or more harsh, gritty, porous, or friable.

Mr. Marshall, in his Rural Economy of Norfolk, in a treatise on *mould*, says, "Besides what come under the idea of marles and clays, a variety of other earths are industriously sought after by the Norfolk husbandmen, for the purpose of bottoming their farm-yards and dung-hills; with a view to catch the drainage of the dung. The dung and the mould are afterwards turned up and mixed together; by which means the mould becomes saturated with juices communicated to it by the dung: and it is a common observation, that the mould thus prepared lies longer in the ground, and is a more permanent manure than the dung itself."

"This is not improbable; for crude unmixed dung, buried in lumps, and dissolved in the soil, by heavy rains, is liable, no doubt, to be carried away, in part, below the vegetative stratum; especially of a light soil: therefore, to arrest and fix it, before it be carried upon the land, seems to be, in the management of such a soil at least, highly judicious."

"This piece of good management is talked about in most countries, and practised perhaps by some few individuals: but, in Norfolk, a light land country, it is the universal practice."

"I mean, to bottom dung-heaps with a stratum of mould. It is not equally universal to turn over and mix the dung and mould together; but this is frequently done by good husbandmen. It is not, however, in every case, eligible. A dung heap, formed in the spring, for turneps, would, in a dry season, be injured by such treatment."

"The principal source of this mould, provincially manure, is the shovellings of ditches; which, in this country, are found to contain in themselves a singularly fertilizing property. This rich mould is not composed of the sediment of the washing of the adjoining inclosures; many of the ditches perhaps never having, from the time of making to the time of scouring, admitted a current of water; but consists altogether of dead weeds, leaves of the hedge, and the mouldering of the bank and the sides of the ditch."

MOULDINESS, a term applied to bodies which corrupt in the air, from some hidden principle of humidity therein; and whose corruption shews itself by a certain white down, or lanugo, on their surface, which, viewed through a microscope, appear like a kind of meadow, out of which arises herbs and flowers, some only in the bud, others full blown, and others decayed, each having its root, stalk, and other parts.

MOUND, a bank or fence of earth. *See the article BANK.*

MOW, the pile or collection of corn in the straw, placed in a bay of a barn. *See the article BARN.*

MOW-BURNT, over-heated in the mow for want of being dry.

MOWING, the art of cutting down corn, grass, &c. with a scythe.

M. de L'Isle lately introduced the mowing of wheat. The method is this; the scythe he uses is at least six

inches shorter in the blade than the common scythe, and instead of a cradle has two twigs of osier put semicircular-wise into holes made in the handle of the scythe, near the blade, in such a manner, that one semicircle intersects the other: this method is frequently practised by the men who mow our meadows, as they think a cradle unnecessary and cumbersome, unless the scythe is to carry over a very large and very heavy sward.

In mowing barley, or oats, the corn is always on the right-hand of the workman: but by M. de D'Isle's method of mowing wheat, the corn is at his left-hand: he mows it inward, bearing the corn he cuts on his scythe, till it comes to that which is standing, against which it gently leans. After every mower follows a gatherer, which may be a lad of twelve or fourteen years of age, or a woman. The gatherer keeps within five or six feet of the mower, and being provided either with a hook or stick about two feet long, gathers up the corn, makes it into a gavel, and lays it gently on the ground: this must be done with spirit, as another mower immediately follows: for to every mower there is a particular gatherer.

To do this work properly, the mower should form but one track with his feet, advancing in a posture nearly as if he was going to fence, one foot chafing the other. In this manner the standing corn is mowed; but the workman must take care to have the wind at his left, as it bears the corn towards the scythe, and causes it to be cut nearer the ground. If the wind is behind the mower, it is no great inconvenience: it only occasions the scattering of a few ears; and the cut of corn, which should lean against the standing corn, is sometimes thrown down; which makes the work go on slower, and increase the gleanings. The wind in front is very bad; the corn cannot be cut close, and there is a great loss: but the wind on the right-hand is worst of all; the stubble is left long, and such a quantity of gleanings, that one would imagine no crop had been taken off. When wheat is bent, the workman takes the corn as it presents itself to him, which has the same effect as if the wind was at his left-side. When wheat is laid, it is more troublesome to the gatherer, because the cut corn is apt to be mixed with that which is standing; but a good mower takes the advantage of the wind, and cuts it against the way it is laid. No particular directions can be given for corn that is lodged and entangled, unless it is to take it as it is inclined, as if the wind was in the back of the mower.

This method of mowing of wheat was tried in Northamptonshire, and the following account of it sent to the editors of the *Museum Rusticum*.

"A gentleman, a foreigner, says this writer, came down here to a neighbour of mine, in order to put us into a method of going about this work.

"Many trials were made in the presence of myself, and a great number of others: the scythes did their work well; they cut the corn within two inches of the ground; and though our workmen were of course a little awkward, scarcely any ears were scattered; but the greatest advantage is, that a man with one of these scythes can cut down at least double the quantity of wheat in the day he can with a sickle or hook.

"The chief objections made to the introduction of this method were, that the stubble is left too short, and on that account is not fit for thatching; that the weeds are cut with the corn, and will be apt to mould or heat, and the seeds to mix with the corn in threshing; and that the poor are deprived of their gleanings, as none of the corn is scattered.

"But these objections must soon fall to the ground, when we reflect that, by mowing, the straw is much longer, and certainly straw is much better for thatching than stubble.

"As to the weeds being cut with the corn, it is of no consequence; for they are easily shaken out of the bottoms of the sheaves, after drying a day or two; and the sheaves may be safely left to dry, if they are laid in the following manner:

"Suppose three tobacco pipes to represent three sheaves, the bowls to be the feet of the sheaves, and the small part the ears: lay one of these on the ground; then take another, and lay the bowl of it under the small end of the first; take afterwards a third, and disposing them in form of a triangle, lay the bowl of the third under the small end of the second, and the bowl of the first under the small end

of the third; by disposing them in this form, the ears are always kept from the ground, and will endure a great deal of wet without damage.

"As to the seeds of the weeds being threshed, and mixing with the corn, this may easily be avoided; for the wheat, by this method of mowing it, is so regularly disposed in the sheaf, that the sheaves need only be threshed on the ear, without being unbound.

"The objection that the poor would be deprived of their gleanings, is a mere farce: their time might be much better employed; and by the same parity of reason, the more corn the farmer left for them in the field, the more justice he would do them; and this few would venture to assert, as custom might in time extend it to half the crop: besides, as by this new method, a great deal more corn will be inned, it will of course be cheaper the year round, and easier purchased by the poor.

"The foreign gentleman was of great use to us; he is intelligent and communicative, and we all of us acknowledge ourselves much obliged to him.

"Many in this county purpose making more extensive trials of it next harvest, and there is no doubt but that in the space of a few years it will be brought into constant use.

"A short certificate of the advantages resulting from the practice of this method, was some time ago drawn up; it was presently signed by a number of gentlemen, farmers, gardeners, labourers, &c. and transmitted to Dr. Templeman, secretary to the Society of Arts in London, to be, if necessary, published for the benefit of the kingdom. This new method will doubtless be introduced to the knowledge of the English world with a better grace, coming under the sanction and recommendation of so respectable and useful a Society."

The authors are happy, that, as members of the society, they have an opportunity of conveying to the readers of this Dictionary a perfect idea of the form of the scythes lately tried in Northamptonshire; for this purpose they have annexed a plate engraved from a drawing taken from the three scythes now deposited in the Society's machine-room, for the inspection of the curious. The parts are represented separate, that they might be more distinct: the dimensions and proportions follow. Plate XX. fig. 7. is the handle, or mounting of the largest scythe; the length of it from *a* to *c* is eight feet, from *a* to *b* five feet, from *b* to *c* three feet: at *c* is the part whereon the blade is fixed, *d* shews the two bends which serve instead of a cradle. Fig. 3. is the blade to this scythe; from the heel *a*, to the point *b*, measures three feet, and it is two inches and a half broad; when the scythe is mounted, from the point to the blade *b*, to the end of the long handle *a*, measures an angle of seven feet. Fig. 4. is the blade of another scythe, the length and breadth the same as the last blade. Fig. 5. is the handle to this second scythe; from *a* to *d*, it measures three feet ten inches, from *a* to *b*, two feet, and from *b* to *c*, one foot seven inches; the blade is fixed at *a*, and when the scythe is mounted, the angle from the point of the scythe-blade to the end of the handle, measures three feet nine inches. Fig. 6. is the blade of the smallest scythe; from *a* to *b*, it measures one foot nine inches, and is two inches and an half broad. Fig. 7. is the handle or mounting to this last scythe; at *a* the blade is fixed; from *a* to *b*, is one foot five inches and an half; the angle from *b* to *c*, four inches and an half; from *c* to *d*, five inches; from *d* to *e*, three inches and three quarters. Fig. 8. is the gathering-hook; the length of its handle, from *a* to *b*, is three feet nine inches; the hook from *b* to *c*, is ten inches long. See HARVESTING.

MUCK, dung, or straw that lies rotting. See DUNG.

MUD, the sediment at the bottom of rivers, ponds, ditches, &c. See the article DUNG.

MUGWORTH, a very troublesome weed; for its roots creep far under the surface of the ground, so as soon to overspread a large space, if they are not stopped; and its seeds, being light, and easily carried to a distance by the wind, will produce numbers of new plants the next spring. It has plain cut leaves, ending in many parts, woolly underneath, and single spikes of pale yellow oval flowers, which blow in June.

MULBERRY, the name of a tree, of which there are several species, but two only are generally cultivated, called the black and white mulberry.

The black mulberry grows naturally in Persia, from whence

whence it was first brought to the southern parts of Europe; but is now become common in every part of Europe, where the winters are not very severe: for in the northern parts of Sweden, these trees will not live in the open air; and in several parts of Germany they are planted against walls, and treated in the same way as peach and other tender fruits are here.

These trees are generally of both sexes, having male-flowers or katkins, on the same tree with the fruit; but it often happens, that some of the trees which are raised from seeds, have only male flowers, and produce no fruit; so that those who plant these trees for their fruit, should never make choice of such as have been propagated by seeds, unless they have seen them produce fruit in the nursery. It is also the surest way to mark such trees as are fruitful in the nursery at the time when their fruit is upon them, because those trees which are propagated by layers, are sometimes of the male sort.

The old mulberry trees are not only more fruitful than the young, but their fruit are much larger and better flavoured; so that where there are any of these old trees, it is the best way to propagate from them, and to make choice of those branches which are most fruitful. The usual method of propagating these trees, is by laying down their branches, which, will take root in one year, and are then separated from the old trees; but as the most fruitful branches are often so far from the ground as not to be layed, unless by raising of boxes or baskets of earth upon supports for this purpose; so the better way is to propagate them by cuttings, which if rightly chosen and skilfully managed, will take root very well; and in this method there will be no difficulty in having them from trees at a distance, and from the most fruitful branches. These cuttings should be the shoots of the former year, with one joint of the two-years wood to their bottom; the cuttings should not be shortened, but planted their full length, leaving two or three buds above ground. The best season for planting them is in March, after the danger of hard frost is over; they should be planted in light rich earth, pressing the ground pretty close about them; and if they are covered with glasses, it will forward their putting out roots; but where there is no such conveniency, the ground about them should be covered with moss, to prevent its drying; and where this is carefully done, the cutting will require but little water, and will succeed much better than with having much wet. If the cuttings succeed well, and make good shoots, they may be transplanted the following spring into a nursery, where they should be regularly trained to stems, by fixing down stakes to each, to which the principal shoots should be fastened; and most of the lateral branches should be closely pruned off, leaving only two or three of the weakest to detain the sap, for the augmentation of the stem; for when they are quite divested of the side shoots, the sap is mounted to the top, so that the heads of the trees grow too fast for the stems, and become too weighty for their support. In about four years growth in the nursery, they will be fit to transplant, where they are to remain; for these trees are transplanted with greater safety while young than when they are of a large size.

The white mulberry is commonly cultivated for its leaves to feed silk-worms, in France, Italy, &c. though the Persians always make use of the common black mulberry for that purpose; and it is said that the worms fed with those of the black produce much better silk than those fed with the white; but it is to be observed, that the leaves of the black sort should never be given to the worms, after they have eaten for some time of the white, lest the worms should burst, which is often the case when they are thus treated.

The trees which are designed to feed silk-worms should never be suffered to grow tall, but rather kept in a sort of hedge; and instead of pulling off the leaves singly, they should be sheared off, together with their young branches, which is much sooner done, and not so injurious to the tree.

This white sort may be propagated either from the seeds or layers, as the black mulberry, and is equally hardy; but the most expeditious method of raising these trees in quantity, is from the seeds, which may be procured in plenty from the south of France and Italy. The best way to sow these seeds, in England, is to make a moderate hot bed, which should be arched over with hoops, and covered with mats; upon this bed the seeds should be sown in the middle of March, and covered over with light

earth about a quarter of an inch deep: in very dry weather, the bed must be frequently watered, and in the heat of the day shaded with mats, and also covered in the nights when they are cold. With this management the plants will come up in five or six weeks, and as they are tender when they first appear, so they must be guarded against frosty mornings, which often happen in May. During the summer they must be kept clean from weeds, which is all the culture they require: but there must be care taken of them the first winter, especially to cover them in autumn, when the frosts come, which will kill the tender plants to the ground, if they are not protected; the following March, these plants should be transplanted into the nursery, to get strength, where they may remain two or three years, and then should be removed where they are to continue.

MULE, a mongrel kind of quadruped, usually generated between an ass and a mare, and sometimes between a horse and a she-ass.

The mule is a sort of a monster, of a middle nature between its parents, and therefore incapable of propagating its species; so careful is nature to avoid filling the worlds with monsters. Mules are chiefly used in countries where there are rocky and stony roads, as about the Alps, Pyrenees, &c. Great numbers of them are kept in these places; they are usually black, strong, well limbed, and large, being mostly bred out of the fine Spanish mares.

In Spain there is great encouragement for breeding and training mules to every kind of business: in Portugal they are estimated at a high price, and are not a little valued in the southern parts of France.

I own, says a writer in the *Museum Rusticum*, I have often been astonished (the useful nature of this creature considered) that we do not more encourage the breed in England. This inattention may perhaps proceed from mules being thought naturally more vicious than horses: I doubt the fact; yet be it as it will, they are, to my knowledge, equally capable of being made useful, docile, and gentle.

I assert not this merely from opinion, having had many years experience of what may be done in this way.

During the course of the war, in which his royal highness the duke of Cumberland commanded the army of the allies in Flanders, the empress queen made him a present of above fifty fine mules to carry his baggage: these mules at the end of that war, were brought to England, at which time I had an opportunity of seeing and admiring them. They were, I think, the finest and largest I ever before beheld; and one, nearly white, particularly attracted my attention, being almost sixteen hands high.

This circumstance of seeing his highness's string of mules, it was first induced me to think of breeding them, in which I have since had uncommon success.

I had many encouragements to make the attempt: my fortune was such as could not be hurt by the experiment; my park was extensive, and very proper for the purpose; and I had many servants, who had so little to do, as to have leisure time enough to obey my orders in this matter.

My great difficulty at first setting out was to procure a he ass or two to cover my mares; for I found none were to be got of any size bred in England.

It is true, I met with some Spanish asses; but they were sluggish, and not likely to get mettled colts: besides, I could not buy two of them, of any size and shape, under seven hundred pounds, which I thought too much money to throw away, if I could by any other means get my end easily answered.

Sensible that perseverance does much in all things, I bought a strong-boned, fine-shaped he ass, and two she-asses of a large size, considering they were bred in England, determined to try if I could not by a little care and attention mend the breed, before I attempted to get any mules.

These cost me only four pounds, and my two she-asses soon afterwards dropped a foal each.

I continued to breed from them several years; but it is the manner in which I managed the ass-colts, that the great success I have lately had in breeding mules must be ascribed.

I took care that the she-asses should be well fed, and be kept in order, both before they dropped their foals, and afterwards whilst they suckled.

As soon as the colts were weaned, I had them as carefully

fully attended and fed as if they had been got by Childers or Babram: every winter they stood under cover, defended from the injuries of the weather, and were regularly fed, cleaned, and littered, the door of the stable being always left open two or three hours in the middle of the day, for them to exercise themselves as they thought proper, which they seldom failed to do, if the weather was fine, to some purpose; returning, without compulsion, when the hour of feeding approached.

In this manner I always managed them till they were three years old, when I permitted my stone colts to cover, and my females to breed.

You would indeed be surprised to see how much, by this plain and simple management, my breed of asses is improved: for I have now in my stables several he-asses, which I keep as stallions, that are, I believe, as large, and as well shaped, as any that were ever heretofore bred in these islands.

I shall now proceed to describe to you the manner in which I breed my mules. For this purpose I chuse mares that are of a very large breed, such as are sometimes used to draw the brewers drays in London.

My next care is that they are young, full of life, large barrelled, but small limbed, with a moderate sized head, and a good forehead. At the proper season my mares are covered by my ass-stallions, and they seldom miss. During the time the mares are in foal, I take care to have them fed with nourishing fodder, such as I imagine will most contribute to the size of the foal.

My expectations, after this management, are generally answered, for in due season my mares drop foals, which I could often sell for ten, and sometimes for twenty guineas a piece at three months old; and their future value is more in proportion increased afterwards.

I always house my mule colts the first winter; otherwise the hard frosts, and sharp, cold, long nights, would stint them in their growth, besides making them unshapely and rough.

From the time of their being dropped, I cause them often to be handled, to make them gentle: this prevents their hurting themselves by skittishness, and sudden frights; they are besides much easier broke at the proper age, and become docile and wonderfully harmless, having nothing of that viciousness which is so commonly complained of in these animals.

I have them for the most part broke at three years old, but never permit them to do much work till four; they are thus secure from being hurt by hard labour, till they have acquired strength enough to bear it without injury.

I have now several mules which I constantly employ in various kinds of labour; two, which are indeed very fine, I ride myself after my harriers; two more I keep for my huntsman, and one for my whipper-in: these are black, sorrel, and grey.

I have also four fine mules, but stronger and heavier than those above-mentioned, which I drive occasionally in a four-wheel chaise, besides several others less valuable, used for ploughing and carting.

Some of my neighbours smile at my taste; yet they cannot at the same time help acknowledging, that they are cheaper animals, when bred at home, as has been my practice, than horses.

Perhaps some of your readers, from the hints above thrown out, may be inclined to try the experiment: if so I would caution them against some errors I at first setting out fell into.

I thought at first I could not keep my colts too well during the winter months: accordingly I ordered that they should have the sweetest hay, which I had before ordered to be reserved for my cows, and as many oats as they could eat.

This way of feeding them, it is true, made them very fat; but it was far from being an advantage to them; for I afterwards found by experience, that it was not only incurring a much larger expence than was any ways necessary, but also made them wonderfully nice and delicate in their appetites ever after, and also by increasing their weight of flesh, made them more subject to strains and hurts in their morning gambols.

Finding this to be the case, I altered my method entirely, and contented myself with giving them food enough to prevent their losing flesh, and keep up their growth, without palling their appetites with delicacies, or making them over fat: as to the rest, I took the same care of defending

them from the injuries of the weather as ever, by allowing them stable room, and good litter to sleep on, besides causing them every day to be well rubbed down with a hard whisp of straw by an active groom, whose peculiar province it was to attend them; and this was scarcely ever omitted, particularly in cold, raw, wet weather, when they were least inclined to exercise themselves in the park. *Museum Rusticum*, vol. II. p. 162.

MULCH, straw half rotten.

MULLOCK, dirt, or rubbish.

MULLEIN, the name of a biennial plant, which perishes soon after it has perfected its seed. The leaves spread on the ground, are nine or ten inches long, and six broad, very woolly, of a yellowish white colour, and very little footstalk. The stem rises four or five feet high, and the upper part of it is garnished with yellow flowers, which sit very close, and form a thick spike. These flowers have an agreeable odour, appear in July, and the seeds ripen in autumn.

This plant commonly grows by the sides of highways, and on banks: but if it once gets into the fields in a warm exposure, and is suffered to seed there, it will soon overrun the whole ground. It may be easily destroyed by cutting off the stem, when it is in flower.

MURE, the cake of apples, grapes, &c. left in the press, after extracting the juice.

MURRAIN, or *Gargle*, a contagious disease among cattle.

The most remarkable murrain is that mentioned in the Philosophical Transactions, which spread through Switzerland, Germany, into Poland, &c.

The contagion seemed to propagate itself in form of a blue mist, which fell on the grass where the cattle grazed, when whole herds, forbearing their food, almost died away in twenty-four hours. Upon dissection were found large corrupted spleens, sphacelous and corroded tongues, &c. And even the persons who managed them were infected, and died like the beasts.

Some imagined it had its rise from noxious vapours thrown out of the earth, in three earthquakes perceived in the neighbourhood of the place where it began; though Dr. Slare thinks it rather owing to swarms of volatile insects.

The antidote for the sound, and medicine for the sick, was equal parts of foot, gunpowder, brimstone, and salt, with as much water as would wash it down: a spoonful was the dose.

The common signs of this disease are a hanging down of the head, gum at the eyes, as big as your finger, growing weakly, staggering, the head swelling very much, the breath short, the heart beating, with rattling in the throat; and if you put your hand into the creature's mouth, and find his breath very hot, and his tongue shining, the distemper is very strong.

As soon as you find any of your cattle infected, take a pretty large quantity of blood from them immediately, and give them a drench. Maddar root is highly commended for this distemper.

MUSHROOM, a genus of imperfect plants, composed of a pedicle crowned with a broad head, convex and smooth at the top; and hollow, foliated, lamellated, or pitted underneath.

It is of the utmost importance to distinguish the right eatable sort, from several noxious kinds that have been productive of even fatal accidents: the true sort appears at first with a roundish head, not unlike a button. The outside of this head is then very white, as is likewise the stalk on which it grows; but its under part, when it is taken off that stalk, from which it separates pretty easily, is of a livid flesh colour. Its flesh is also very white within. If this sort remains undisturbed, its head will spread to a considerable size, and open at the bottom, so as to form an almost flat surface, the under part of which will then be changed to a dark colour.

Most of the writers upon gardening have spoken so confusedly, not to say, of most of them, so unintelligibly, of the means of propagating this plant; that excepting the authors of the *Maison Rustique*, and Mr. P. Miller, one is sometimes puzzled to guess at their meaning. The account which this last has given in his Dictionary, is the most practical, being the method of the gardeners near London, who raise annually great quantities of mushrooms for sale. The substance of it is to the following effect:

The spawn of mushrooms, from which only they are pro-

propagated, looks like a white mouldiness shooting out in long strings. It is frequently found among the dung of old hot-beds, or in old dung-hills, especially when much litter has been mixed with these last, or the wet has not penetrated so as to rot it; or it may be procured by mixing some long stable dung, which has not been thrown up in a heap to ferment, with strong earth; and then laying this mixture under cover, where it cannot be wet, and where the air may be excluded from it as much as possible; for, the more effectually it is kept from air, the sooner the spawn will be produced. It will generally appear in about two months, if the heap has not been laid so close together as to heat (for that will destroy the spawn) and especially if it has been well covered with old thatch, or litter which has lain so long abroad as to have lost the power of fermenting. These are expedients by which the spawn of mushrooms may be procured at almost any time, by those who have not already had mushroom-beds in their gardens, and therefore cannot collect it from their remains: for there are but two months of the year in which it can be gathered from downs or pastures. These are August and September; when plenty of mushrooms spring up naturally in many of those places. To propagate them from thence, the ground should be opened about their roots, and such earth as is there found full of small white knobs, which are the offsets, or young mushrooms should be attentively gathered up, with as much care as can be, not to break the lumps or the earth about them. This seed, or rather this spawn (for if mushrooms have seeds, they are imperceptible to the eye) should be kept very dry till it is used: for the drier it is, the better it will take to the bed, as has been remarkably experienced by Mr. Miller, who declares, that he never saw these plants produced so soon, or in so great quantity, as from a percal of their spawn which had lain near the oven of a stove for upwards of four months, and was become so dry, that he despaired of its success.

The beds for mushrooms should be made of dung plentifully intermixed with litter, but not thrown in a heap to ferment. The best dung for this purpose is that which has lain spread abroad for a month, or longer. Their breadth should be about two feet and a half at bottom, their length proportioned to the desired quantity of mushrooms, and they should be made on dry ground, by spreading upon it, first a layer of dung about a foot thick, and upon this about four inches deep of strong earth; then a couch of dung, about ten inches thick, and upon that another layer of earth, contracting the surface of the bed all the way up, till it terminates like the ridge of a house. This may be done with three layers of dung, and as many of earth. When it is finished, it should be covered with litter, or old thatch, as well to prevent its drying, as to keep out wet, and after it has remained eight or ten days in this situation, it will be of a proper temperature to receive the spawn, for which its warmth should be but moderate. The thatch, or litter, should then be taken off, the sides of the bed should be smoothed, and a covering of light rich earth, by no means wet, should be laid all over it, about an inch thick. Upon this the spawn should be placed, by laying its lumps about two or three inches asunder, in such manner as to prevent their slipping down, and then the whole should be covered gently with about half an inch thick of the same light earth as was used before. The covering of litter should then be replaced over the bed, so thick as to secure it from wet, and to prevent its drying. If these beds are made in the spring or autumn, when the weather is temperate, the mushrooms will frequently come up in a month's time: but those which are made in summer, when the season is hot, or in winter, when it is cold, will not produce them so soon. Sometimes too it happens that neither of these beds, but most particularly those made in the summer or winter, yield any mushrooms before the end of five or six months; and that they then produce uncommon quantities, and continue in perfection for a long time.

The great art in managing of these beds is, to keep

them constantly in a due degree of moisture, and, above all, not to suffer them ever to receive too much wet; for that would inevitably destroy the spawn of the mushrooms. During the summer, they may be uncovered, to admit gentle showers of rain to them at proper times; and if the weather continues dry for a long while together, it will be right to water them gently now and then, but by no means to overdo it. During the winter, they must be kept as dry as possible, and closely covered, lest the cold air of the season should injure them. It will even be right in frosty or very cold weather, to lay over them a covering of dry litter, for it must not incline to ferment, and upon that some warm litter shaken from out of a heap of dung: This covering should also be renewed as often as it is found to decay, and, if the cold grows more severe, its thickness should be increased.

The mushrooms thus produced have a finer flavour than any that are gathered in the fields; and if the above directions are observed, they may be had in plenty during the whole year: for each single bed will continue good for several months, and yield great quantities if the spawn takes kindly.

When these beds are destroyed, the spawn for a fresh supply should be taken from them, and laid up in a dry place till the proper season for using it, which should not be sooner than five or six weeks, in order that it may have time to dry well, before it is put into the new bed; for otherwise there will be some danger of its succeeding.

MUST, new wine, or wort, before it is fermented.

MUSTARD is an annual plant raised from its seed only. The white mustard, as it is commonly called, is the sort chiefly cultivated in gardens, for a fallad herb in the winter and spring. The seeds of this are sown very thick in drills; either upon a border warmly situated, or if the weather be very cold, upon a gentle hot-bed, in the same manner as cresses and other small fallading, and in about ten days or a fortnight after the time of sowing, the plants will be fit for use; for when they are large and have rough leaves, they are too strong to be mixed with fallads.

The best way to save the seeds of this plant, is to sow a spot of ground with it in the spring, to thin the plants when they have about four leaves, and at the same time to hoe down the weeds, as is practised for turneps. This hoeing is to be repeated in about a month after, and the plants are then to be left about eight or nine inches asunder, which will be a sufficient space for the growth of this species. If these hoeings are well performed, in dry weather, they will keep the ground clean till the mustard seeds are ripe. The stalks of this plant, which are branched and hairy, will then be about two feet high, and the ripening of its seed is indicated by the pods changing to a brown colour; immediately after which they should be cut down, dried upon cloths, for two or three days, and then threshed out for use.

The larger sorts of mustard, the seeds of which are used chiefly for sauce, are to be treated in the same manner; excepting that, as they grow much larger, a proportionably greater space must be left between their plants: and as their seeds will not ripen so soon as those of the smaller kind, three hoeings, or rather good deep stirrings, of the ground may be requisite for them. One of these large sorts, which is the common mustard, grows naturally in many parts of England; but is cultivated in the fields for its seeds, of which the sauce called mustard is made; and another sort, which naturally grows in our arable lands, and is also cultivated for use, produces the seeds which are commonly sold under the appellation of Durham mustard-seeds. The stalks of the last sort seldom rise above two feet high; but those of the former generally run up to the height of four or five feet.

Mr. Young, in his *Annals of Agriculture*, vol. II. says, "that mustard seed sometimes turns out prodigiously profitable, that is, three or four, and even five quarters, at 4/ a quarter. But it is hazardous, and has a very great evil of rising afterwards in successive crops, and is hardly ever completely eradicated."

N.

NAIL, or *Naile*, the weight of eight pounds.

NAPE, or *Neap*, a piece of wood with two or three with which they support the fore part of a loaded wain.

NASTURTIIUM. See the article **CRESS**.

NAVEL-GALL, is a bruise on the back of a horse, or pinch of a saddle behind, which if left alone long will be hard to cure.

The hurt obtains this name, because it is over-against the naval. The cure :

Take oil of bay, oil of costus, fox-grease, oil of favin of each an ounce ; a handful of great garden worms ; scour them with salt and white wine, and put all the ingredients together into an earthen pipkin ; stop or cover it very close, and boil them well ; then add an ounce and a half of fallad oil ; set it upon the fire again, and boil it till it becomes a perfect ointment, which strain into a gallipot : warm it when you use it, and so dress the sores with lints or hards dipt in it.

If the place be only swelled, and the skin not broken, then rub it with your hand, or a rag dipped in brandy, and it will take it down.

NAVE of a Wheel, is that short thick piece in the center of the wheel, which receives the end of the axle-tree, and in which the ends of the spokes are fixed ; it is bound at each end with hoops, called the nave bands ; it has likewise in each end of the hole, through which the end of the axle-tree goes, a ring of iron called the wisher, which saves the hole of the nave from wearing too big.

NEAT ; black cattle, oxen.

NECK of a horse, should be lean, and but little flesh upon it ; and to be well shaped, it should, at its going from the withers, rise with a slope upwards, diminishing by degrees toward the head.

In mares, it is a good quality to have their necks somewhat gross, and charged with flesh, because their necks are generally too fine and slender.

Deer necks, cock-thropled, are those, in which the flesh that should be next the mane, is set below, and next the throat, which renders the neck ill-shaped and ugly.

A well-shaped neck contributes very much to the making him light or heavy of the hand, according as it is fine or coarse.

NETTLE, the name of a weed well known, and which may be easily destroyed by cutting the roots, before the plant has perfected its seed.

NEWING, yeast, or barm.

NICKING, the name of an operation often performed on the tails of saddle-horses, and by which means they carry them in a more beautiful manner.

Before we describe the operation of nicking, it may be necessary to enquire how the effect of it (the elevation of the tail) is brought about ; and in order to know this, and judge with propriety of the operation, we must consider the tail as elevated or lifted up by one set of muscles, and depressed or pulled down by another.

It is somewhat remarkable, that Snape, Saunier, and Gibson, who are in general pretty exact in their anatomical descriptions, should omit, in their account of the muscles of a horse, to describe those of the tail ; for which reason, as a proper opportunity has not offered, to supply this omission by making a compleat dissection with that accuracy we could have wished, it is hoped the subsequent imperfect description will be excused, as it was taken only from a tail that was dissected after docking.

Here we observed, that the muscles which elevate the tail, are more numerous, large, and strong, than those that depress it ; that they are closely connected to the bones of the tail by fleshy fibres, and terminate in strong tendons at the extremity ; that the muscles of the latter soon form into tendinous expansions, and besides three large tendons,

which are inserted into the latter bones of the tail, there are several other small tendons, which run laterally, whose use most probably is to move the tail sideways : the arteries are four in number, and run sometimes above the bones of the tail, consequently easily avoided by a dextrous hand, as they cannot readily be wounded by the knife, in dividing the tendons necessary to be cut in this operation.

The art of nicking horses then chiefly consists in a transverse division of these depressing tendons of the tail, and such a position afterwards as will keep their extremities from coming again into contact ; so that an intervening callus fills up the vacuity : by these means an additional power is given to the antagonist muscles, viz. the elevators ; the counteraction of the depressors being manifestly abated by the division of the tendons, and the intervention of the callus.

The usual method of supporting the tail by a pulley and weight, is liable to many exceptions, the extremities of the divided tendons not being by that method kept sufficiently asunder ; the situation of the tail being rather inclined to a perpendicular than a curved direction : this position too is liable to many variations, from the different movements of the horse, and is the reason that the tail frequently inclines to one side, as the nick may heal up faster on one side than the other ; the disagreeable situation the horse must stand in, with a weight consequently hanging to his tail, is another material objection, besides the necessity of removing it when the horse is exercised, or taken out to water.

To remedy these inconveniences, and perfect this operation, a very ingenious gentleman, who had thoroughly considered it, has been so kind as to favour us with a draught and description of a machine he contrived for that purpose, which has frequently been practised with the expected success, and indeed at first view appears in every respect calculated to correct all the defects in the old one : as we doubted not its reception being perfectly agreeable to the public, we have ordered a plate to be engraved, which, with the annexed description, will, we hope, make it very familiar and intelligible to every capacity.

In regard to the operation, it is worth notice, that the extremities of the tendons, which jut out in the operation, need not here be cut off, as is customarily done ; the number of the incisions must be in proportion to the length of the tail, but three in general are sufficient. The most approved method of dressing at first, is with powdered rosin, and spirit of wine, applying a soft dossil of lint or tow, dipped in the same, between each nick, and lapping the tail up with a linen cloth and broad fillet ; which the next morning should be cut open down the back part of the tail, and the morning after be gently taken off : when it will be proper to plat the hairs, in order to keep them clean, and to set the tail, as will be directed in the plate and references.

Every two or three days, the tail should be let down, and the upper part next the rump bathed with hot vinegar, and if it begins to crack, and the hair comes off, a little tincture of myrrh will soon put a stop to it. To obviate any threatening symptoms that may arise in regard to the wounds, have recourse to the remedies used in docking.

After six or eight days, it will be proper to let the horse stand without the machine for a few hours, and then be rode about in order to observe how he carries his tail ; by which means you will the better judge how to fasten it down, whether to confine it closer, or give it more scope : after the wounds are healed up, it may be necessary to keep the tail suspended, till the callus is confirmed, at least for some hours in the day, though a greater liberty may now be allowed it.

Thus this machine answers every intention, is far preferable to the pulley, as it keeps the tendons properly separated, and the tail in a certain position ; so that the wounds heal up uniformly, without any risk of its inclining to one side ; the

the horse also is more at ease, having no weight constantly pulling and teasing him, and may be taken out to water or exercise without any inconveniency, or disturbance.

Directions for the Application of the Nicking Machine; and Explanation of the Plates.

When the hair of the tail is properly platted, and tied with a knot or two at the end, the pad, &c. as described in Plate XX. fig. 9. must be put on, and the machine, as in fig. 10. buckled to them, letting the part G in the machine lie over the part of the tail that joins to the horse's rump; then let an assistant, standing on the side rail of the brake, or any other conveniency that may place him above the horse, raise the horse's tail very gently till the knot of the tail gets so far beyond the strings L L in fig. 10. that it may be tied down; which being done, the tail may be let down lower, or taken up higher at pleasure. It is to be observed, that the ligature is not made on the tail itself, but on the platted hair, at the extremity of the stump.

The machine, fig. 10. must be made of a piece of tough wood about a foot long, viz. from A to B, and about nineteen inches broad from C to D, and seven or eight inches thick. The under part must be hollowed, so as to let in the horse's rump, and that the wings C D may rest on his buttocks. To receive the tail a groove must be cut from G to H, about three inches wide, and three deep at G, lessening gradually both in height and breadth to H. Holes must be made at certain distances in the groove, as at H, for the string, and a nick cut to receive the billet from the strap K. Two buckles fixed to the machine as at I I.

The pad, &c. are sufficiently described in fig. 9. and its references: the wood must be sloped off from E to C and A, and so on the other side, to lighten the machine, and hallowed at B, G, and F.

Fig. 9. represents a horse, with his tail in the frame or machine. A is a pad, to which is fastened a circingle B, C C two side straps, one on each side the horse, fastened to the circingle, to keep the machine from going to either side; D, a breast-plate to prevent the pad, &c. slipping back. E, a strap fixed to the pad, and buckling to the machine to keep the tail on the stretch at pleasure. F, the string tied on the hair, to confine the tail down to the machine.

Fig. 10. from A to B is twelve inches; from C to D, measured with a string drawn over E F, is nineteen inches. From the top of the groove at E to the bottom G, is three inches. From E to F, the widest part of the groove, three inches, gradually narrowing as the tail lessens to its extremity. The dots about H are holes in the groove, through which a piece of tape or pack-thread must be put, according to the length of the dock, and the distance of the knot to tie the tail down behind the knot. I I, the buckles to receive a strap from the circingle on each side, as described in fig. 9. which keeps the machine from turning to either side. K, the strap with a billet and buckle, which comes along the back from the pad, and is fastened to the machine, through a nick cut just above H. L L, the strings to tie down the tail. B, G, F, the hollow to let in the rump.

Fig. 11. represents the horse with the machine on, standing directly before you, where the depth of it is shewn, being three inches.

C D, the extremities of the wings. E F, the upper part. *Bartlet's Farriery, p. 325.*

NIGHT-FALL; the beginning of night.

NIGHT-MARE. A malady incident to horses as well as the human species, proceeding from the melancholy blood oppressing the heart: it will cause the horse to sweat more in the night than in the day, and thereby deprive him of his rest.

You may discover it by observing him in the morning, whether he sweats on the flanks, neck, and short ribs, which are sure indications of it.

For the cure:

Take a pint of fallad oil, a quarter of a pound of sugar-candy, put into them a handful of salt, mix them well together, warm them blood-warm, and give it the horse two mornings.

NINE-PIN COLLARS. See COLLARS.

NIPPERS, are four teeth in the fore-part of a horse's

mouth, two in the upper and two in the lower jaw: a horse puts them forth between the second and third years.

NOPE, a bull-finch, or red-tail, a small singing bird, well known.

NURSERY. Mr. Young, in his *Annals of Agriculture* Vol. III. inserts the following information, (by the Rev. Mr. Swayne. Mr. William Boucher, of Edinburgh, in his preface to his *Treatise on Forest Trees*, has the following observations: "It has been an almost universally received opinion, that trees ought to be raised in the nursery on a poorer soil than that to which they are afterwards to be transported for good, and it has been directed by many, otherwise the most respectable authors. I must acknowledge this doctrine has a very specious appearance at first view. I adhered to it early in life, and it is so seemingly consistent with nature, that I am not surprised it has been generally adopted by young planters: at the same time, I cannot account for those who have had much practice and long experience not exposing the errors of it.

"In the following lines, I have given some examples, from frequently repeated experiments, of the ill effects I have felt by planting young and tender seedlings in the poorest soils, and the greater success attending those that were well-grown, on the same, or in similar situations. The consequences of raising plants on poor hungry land, are no less fatal than planting the seedlings in such, and should as much as possible be avoided. I have mentioned, in the culture of many trees, the necessity of promoting their vigorous growth at first, in order to their becoming stately and handsome; nor can this be effected by any other means than being early nursed in generous soil, for whatever future purpose they are meant, or to whatever situations they are destined, and that, if they are but barely supported from infancy on meagre ground, they will never afterwards become strong, though removed to that which is rich and feeding." In chapter 40, p. 252, of the *Treatise*, he says, "I have sown the seeds of forest trees on the poorest ground, planted seedlings, and strong well-nursed trees, from five to ten feet high, on the same ground, and at the same time, where the old well cultivated plants have frequently made goodly trees, when the seedlings have perished, and from the sterility and coldness of the soil, the seeds have not so much as vegetated. In short, the roots of seedlings are not so well fitted as larger plants to draw sufficient nourishment from crude, rank, and uncultivated soils: and as I have truly found what is here said, in many instances to be the case, I am obliged to believe that the general practice of planting seedlings in poor, and large trees in good, land, should be quite reversed."

Mr. Anderson, of Monkhill, Aberdeenshire, in his very ingenious and scientific *Essays on Agriculture and Rural Affairs*, sect. 6, p. 24. vol. 1. 2d edit. says: "Almost all writers on agriculture advise the farmer to be very careful to make choice of such plants only as have been raised in a nursery of a poor soil; and always to reject such as have been reared in a richer soil than that in which he is to plant them: because, say they, a plant which has been reared in a barren soil has been inured, from its infancy, to live hardily, and will advance with a great degree of luxuriance, if it is planted in one that is better: whereas a plant that has been nursed in a fertile soil, and has suddenly rushed up to a great size, like an animal that has been pampered with high feeding, and swelled up with fat, will languish and pine away, if transplanted to a more indigent soil.

"It would be no difficult matter to shew the fallacy of this mode of reasoning, and to point out many errors which have crept into almost all sciences, from pursuing such fanciful analogies between objects, in their own natures so different, as in this example. But as this would be in some measure foreign to my aim in this essay, I shall content myself with observing, that it could seldom be attended with worse consequences than in the present case, as it leads to a conclusion directly the reverse of what is warranted by experience. For I have found, from reiterated experiments, that a strong and vigorous plant, that has grown up quickly, and arrived at a considerable magnitude in a very short time, never fails to grow better after transplanting; than another of the same size that is older and more stunted in its growth, whether the soil in which they are planted, be rich or poor: so that instead of recommending a poor hungry soil for a nursery, I would, in all cases, wish to set apart for this purpose, the richest and most fertile spot that could be found; and in the choice of plants, would always prefer the youngest

youngest and most healthy, to such as were older, if of an equal size. I speak here from experience, and therefore do it without the smallest doubt or hesitation, being certain that future observations will confirm the justness of these remarks."

"In page 8, of the same Number of these Annals, Monf. Mournon, in his directions concerning the cultivation of carrots, observes, after sowing the seed, that the field should then be harrowed and rolled smooth." Query, should not the roller precede the harrow? In the garden-culture of these roots it is the constant practice, and recommended by the most approved writers on gardening, after sowing to tread the ground, and then to rake in the seed. I was long averse to this method, as thinking the ground

ought to be left in as light and open a state as possible, that the roots might have the more room to swell, till a constant failure in my crops impelled me to try the common method, the consequent success of which has obliged me to continue the practice.

"Notwithstanding M. Mournon's advice to roll often, after the plants are come up, with a view to prevent the too great luxuriance of the greens, has rather an unphilosophical appearance (as you observe), yet I myself often remarked, that those plants which have uncommonly large tops, have always the worst roots." See ORCHARDS, and PLANTING.

NUSHED, starved in bringing up.

O.

OAK, a tree well known, and one of the principal materials in building ships, &c. being strong in all positions.

All the sorts of oaks are propagated from acorns, which should be sown as soon as possible after they are ripe; for if they are kept too long out of the ground, they seldom grow.

The manner of sowing these acorns, if designed for a small plantation, or to be removed, is, to prepare some beds of fresh earth, neither too strong and heavy, nor too light and dry; in these beds you should place the acorns in rows one foot asunder, and about two inches distance in the rows, covering them about two inches thick with the same fresh earth; observing to leave none of them uncovered, to entice the vermin, which may in a short time destroy all the seeds.

In the spring, when the plants begin to appear, you must carefully clear them from weeds; and if the season proves dry, you should refresh them now and then with a little water, which will greatly promote their growth. In these beds the plants should remain until the following autumn, observing constantly to keep them clear from weeds; at which time you should prepare a spot of good fresh earth, in size proportionable to the quantity of plants, which should be trenched and levelled: then towards the middle or latter end of October, you should carefully take up the plants, so as not to injure their roots, and plant them out in rows three feet asunder, and eighteen inches distance plant from plant; observing never to suffer the plants to abide long out of the ground, because their roots would dry, and endanger the growth of the plants.

When they are planted, you should lay a little mulch upon the surface of the ground, near the roots, to prevent the earth from drying too fast: and if the season should prove very dry, you should give them a little water to settle the earth to their roots.

When the plants have taken root in this nursery, they will require a little more care than to keep them clear from weeds, and dig the ground between the rows every spring; in doing of which, you should cut off such roots as extend very far from the trunk of the trees, which will render them better for transplanting again: you should also prune off such side-branches as extend themselves very far, and would retard the upright shoot; but you should by no means cut off all the small lateral branches, some of which are absolutely necessary to be left on, to detain the sap for the augmentation of the trunk; for I have often observed, where trees have been thus closely pruned, that their heads have overgrown their bodies, so that they have bent downward and become crooked.

When these trees have remained in the nursery three or four years, they will then be large enough to transplant to the places where they are to remain; for it is not proper to let them grow very large before they are planted out; because they are very hazardous trees to remove when old, or after they have taken deep root.

The season for this work is, as I said before, in the autumn; at which time, if they are carefully taken up, there will be little danger of their succeeding. When they are

planted, the surface of the ground should be mulched about their roots, to prevent its drying too fast; and if the season is very dry, they should be watered, to settle the earth to their roots, which may be repeated two or three times in very dry weather; but you must carefully avoid giving them too much water, which is very injurious to these trees, when newly removed.

You should also stake them, to prevent their being shaken and disturbed by the winds, which would retard their rooting. In transplanting of these trees, you should by no means cut their heads, which is too much practised: all that should be done, must be only to cut off any bruised or ill-placed branches, which should be taken off close to the place where they are produced: but there can be no greater injury done to these trees than to shorten their shoots; for when the leading bud, which is absolutely necessary to draw and attract the nourishment, is taken off, the branch often decays entirely, or, at least, down to the next vigorous bud.

The trees, thus raised and managed, will, if planted in a proper soil, grow to a considerable magnitude, and are very proper for a wilderness in large gardens, or to plant in clumps in parks, &c. but if they are designed for timber, it is much the better method to sow the acorns in the places where they are to remain; in order to which, you should provide yourself in autumn with a sufficient quantity of acorns, which should be always taken from straight, upright, vigorous growing trees; these should be gathered from under the trees as soon as may be after they are fallen, and, if possible, in a dry time, laying them thin in some open room to dry; after which they may be put in dry sand, and preserved in a dry place until the end of November, when you should prepare the ground for planting them.

The directions here given are designed only for small plantations in a garden or park, which are only for pleasure; but where these trees are cultivated with a view to profit, the acorns should be sown where the trees are designed to grow; for those which are transplanted will never grow to the size of those which stand where they are sown, nor will they last near so long sound: for in some places, where these trees have been transplanted with the greatest care, and they have grown very fast for several years after, yet they are now decaying, when those which remain in the place where they come up from the acorns are still very thriving, and have not the least sign of decay: therefore, whoever designs to cultivate these trees for timber, should never think of transplanting them, but sow the acorns on the same ground where they are to grow; for the timber of all those trees which are transplanted, is not near so valuable as that of the trees from acorns. I shall therefore add some plain directions for the sowing of acorns, and managing of the young trees, during their minority, until they are out of danger, and require no farther care.

The first thing to be done is that of fencing the ground very well, to keep out cattle, hares, and rabbits; for if either of these can get into the ground, they will soon destroy all the young trees. Indeed, they will in a few years

years grow to be out of danger from the hares and rabbits; but it will be many years before they will be past injury from cattle, if they are permitted to get into the plantation; therefore, durable fences should be put round the ground. If, in the beginning, a pale-fence is made about the land, which may be close at the bottom, and open above; and within the pale a quick-hedge planted, this will become a good fence, by the time the pale decays, against all sorts of cattle; and when the trees will have got above the reach of hares and rabbits, so that they cannot injure them; for the bark of the trees will be too hard for them to gnaw.

After the ground is well fenced, it should be prepared, by ploughing of it three or four times, and, after each ploughing, to harrow it well, to break the clods, and cleanse the ground from couch, and the roots of all bad weeds. Indeed, if the ground is green sward, it will be better to have one crop of beans, pease, or turneps, off the ground, before the acorns are sown, provided these crops are well hoed to stir the surface, and destroy the weeds: for if this is observed, the crop will mend and improve the land for sowing; but in this case the ground should be ploughed as soon as possible, when the crop is taken off, to prepare it for acorns; which should be sown as soon as may be after the acorns are ripe: for although these may be preserved in sand for some time, yet they will be apt to sprout; and, if so, the shoots are in danger of being broken and spoiled; therefore we would advise the sowing early, which is certainly the best method.

In making choice of the acorns, all those should be preferred which are taken from the largest and most thriving trees; and those of pollard trees should always be rejected, though the latter are generally the most productive of acorns; but those of the large trees commonly produce the strongest and most thriving plants.

The season for sowing of the acorns being come, and the ground having been ploughed, and levelled smooth, the next work is to sow the acorns; which must be done by drawing of drills across the ground, at about four feet asunder, and two inches deep; into which the acorns should be scattered, at two inches distance. These drills may be drawn either with a drill-plough, or by hand, with an hoe; but the former is the most expeditious method; therefore in large plantations should be preferred. In the drawing of the drills, if the land has any slope to one side, these should be made the same way as the ground slopes, that there may be no stoppage of the wet by the rows of plants crossing the hanging of the land. This should be particularly observed in all wet ground, or where the wet is subject to lie in the winter. When the acorns are sown, the drills should be carefully filled in, so as to cover the acorns securely; for if any of them are exposed, they will entice the birds and mice; and if either of these once attack them, they will make great havoc with them.

The reason of my directing the drills to be made at this distance, is for the more convenient stirring of the ground between the rows, to keep the young plants clean from weeds: for if this is not carefully done, it cannot be expected that the young plants should make much progress; and yet this is generally neglected by many who pretend to be great planters, who are often at a large expence to plant, but seldom regard them after: so that the young plants have the difficulty to encounter the weeds, which frequently are four or five times the height of the plants, and not only shade and draw them, but also exhaust all the goodness of the ground, and consequently starve the plants: therefore, whoever hopes to have success in their plantations, should determine to be at the expence of keeping them clean for eight or ten years after sowing, by which time the plants will have obtained strength enough to keep down the weeds: the neglecting of this has occasioned so many young plantations to miscarry as are frequently met with in divers parts of England.

About the end of March, or beginning of April, the young plants will appear above ground; but before this, if the ground should produce many young weeds, it will be good husbandry to scuffle the surface over with Dutch hoes, in a dry time, either the latter end of March, or the beginning of April, to destroy the weeds, whereby the ground will be kept clean, until all the plants are come up so far as to be plainly discerned; by which time it may be proper to hoe the ground over again; for by doing it early, while the weeds are small, a man will perform more of this work in one day than he can in three or four when the

weeds are grown large: besides, there will be great hazard of cutting off or injuring the young plants, when they are hid by the weeds; and small weeds, being cut, are soon dried up by the sun; but large weeds often take fresh root, and grow again, especially if rain should fall soon after, and then the weeds will grow faster for being stirred; therefore it is not only the best method, but also the cheapest husbandry, to begin cleaning early in the spring, and to repeat it as often as the weeds are produced.

The first summer, while the plants are young, it will be the best way to perform these hoeings by hand; but afterwards it may be done with the hoe-plough; for as the rows are four feet asunder, there will be room enough for this plough to work; and as this will stir and loosen the ground, it will be of great service to the plants; but there will require a little hand labour where the plough is used, in order to destroy the weeds, which will come up in the rows between the plants; for these will be out of the reach of the plough, and, if they are not destroyed, they will soon overgrow and tear down the young plants.

After the plants have grown two years, it will be proper to draw out some of them, where they grow too close; but in the doing of this, great care should be had not to injure the roots of those left; for as the plants which are drawn out are only fit for plantations designed for pleasure, so these should not be so much regarded in their being removed, as to sacrifice any of those which are designed to remain. In the thinning of these plantations, the plants may, at the first time, be left about one foot asunder, which will give them room enough to grow two or three years longer; by which time it may be easy to judge which are likely to make the best trees. Therefore these may be then fixed on, as standards, to remain; though it will be proper to have a greater number at this time marked than can be permitted to grow, because some of them may not answer the expectation; and, as it will be improper to thin these trees too much at one time, so the leaving double the number intended at the second thinning will not be amiss. Therefore, if they are then left at about four feet distance in the rows, they will have room enough to grow three or four years longer; by which time, if the plants have made good progress, their roots will have spread over the ground; therefore it will be proper to take up every other tree in the rows. But, by this, I do not mean to be exact in the removing, but to make choice of the best plants to stand, which ever rows they may be in, or if they should not be exactly at the distance here assigned: all that is designed here, is, to lay down general rules, which should be as nearly complied with as the plants will permit: therefore every person should be guided by the growth of the trees in the performance of this work.

When the plants have been reduced to the distance of about eight feet they will not require any more thinning. But in two or three years time, those which are not to remain will be fit to cut down, to make stools for underwood; and those which are to remain, will have made such progress as to become a shelter to each other; for this is what should principally be attended to, whenever the trees are thinned; therefore, in all such places which are much exposed to the wind, the trees should be thinned with great caution, and by slow degrees; for if the air is let too much at once into the plantation, it will give a sudden check to the trees, and greatly retard their growth; but, in sheltered situations, there need not be so great caution used as in those places; the plants will not be in so much danger of suffering.

The distance which I should chuse to allow to those trees which are designed to remain for timber, is, from twenty-five to above thirty feet, which will not be too near, where the trees thrive well; in which case their heads will spread, so as to meet in about thirty, or thirty-five years: nor will this distance be too great, so as to impede the upright growth of the trees. This distance is intended that the trees should enjoy the whole benefit of the soil. Therefore, after one crop of the underwood, or, at the most, two crops are cut, I would advise the stubbing up the stools, that the ground may be entirely clear, for the advantage of the growing timber, which is what should be principally regarded: but, in general, most people have more regard for the immediate profit of the underwood than the future good of the timber, and, frequently, by so doing, spoil both: for, if the underwood is left after the trees have spread so far as that their heads meet, the underwood will not be of

much worth ; and yet by their stools being left, they will draw away a great share of nourishment from the timber-trees, and retard them in their progress.

The soil in which oak makes the greatest progress, is a deep rich loam, in which the trees grow to the largest size ; and the timber of those trees which grow upon this land, is generally more pliable than that which grows on a shallower or drier ground ; but the wood of the latter is much more compact and hard. Indeed there are few soils in England in which the oak will not grow, provided there is proper care taken in their cultivation ; though this tree will not thrive equally in all soils : but yet it might be cultivated to a national advantage upon many large wastes in many parts of England, as also to the great profit of the estates where these tracts of land now lie uncultivated, and produce nothing to the owner. And, should the present temper of destroying the timber of England continue in practice some years longer, in the same degree which it has for some years past, and as little care be taken to raise a supply, this country, which has been so long esteemed for its naval strength, may be obliged to seek for timber abroad, or be content with such a naval strength as the poor remains of some frugal estates may have left growing : for as to the large forests, from whence the navy has been so long supplied, a few years will put an end to the timber there ; and how can it be otherwise, when the persons to whose care these are committed, reap an advantage from the destruction of the timber ? *Miller's Gard. Dict.* See TIMBER.

Mr. Marshall, in his Rural Economy of Norfolk, vol. II. says, that "oaks are observed to grow best, and make the finest plants and the most beautiful trees, when they are raised undisturbed from the acorn. The oak having naturally a strong tap-root, it is almost certain death to remove a large plant which has not been transplanted or tapped whilst young : nevertheless, if the tap-root has been properly taken off from the seedling plant, it may afterwards be removed at pleasure, with safety.

"Oaks may be tapped by taking up the plants and taking off the tap-root with a knife, or it may be done as they stand, with a tapping iron, or even a common spade ground to an edge. This, being introduced at a proper depth beneath the surface of the ground, cuts off the tap-root ; leaving the principal part of the lateral horizontal fibres undisturbed. When the plants have got large (four or five years old for instance), this is perhaps the safest way of treating them ; for the lateral shoots in this case receive no check whatever, but continue to throw up a regular supply of sap to the plant : whereas, by taking them up and removing them into a fresh situation, they are several days before they begin to work ; in which time the plant may receive irrecoverable injury.

"A seed-bed of oaklings, five years old, I treated in this manner : in March and April I tapped them all with common spades, ground sharp ; pruned such as were in any degree straight ; and headed down the rest near the ground, to throw out straight shoots to be trained.

"Not a plant I see is dead.

"Had there been more of them cut down the effect would have been still better.

"A striking instance of success in transplanting large oaks for standards occurs on Gunton Common. Scarcely a plant, of some thousands, has miscarried, and very few which do not flourish.

"A person who had some share in the business of this plantation, tells me, that it was the employment of two men and a couple of horses, almost all the first summer after they were planted, to water them ; not by a pailful, but by a hoghead, at once ; which served for the summer.

"This was a rational method ; a pailful only tantalises and baulks the plant ; whereas a hoghead deposited at its root affords a natural and regular supply, to be drawn up leisurely by the sun during the course of the summer."

Mr. Marshall, also observes, that "upon some estates it is the practice to put in, when a new hedge is planted, a holly at every rod, and an oak-plant at every two or three rods, among the white-thorn layer. This is an excellent practice, provided the young oaks be trained to a proper height before they be suffered to form their heads. For, in this case, they will become a valuable source of timber, without injuring, in any material degree, the inclosures they grow between. It is the roots of the ash and elm, and the tops of low pollards, and tall overgrown hedge-woods, which are injurious to the farmer. A timber-oak, of fifteen to twenty feet stem, does very little if any injury either to the crop, or the hedge growing under it.

"But if, on the contrary, the oaklings, thus planted, be suffered to rise with more than one stem, as stubwood, or, rising singly (which is seldom the case in a young hedge), they be permitted to form their heads at eight or ten feet high, with flat wide-spreading tops, they lose their intended value, and become nuisances, not only to the adjoining inclosures, but to the hedge in which they grow. Eligible, therefore, as it is to plant young oaks among hedgewood, the advantage to be obtained from it rests wholly on the after-management."

Mr. Young, in his Annals of Agriculture, vol. I. says, that "oaks are of slow growth, but if you put them at proper distances amongst the quick growing trees, they will sometimes be drawn up beyond your expectations, and let me caution you to watch them, and to cut out such trees as crowd upon them, by transplanting them every third year in a nursery ; they may be put out from six to ten feet high.

"Land that will let at from 12s. to 18s. per acre, for any given time, pays better than with wood, if you calculate the compound interest on the annual rent ; but who is there that is so careful as to make it, or that can make it on very small sums ? I consider the appropriating of 50 acres out of every thousand, as laying by a small part of the income of an estate, that will not be missed, at compound interest, as an accumulating fund, that frequently comes in very seasonable to stop a large gap.

"I have now, of my grandfather's sowing, about 26 acres of as fine young oak timber as can be seen, which may be worth, in 25 or 30 years, 4000l. I have likewise, of my father's sowing, 20 acres to succeed them. My ancestors have done so much : I have only added about ten acres to the fund, chiefly of Scotch fir, on a poor soil, where other trees have been tried, and failed ; the thinning of these woods likewise pay a fair rent, after a time. I made a purchase, upon which were 14 acres of wood-land ; there are 400 oak trees upon it, that, in 30 years from the time of purchase, will sell for as much as the estate cost me, 1000l.

"If you could find situations adapted to the tree, popular pays beyond any other ; but they require a deep loamy soil by the side of a stream. My father felled two in the year 1760, of 45 years growth ; they sawed to 2200 feet of inch boards, which would now be worth 16s. 4d. per hundred ; deduct 2s. 4d. for sawing, remains nett profit 15l. 8s. In 1761, my father planted a clean shoot of poplars, about ten feet long, which girthed, in December 1770, four feet four inches, and in October 1775, five feet five inches, and at this time, is, at three feet from the ground, six feet seven inches ; within two yards of it stands another of the same age, that measures five feet five inches and a half, and, I think, in the end, will be a larger tree ; they are at least 60 feet high. Poplars should never be shredded up.

"A gentleman that farms, and keeps a waggon team, should have 120 or 130 acres of land."

The Cowthorp oak, the largest in England, is 36 feet, 6 inches circumference, 5 feet from the ground. The oak in Holt-forest, near Bentley, at 7 feet 34 in circumference. The Fairtop oak seemingly found in 1754 ; and the earl of Thanet's, in Whinfield park, Westmoreland, 31 feet 9 inches. The handsomest in England, is in the earl of Powis's park, by Ludlow, which, in 1757, was 16 feet 3 inches ; but straight and clear for 60 feet. The Dunbarton ash 16 feet 9 inches. A Wych elm at Bradley, in Suffolk, 26 feet 3 inches. Lord Ducie's chestnut, at Totworth, in Gloucestershire, at 6 feet, was 46 feet 6 inches in 1759, it is above 1100 years old. It was called the great chestnut in King John's time ; Mr. Marsham calculates, that it was 540 years old when he came to the throne, and was 11 yards in circumference. See BATH MEMOIRS, vol. I p. 76.

OAK-BARK. See the article BARK and TAN.

OATS, the name of a well known species of grain, and of which Mr. Miller reckons four sorts, cultivated in England, viz. the white, the black, the brown, or red, and the naked oat, in which, though supposed to be only accidental varieties, he has never observed any alteration where they have been cultivated separately for many years. Their principal difference is in the colour of their grain.

The white sort, which is most common about London, makes the whitest meal, and is chiefly cultivated where the inhabitants live much upon oat-cakes. The black oat is more cultivated in the northern parts of England, and is esteemed a very hearty food for horses. Red oats are much cultivated in Derbyshire, Staffordshire, and Cheshire, but are

are seldom seen in any of the counties near London; though, as they are a very hardy sort, and yield a good increase, they will be well worth propagating, especially in all strong lands. The straw of these oats is of a brownish red colour, as is also the grain, which is very full and heavy, and esteemed the better food for horses than either of the other sorts. The naked oat is least common in the southern parts of England; but in the northern counties, in Scotland, and in Wales, it is pretty much cultivated, and is particularly esteemed, because its grain threshes clean out of the husk, and need not be carried to the mill, to be made into oat-meal or grist.

As oats are very hardy and will thrive in almost any soil, they have been a great improvement to many estates in the northern parts of this kingdom, where, though sown even so late as April, and in stiff ground, they have ripened early, and yielded a good crop. However, February or March, according as the season proves early or late, is a more common and better time for sowing this corn, of which it may always be right to sow the largest grain sort earliest.

Oats are often sown after a crop of wheat, rye, or barley; in which practice the common method is to turn in the stubble, with one ploughing, about the beginning of February, and sow the seed with a broad-cast at twice, harrowing it in, once after the sowing, and five or six times after the second, observing to draw the harrow once or twice across the furrows, to break the clods and cover the seeds: but at the other times to harrow in the same direction as the furrows, lest the stubble should be raised on the surface. But it would be much better husbandry to plough in the stubble in autumn, that it may rot in winter, and to give the land another ploughing, and a good harrowing just before the oats are sown. This will render the ground finer, and fitter to receive the grain, the increased produce of which will amply repay the extraordinary expence of tillage. M. Duhamel, after observing that every farmer knows, though but few practise it, that all crops of spring-corn are greatly bettered by this method, instances the example of M. d'Elu, one of his correspondents, who having given three ploughings to some of his oat-lands, had in 1759, a year remarkably dry, and unfavourable to spring-corn, a plentiful crop of oats, which held up well till they were perfectly ripe, and yielded excellent grain.

Another thing, which I must also insist on, is, that if farmers were to follow the directions before given, in regard to the changing of crops, by which means oats, which impoverish the ground, would always succeed some one of the meliorating crops, the return would be much more plentiful than in the common way, because the earth would be in a much looser state.

When oats, as it frequently happens, are sown upon lay, or on ground newly broken up, after only one ploughing, which is given in January, when the earth is moist, to turn down the sward; the harrowing must be in the same directions as the furrows, or but very little across, for fear of raising the turf. But this again is bad husbandry: for the ground would be brought to a much better tilth for other grain, as a preparation, for which this sowing is chiefly intended, by giving the sward time to rot before the oats are sown; because the roots of the grass will prevent those of the corn from striking downward.

Black oats delight in a moister soil than the white sort, and, being a hardier plant, may be sown a month earlier. The white, which prefer a dry land, and will do well on gravel and sand, are the best of all corn for ground subject to quick-grass or weeds, because it may be ploughed later for them, and they rise sooner, and top the weeds better than black oats. The weather cannot be too dry when white oats are sown; though the ground may then be moister for them than barley will endure; because this last, having a thinner coat, is soon killed by imbibing the wet, which may perhaps burst many of its vessels; whereas, white oats, being protected by a double husk, better resist the entering of the moisture. Mr. Lisle, who makes these remarks, adds, that according to the best of his observations, white oats require a rich feeding soil; because their haulm, or straw, running to a great largeness, cannot be supported without good juices and moisture; that white chalky ground, though in never so good heart, will be unfruitful with white oats; and that a mixed mould, between white earth and red clay, of which there is a great deal in the hilly parts of Hampshire, is not feeding enough for them. The red and the white clays, when in good

heart, carry moisture enough, and are very fit for this grain.

The common allowance of seed oats is four bushels to an acre; but Mr. Miller rightly thinks three bushels more than enough: and the usual produce is about twenty-five bushels from an acre; though he observes, that he has sometimes known more than thirty bushels reaped from that extent of ground; and we can say with truth, from an accurate account now in our possession, that a gentleman who is indeed an excellent husbandman, has had, for a continuance, forty-eight bushels of oats from off each acre of his land sown with that grain. I do not mean forty-eight bushels of naked oats; for the produce of that sort is the least of any in bulk, because its grains are small and lie very close together; but they make up in value for what is wanting in measure. White oats always produce a greater increase than black oats. Mr. Lisle threshed a stack of twenty-eight loads of the former, and found it yield more grain than a stack of thirty-eight loads of the latter: and farmers in general account an ordinary crop of white oats as good as a middling crop of black oats. This last sort is also most liable to blight, especially if a hot summer follow a dry, cold spring, and the grain has been sown on lay ground. Their culture is alike; and the manner of mowing and ordering them at harvest exactly the same. Only it is to be observed, that white oats are apt to shed most as they lie; and black oats as they stand.

In the year 1709, Mr. Lisle sowed, in the beginning of May, in some of his wheaten ground, where the corn had been killed in the preceding hard winter, rath-ripe barley in one part, and short grained white oats, which he distinguishes by the name of white Poland oats in another. Both grains were sown on the same day, in an equally fertile, moist, and well-tilled ground. He made no doubt but that the Poland oat would be first ripe, and was therefore surprised to see the rath-ripe barley spring up soonest, by four or five days: but reflecting on the nature of each grain, he soon concluded the reason to be, that the oat having a double hull, and being consequently better guarded from moisture; could not imbibe the vegetable water so soon as the barley; but that, the texture of the flour of the oats, and the infolded fibres of the inclosed plant being softer, it would consequently grow faster. From hence he infers, that, to secure the growing of Poland oats without rain, they must be committed to the earth before it becomes so dry as is proper for the sowing of barley, not only because the oats require more moisture to make them grow, but also because they lie so many days longer on the ground, before they come up, than the barley does.

When oats are about four inches high, intelligent husbandmen run a wooden roller over them, after a shower of rain has softened the clods, by the breaking of which, in this manner, fresh earth is laid to the roots of the plants; their tillering is considerably increased, if they have not been sown too thick, and the surface of the field is smoothed; so that the mowers, at harvest, are able to cut close to the ground, as it is very fit they should, because oats seldom grow high. Both oats and barley should be carefully weeded.

Oats are ripe when the straw turns yellow, the grain becomes hard, and the chaff begins to open and shew the seed. When mowed, they are generally let lie some time for the dew and the rain to plump them, and make them thresh well, and, if weedy, to kill the weeds; but if rain wet them much, they should be carried off as soon as they can be got tolerably dry again, or they will shed; for oats may be inned the wettest of any corn, if the weeds among them be but dead. Even in very rainy harvests, when other grain is spoiled, this will receive little or no damage, the surface of its straw and ears being so smooth and compact as to turn off water, and of so dry a nature, that, though housed wet, they will not heat in the mow, or become mouldy, as other grain usually do. This is a vast advantage in northern climates, where the harvest is generally late, and the autumn wet.

M. Duhamel is strongly of opinion, that farmers, especially those who keep many cattle, would find their account in housing their oats directly, without letting them lie out after they are cut, as is the common way, that rain and dews may moisten, and consequently swell their grain. He earnestly advises husbandmen to try the experiment upon a part of their crop; "because," says he, "the fodder will by this means certainly be much better for cattle, and much less grain will be lost in the field. It may be objected, that these oats will be difficult to thresh; to which

which I answer, that if this be the only inconvenience, the superior quality of the fodder, and the saving of a quantity of grain, which would otherwise be shed, will probably more than pay the extraordinary wages of the thresher.

"But allowing that the oats thus housed cannot be threshed quite clean, and that some grain will necessarily remain in the ears, I say that this will not be lost to the farmer; for he is obliged to give his cattle unthreshed oats, and they will easily find the grains remaining in the straw, which will not perhaps exceed the quantity that would have been dropped in the field: and even granting, though it will not happen, that the greatest part of the grain be left in the ear, still it will not be lost in the hands of an intelligent farmer; for what should hinder him from giving it to his horses? Supposing that four sheaves yield a bushel of oats, he need only give his horses those sheaves instead of a bushel of corn. They will certainly be longer in feeding upon four sheaves, than upon a bushel of cleared oats; and at the same time they will eat some straw with corn, which will supply the place of other fodder, and probably prove a more healthy food." This method may be particularly beneficial to such as live in very hot countries, or in very dry seasons.

Mr. Lisle, refuting the opinion of those who think that oats cut green will ripen while they lie in swarth, says, "If by ripening be meant shrinking, drying, or withering, I must allow the position; but if the countryman will have it, that the greenish oat, cut a fortnight or ten days, or be it but a week, before it is ripe, will proceed in its vegetable increase, and swell as well as harden by lying in swarth, I must deny it. This year (1707), I made a full experiment of this matter; for when the spring corn was sown, the ground being generally dry, half the oats and barley came not up till the latter end of May, when rain came, whereby in most places half the crop was edge-grown. The forward oats being then in danger of shedding, we were forced to cut down the greenish corn with the ripe, when otherwise we should have waited ten days longer. I let them lie in swarth about a week, and, when I carted them, I found the hull of the greenish oat had got a riper colour, and the pith was hardened, but pitifully lean and shrunk; so that though this is to be done on necessity, yet it ought not to be practised with such indifference as is usual among farmers. Note, the pith of these green oats was well past the milk, and came to a floury substance."

The same gentleman adds, that oats are the worst of all grain to keep, because of the great moisture in them, and their consequent aptness to heat when laid in a heap; and that when the heat has been such as to spoil them for growing, their hulls look as red as a fox.

The meal of oats makes tolerably good bread, and is the common food of the country people in the North. In some places beer is made with this grain: in Russia, in particular, the poorer sort make with it a drink, which they call *quas*; but its principal use is for the food of horses, for which purpose it is reckoned very wholesome, being sweet and of an opening nature: but it must not be given them before it has sweated in the mow, or been otherwise dried, lest it should prove too laxative.

The very long drought of the summer 1762, shewed another very profitable use of oats on such occasions; and probably it will answer equally well in the winter. Some milk-men near London boiled oat-meal in the water which they give their cows to drink, and found that the expence was abundantly repaid, by the additional quantity of milk which these cows yielded more than those which had not this mash.

Mr. Marshall, in his Rural Economy of the Midland Counties, says, "this year (1785, September 9), I grew ten or twelve acres of oats, on a foul wheat stubble, once ploughed, by way of bringing it into course, for fallow next year.

"About two acres (a cool moist part of the piece) were sown the 7th of April; the whole being ploughed in March. But the remainder of the piece I suffered to lie unsown, for two reasons; the dryness of the soil, and the backwardness of the season: the fallow did not blow before the 16th of April; nor did the grossberry foliate, before that time.

"Nevertheless, I finished sowing the 18th April: not more to save appearances, than to endeavour to hit the middle way between the season and the sun: for, although I am clearly of opinion, that the latter ought not to be wholly attended to, yet it is more than probable, that it

should not be wholly disregarded; because, when the season is backward, it is generally rapid; and although oats, for instance, may be sown with the fallow, yet, before they have had time to prepare for a state of vegetation, and to struggle through the soil, the hawthorn may (as it did this year), have foliated; and it is, probably, the emergence of the plant, not the deposit of the seed, which ought to keep pace with the vegetation of trees.

"All the oats in the country (Mr. ———'s perhaps only excepted) were sown before the fallow blowed: in general, between the 1st and the 15th April.

"Those which were sown early, and immediately after the plow, before the frost had taken the surface, came away, at once, and looked beautifully: while those of No. 17, sown by the fallow, came up in patches, and made a very poor appearance.

"The plants, however, which rose, were strong, and of a good colour, with the ribbon broad; and, when the panicles pushed out of the hose, they proved to be unusually well corned; so that, before harvest, they put on the appearance, notwithstanding the season and the state of the soil, of a tolerably full crop: while those, which had been sown early, and looked so beautifully in the spring, dwindled away daily: becoming weak, short, thin, and scrawly; and, when they were mown, afforded no swath. Neither Mr. —, nor Mr. —, I apprehend, had a load an acre, notwithstanding the soil was evenly occupied; while in No. 17, where not half the seed vegetated at the time of sowing, and where, in many places, not half the soil was occupied, there was from a load to a load and a half an acre. Had the whole of the seed vegetated at the time of sowing (and that it did not vegetate then, was not owing to the lateness but the dryness of the season), there would, in all probability, have been, notwithstanding the droughtiness of the summer, and the condition of the soil, between two or three loads of well-corned oats an acre.

"The patch sown first, though peculiarly moist and cool, and fully furnished with plants, bore no greater burden, and much less luxuriant plants, than the part sown last; though of a drier nature and not half covered.

"Therefore, this year's experience, with oats, has strengthened my opinion of the propriety of sowing by the seasons, rather than by the sun.

"However, for the reason mentioned, it may be prudent in an early season to follow in a late one, to precede, the progress of spring.

"It may nevertheless be proper to remember, that this caution is drawn from reason, and not from the experience of this year: for the oats, sown two days after the ploughing of the fallow, were evidently stronger, more healthy plants, than those sown three days before the circumstance took place.

"It is observable, however, that the part sown first, was first ripe; and that the time of ripening, throughout the country, corresponded, in this case, with the time of sowing.

"Many oats, in different parts of the district, have this year been sheaved: namely, mown outward, gathered from the swaths, bound, and shucked; in order to be cut, with greater propriety, into chaf, or cut-meat, for horses, &c. &c. this year of scarcity of hay. Sheaf corn lies straighter in the cutting box, and is of course less liable to be cut at a double, than loose corn.

"The common price has been five shillings an acre, for mowing, binding, shucking, and raking.

"I had about three acres harvested in this way; partly for the purpose of cutting, and, in part, to secure the fodder, and to put it, as much as possible, out of harm's-way, this hazardous harvest. The rest, getting ripe too fast for the few hands I had in employ, I harvested in swarth.

"The whole received a considerable quantity of wet; and those which were exposed in swarth, were of course considerably hurt. The corn discoloured, and the straw withered; while those in the sheaves were little, or not at all, worse for the weather. The superior quality of the straw of those which were sheaved is, this extremely scarce year for fodder, worth ten times the extra labour. Indeed, if turning, cocking, extra trouble in carrying and ricking, the extra shedding, and the raking after the carriage, be taken into the calculation, the saving would perhaps be found on the side of the sheaves.

"Of this, at least, there is no doubt, that in a catching harvest,

harvest, the sheaving of oats, if hands can be got, is incomparably better management, than exposing them in swarth. For if mown oats be carefully gathered, and somewhat loosely tied in small sheaves, carefully set up, and securely covered, there is scarcely any harvest untoward enough to hurt them.

"In the harvesting of oats, the primary objects to be attended to, are the colour of the grain, and the sweetness of the fodder. Clean threshing is a secondary consideration; for, if a few light grains be left in the straw of oats, the fodder is the better, and the sample more slightly.

"Hence" oats should be harvested, as much as may be, in the shade; and, of course, in covered thucks, rather than in swarths, or in single sheaves. See YORK. ECON.

"But, in harvesting wheat, different principles take the lead. The colour is not an object; while threshing clean is of the first importance: for the grains which are left in the straw of wheat are not only lost, but the thatch is injured by them.

"Hence wheat cannot be exposed too much to the weather, provided it is not injured by sprouting: nor oats be dried too much in the shade, provided they will thresh without very extraordinary labour.

"A penny or two-pence a quarter, in the price of threshing oats, is inconsiderable, compared with sweet fodder and a bright sample.

"Oats in thucks, well covered, are nearly as safe in the field as in the rick-yard: and it matters not much whether they remain there a week, a month, or a longer time; provided, in the end, they be carried perfectly dry."

In his Gloucester Economy, Mr. Marshall observes, that "the wild oat, a plant unknown in many parts of the island, is here, as well as in Yorkshire, a most troublesome weed of corn. In general appearance, this plant resembles exactly the cultivated oat: in stem, blade, panicle, chaff, and kernel, they are the same plant; and, in colour, their seeds are subject to the same varieties: namely black, red, white. But, examined botanically, the wild oat differs, in three notable particulars, from *avena sativa*; which is described by Linnæus, as having "calyxes two-seeded; seeds polished; one awned;" whereas, the calices of the wild oat are two or three-seeded; the seeds covered with long soft hair; and all of them awned. Nevertheless, in one instance, I found the lower seeds of the panicle nearly smooth: this, added to the circumstance of the Poland oat (a highly cultivated variety) growing in calices one-seeded, and without any awn, renders it much more than probable, that the various sorts of cultivated oats are no more than cultivated varieties of the wild oat.

"Be that as it may, the wild oat appears to be as confirmed a native of this island, as any other arable weed which grows in it; and is, perhaps of all, the most difficult to be extirpated. It will lie a century in the soil, without losing its vegetative quality. Ground, which has lain in a state of grass, time immemorial, both in this country and in Yorkshire, has, on being broken up, produced it in abundance. It is also endowed with the same instinctive choice of seasons, and state of the soil, as other seeds of weeds appear to have. This renders it, what it is considered, a difficult weed to be overcome: for, ripening before any crop, it sheds its seed on the soil, where it probably finds safety from the birds in the roughness of its coat. Fallowing, hoeing, and, where it is practicable, giving a final hand-weeding, after it shoots its panicle, are the only means of extirpation."

The following Letter from Mr. Lamb, on the best Method of cultivating black Oats, and recommending more frequent Ploughings than any usually afforded them, will, we are persuaded, be acceptable to our Readers.

"Gentlemen,

"Having been for many years a practical farmer in the eastern part of the county of Essex, you will not, I hope, think me impertinent in troubling you on the culture of black oats, which I have very often to great advantage sown.

"Most of my neighbours prefer the white Poland oat, which may, I own, in some circumstances of soil and situation, be best. I prefer the black oats, because they are hardiest, for which reason they suit best with my convenience; for, as a considerable tract of the farm I occupy is light land, I am under a sort of necessity of sowing this

soil early, or, if a dry summer followed, I should have no return at harvest.

"Few people allow more than one ploughing for a crop of oats; but such as follow this practice are very wrong-headed; for they may assure themselves, that no crop pays better for ploughing than oats; and it is on this account that I generally give my land designed for oats three tilths; whence, I am morally certain, arises the largeness of my crops, for I have seldom under five, oftener six, and very frequently seven quarters from an acre, throughout a field.

"Your readers will not be surprised at my having such good crops, when I observe, that I almost every year sow some oats on a fallow that has been well dunged; and this I aver to be good husbandry, as it abates the rankness of the soil, kills many of the weeds, and prepares the land in an excellent manner for a succeeding crop of sweet wheat; but I must observe, that I always clear my land of the stiff oat-stubble before I attempt to plough for the wheat.

"I have already said that I sow black oats early on my light land: by early, I mean as early as the first week of February, by which time I have generally an opportunity of getting the land in proper order, for a light soil is soon wet, and soon dry.

"Let me mention once more to your readers, that it is on a light soil, which is apt to burn a crop, that I sow my black oats so early as the beginning of February; for should any of them attempt to sow them so early in a moist, cold, stiff soil, and a hard frost should follow, the young blade would, in all probability, be killed.

"I must also remark, that when I sow oats thus early, it is generally under furrow; yet I sometimes sow them broad-cast, and plough them in.

"The quantity of seed I for the most part use is about three bushels, which I find to be enough; nay, I have sometimes from only two bushels had a good crop; but then I have been particularly careful and attentive to the goodness of the seed, without which precaution I should not, unless the season had been very favourable indeed, have succeeded.

"I have found it a very good way to sow first half my quantity of seed under furrow, and afterwards, sowing the remainder broad-cast, harrow it in; and this is often my practice when I sow the latter end of February, or the beginning of March.

"When I sow oats after wheat, which however is not very frequently, I turn up the stubble as soon as I conveniently can after harvest, and leave it rough through the winter. The first fine weather after Christmas, I lay it down smooth with the harrows, and immediately give it a cross ploughing.

"As soon as February comes in, if it is not a hard frost, I make the land as fine as I possibly can by the harrows, raising a fine loose mould to the surface, which is to be the bed for the oats to lie in; for I sow my oats directly under furrow; after which I pass a moderate sized roller over the field, and then give a slight scratch with a pair of light harrows.

"This husbandry generally produces me a crop I have no reason to complain of.

"My chief reason for troubling you with this letter is, to endeavour to persuade my brother farmers that they do not, in general, allow their oats a sufficient number of ploughings; one being the stated quantity.

"If they would plough twice for this crop, they would receive more than twenty shillings an acre for their trouble; but if they would consult their own interests, and allow three ploughings, it would often make fifty pounds difference to them in a field of twenty acres: this they will, perhaps, think wonderful; but it is no less true.

"The black oats require particularly to be sown early, especially if the farmer wishes to have them of a fine glossy ebony colour, and that the crop should corn well; for if they are sown late, and wet weather follows soon after sowing, they will be apt to run all to straw; and if it be dry weather, and the soil gravelly, it is a chance but they are burnt up.

"I have found by experience, that black oats will yield a very large crop after turneps; and this I believe is simply owing to their being sown in a fine tilth; for the mould cannot but be reduced to very small particles, if a crop of turneps has been well husbanded, especially if it is in a light soil.

East of Chelmsford,
Essex.

I am, &c.

J. LAMB.

S U

Wild

Wild OATS, a species of oats difficult to be extirpated, where they have once taken possession; for ripening before harvest, and scattering their seed round them, they will remain in the ground till it is ploughed up again, though it be for a whole year, some say four or five years, and will then come up with the corn. The surest way to destroy them is to lay the ground down to clover, and to mow the oats and clover together before the oats are ripe.

OIL-CAKE. See **FLAX SEED.**

OILS, the beards, or prickles of barley, &c.

OLLET, fuel of any kind.

OMY, mellow; spoken of land.

OPE-LAND, ground that is loose or open, from its being ploughed up every year.

ORCHARD. Mr. Marshall, in his *Rural Economy of Gloucester and Herefordshire*, gives the following information, under the heads *Orchard* and *Fruit Liquor*:

"The cultivation of fruit trees, for the sole purpose of liquor, is peculiar to the western provinces. The southern counties, when the London markets are overstocked with fruit, make a sort of liquor from the surplus: but the eastern, the northern, and the Midland counties, may be said to be as much unacquainted with the business of a liquor-orchard, as they are with that of a vineyard. Even Staffordshire, which is divided from the cyder country by a narrow ridge of hill only, has not, generally speaking, a barrel of cyder made within it.

"Herefordshire has ever borne the name of the first cyder county: Gloucestershire, however, claims a preference in the two most celebrated fruit-liquors the district affords. Worcestershire and Monmouthshire have their claims of excellency. May-hill may be considered as the center of this division of the cyder country.

"Devonshire and its environing counties form another division; which, though upon the whole much inferior to this, produces one species of liquor (the coccagee cyder) which is in high estimation.

"Fruit-liquor is here an object of rural economy: and, though inferior to most other of its objects, was a secondary inducement to my visiting the district. In 1783, however, I was unfortunate: it was not a general fruit year. But this year (1788), has made up for the disappointment. There are men who will this year make a hundred hogsheads, that, in 1783, did not wet the press.

"But the management of orchards and their produce, though it enters into the practice of almost every occupier of land, is far from being properly understood. The primary object of farmers, in general, has been that of supplying their own immoderate consumption. The markets for sale liquor has hitherto been confined. In a plentiful year it has barely paid for the slavery of making it. But the late extension of canals, and other inland navigations, and most especially one which is now extended between the Severn and the Thames, together with the present facility of land-carriage, have already extended, and will in all probability still farther extend, the market for fruit-liquor; and there may be, henceforward, some encouragement for the manufacturing of sale-liquor; the right management of which is a mystery which few men are versed in, and which I have found somewhat difficult to fathom.

"I have, however, been the more diligent in my application to this subject, as it is an art which has never been duly investigated. The entire subject having never undergone an analytic examination, no man can be said to have had a view of it, sufficiently comprehensive, to raise every part to the requisite degree of perfection. The cydermen (the buyers of sale liquor), are far advanced in the ordering of the liquor, but are unacquainted with the management of orchards; while the occupiers of orchards are, mostly, as unacquainted with the proper management of the fruit they grow. A general view of the whole art cannot, therefore, fail of having its use; even in the cyder countries.

"In the orchards of this district, we find the apple, the pear, and the cherry. The last, however, is only found near towns, and in young orchards: and although it is probable that a liquor of some richness and flavor might be made, from a well-chosen variety of this species of fruit, I do not find that any attempt has been made, in this district, to produce from it a vinous liquor. Therefore, the apple and the pear, only, are here entitled to examination.

"Nature has furnished us with only one sort of each of

these species of fruit: namely, the common crab of the woods and hedges; and the wild pear, which is pretty common in the hedges of the district.

"Linnaeus, who knew all nature, takes no notice of the apple. He, as well as other botanists, considers it as a production of art: the various sorts, with which our orchards abound, being considered as no other than cultivated varieties of the *pyrus malus*, or crab; while all the rich and highly-flavoured pears, of which gardeners speak so learnedly, are considered as no other than artificial productions from the *pyrus communis*, or common wild pear.

"But we require not the assistance of botanic knowledge to convince us, that the numerous sorts of fruit, which are cultivated by orchardmen and gardeners, are not natural species.

"The huffcap, and the sack, are pears which have been usually grafted: and besides these and a variety of others, great numbers of kernel fruits are found among the pear-trees, as well as among the apple-trees, of this district.

"The production of orchard fruit, for the purpose of liquor, now requires to be examined in detail, agreeably to the subdivisions of the subject enumerated at the head of this article. But in giving this general view of the proper management of orchards, the practice of this division of the cyder country (so far as at least as it has come to my knowledge) will be found, in many particulars, improper to be held up as a pattern. The method of procedure, in this case, must therefore be, to select the best instances of the practice of these districts, and make up the deficiency from my own practical knowledge of the subject of planting; in order to endeavour to render this article, what I wish it to be, general and practical.

"Through the kingdom in general, we see apple-trees in no other situation, than in small inclosures or yards adjoining to a house or garden; having been planted, perhaps, without much regard either to soil or aspect: locality, alone, having determined the site.

"But in this district, locality, with respect to the homestead, appears to have had little weight in determining the situations of orchards: which we frequently see scattered about in every part of a township; perhaps half a mile from any habitation.

"In situations where orchard fruit is scarce, and where a considerable market for them is within reach, such orchards might be hazardous. But in this country, fruit is of little value, until it be converted into liquor: a change which thieves, petty thieves, at least, have not an opportunity of effecting with sufficient secrecy. Cottagers have no mills. The stolen fruit must be carried to a neighbour's mill to be ground. The neighbour knows each man's fruit, and the quantity he grows; and the robbery is of course detected. In small quantities, especially near towns, orchard fruits are no doubt stolen. But the theft is similar to that of stealing a mess of turneps in Norfolk: they are never missed; and the real loss is inconsiderable, except in some particular situations.

"Aspect is of much more importance, here, than locality, and appears to have had due weight in fixing the sites of orchards, in this district; for though orchards are found on every side of hills, the south east, with a screen to the north, seems to be the favourite aspect. The morning sun is esteemed genial to fruit: an old idea, and not merely a popular notion; though in some degree it may be deemed such.

"It is not probable that the quality of the morning rays is much superior to those of the noon-day or evening sun (the popular idea); but it appears demonstrably, that a south-eastern aspect collects a greater quantity of heat, and enjoys a longer day than any other aspect. It is noon before a western aspect reflects a ray. In the morning, it will frequently remain dewy and cold, several hours after vegetation has been roused, against an eastern inclination. The afternoon sun is, no doubt, more intense on the west than on the east side of a hill; but its duration is short. In an afternoon, the air is every where warm; and a regular supply of warmth appears to be more genial to vegetation than a great and sudden transition from heat to cold. The coolness of the evening comes on, and vegetation is probably checked as soon, or nearly as soon, in all aspects. Hence we may, I think, fairly conclude, that the south-eastern aspect enjoys more vegetative hours, and

and receives a more regular supply of heat, than any other aspect.

"Nevertheless, on a fruit-liquor farm, it may be prudent to have plantations in different aspects. Blights (whatever they are) appear to be communicated to the trees by the wind. In 1783, orchard-fruit was cut off in every situation, except a north-west aspect; in which I saw several orchards fully fruited.

"A northern aspect, however, has its disadvantage; and although it may, in this country, especially where the soil is warm, produce fruits fit for the purpose of liquor, yet, in the more northern provinces, it may be altogether inadequate to that purpose. A hill dipping to the south partakes of the nature of a south wall. The atmosphere, a few feet from the ground, is probably many degrees hotter on the south than on the north side of a regular hill: and the richness and flavor of fruit depends much on the heat of the atmosphere it matures in. The fruit of the branch of a vine, for instance, which is introduced into a stove or green-house, is much richer and higher-flavored than that of other branches of the same vine, which remain in the common atmosphere. Hence every means should be used to render the atmosphere of an orchard as warm as may be; to collect as much heat within its area as possible. Therefore, while it enjoys the morning sun, it ought to have a tall woody screen to the east, to break off the piercing winds from that quarter. The winds travel horizontally, or nearly so; while the sun soon gains a sufficient elevation to lodge its rays in the atmosphere of a screened orchard.

"Much has been said about fruit trees in hedges, in the cyder counties. But this should seem to be one of those wild ideas, which hasty travellers are liable to catch. Crab-trees, perhaps, are more common in the hedges of this, than they are in those of other districts; and hedge-crabs, here, as in other places, are sometimes grafted with apples; but I have met with very few instances, in which hedge-rows have been designedly, and regularly, filled with apple-trees. About Bromyard, I saw one or two instances, in which apple-trees form close woody hedge-rows; blowing out, on either side, over the adjoining inclosures. But the practice of planting fruit trees in hedges, I apprehend, has never been common, and is now, I believe, wholly laid aside. There are two disadvantages attend it: the hedge is inevitably destroyed, and the fruit is difficult to collect.

"It appears to be sufficiently well ascertained, in this district, that the same species of fruit, when produced on different soils, affords liquors of very different qualities. The fire-apple, on the limestone lands of the forest of Dean, yields a cyder which is marked by richness, (sweetness), and fulness of flavour: while the same apple, in the Vale of Gloucester, a strong, deep, rich soil, affords a liquor, whose predominant qualities, without great diligence in the manufacture of it, are roughness and strength. The Hagloe crab, too, seems to require a calcareous rock to give full richness and flavor to its liquor. The orchard which yields the nectarious juice, that has been spoken of, has for its soil a very shallow loam, lying on a soft, sandy rock, provincially a dunstone, which, on examination, proves to be pretty strongly calcareous; and is of a con-texture sufficiently porous and loose to admit the fibrils of vegetables.

"On the contrary, the squash-pear draws the finest liquor from deep strong land. A plug of soil, taken beneath a pear tree, in a celebrated orchard, in the township of Taynton, is a strong brown clay, without a particle of calcareous earth in its composition. Nor does the subsoil, a still stronger red clay, shew the least marks of calcareosity.

"I have observed a pear-tree flourish on the side of a cold blue-clay swell (Lassington Hill) where the soil is so infertile that scarcely any herbage, except the wood sedge, will grow upon it; and where the native crab evidently starves for want of nourishment. There are many similar swells scattered over this district; and it is probable that their value (at present very inconsiderable) might be advanced manifold, by planting them with some of the superior sorts of pear trees.

"This contrariety may be reconcileable in the specific qualities of these fruits. The juice of the pear is naturally saccharine; while that of the apple abounds with acidity; and, if we may venture to reason on a subject so little understood, as is that of the vegetable economy; what is more

likely to lessen the proportion of acidity, than the tree which produces it feeding among the calcareous earth, its natural destroyer?

"From the whole of the evidence collected in this district, I am inclined to believe, that there are many situations, even in the more northern provinces, notwithstanding the disadvantage of climature: in which, with due attention to aspect, a judicious choice of fruit, and proper management of the liquor, even cyder of the first quality might be made. Perry of a good quality, I am persuaded, might be made in almost any quarter of the kingdom.

"The seeds generally used, in this intention, are the kernels of cyder-apples, separated from the must, or residuum of the press. These are either sown in autumn, or are kept dry in sand, or otherwise, until spring; care being had, in either case, to preserve them from mice, during winter.

"When the production of fresh varieties is the principal object, or when fruits, which are yet too austere, require to be further improved by cultivation, seeds thus obtained may be eligible. But for fruits, whose flavour is already raised to the desired pitch, and more especially for those which have passed the point of perfection, as some of the dry spongy varieties appear to have done, the seeds should certainly be those of the natural species, the native crab, which most districts produce, and whose juice will generally repay the trouble of collecting.

"Farmers, in general, considering fruit-liquor as the beverage of their servants and work-people, have no stimulus toward excellency in the art, if it is but cyder or perry, and has body enough to keep; no matter for the richness and flavour. The rougher it is, the further it will go; and the more acceptable custom has rendered it, not to the workmen only, but to their masters: the cyder which is drank, in this, and all the cyder countries, with so much avidity and in such quantity, is a very different liquor to that which is drank in the rest of the kingdom. A palate accustomed to sweet cyder, would judge the rough cyder of the farm-houses to be a mixture of vinegar and water, with a little dissolved alum to give it a roughness.

"Men, in general, however, whose palates are set to rough cyder, consider the common sweet sort as an effeminate beverage; and rough cyder, properly manufactured, is probably the more generous liquor; being deemed more wholesome to habits in general than sweet cyder, even when genuine. That which is drank, in the kingdom at large, is too frequently adulterated. The cyderman cannot afford to lose an hogshhead: if it will not do, it must be doctored: or if sound, it may not be sweet enough for the palate of his customers; nor high enough coloured to please the eye; but the requisite colour and sweetness, he finds, are easily communicated.

"The great art, however, in manufacturing fruit-liquors, whether cyder or perry, is that of gratifying the palate and the eye with the juices of the fruit alone. And although farmers in general, more particularly the lower class, are very deficient in the management of their liquors, there are men, especially among the more substantial yeomanry, and the principal farmers who ferment their own liquors for sale, that are far advanced on the line of right management.

"Unfortunately, however, these men, priding themselves, respectively, on the superiority of their liquor (more perhaps than on any other produce of their estates) become jealous of their art, and are not sufficiently communicative with each other. Hence the difference in their several practices; and hence the present imperfection of the art. For although each man may produce good liquor, in his turn, no one, I believe, pretends to uniform success; to produce liquor of the first quality, with certainty.

"The seed-bed should be adapted to the intention. If new varieties, or the improvement of old ones, be the object, the seed-bed ought to be made as rich as possible: perhaps even a frame, or the stove, might be found eligible. On the contrary, if the preservation of varieties be all that is wanted, an ordinary loamy soil is sufficient. In either case, it is proper that it should be perfectly clean, from root weeds at least, and that it should be double dug, from a foot to eighteen inches deep. The surface levelled and raked fine, the seeds ought to be scattered on, about an inch asunder, and covered, about half an inch deep, with some of the finest of the mould, previously raked off

the bed for that purpose. During summer, the young plants should be kept perfectly free from weeds, and the ensuing winter may be taken up for transplantation; or, if not crowded in the seed-bed, may remain in it, until the second winter.

"The nursery-ground, like the seed-bed, should be enriched agreeable to the general intention; and ought, in common good management, to be double dug, at least fourteen inches deep; eighteen or twenty inches deep is always preferable.

"The seedling plants ought to be sorted, agreeably to the strength of their roots, that they may rise evenly together. The top or downward roots should be taken off, and, in this operation, the longer side rootlets should be shortened.

"They should be planted in rows, three feet apart, and from fifteen to eighteen inches asunder in the rows; care being had not to cramp the roots, but to bed them evenly and horizontally among the mould.

"If the plants be intended merely for stocks to be grafted, they may remain, as they generally do, in this and other districts, in this situation, until they be large enough to be finally planted out. But, in strictness of management, they ought, two years previous to their being transferred to the orchard, to be re-transplanted, into fresh, but unmanured double-dug ground, aquincunx, four feet every way, in order that the feeding fibres may be brought so near the stem (yet have sufficient room to form in) that they may be removed with it, into the orchard: instead of being, as they generally are, left behind in the nursery. Hence, in this second transplantation, as in the first, the branches of the root should not be left too long; but ought to be shortened, in such a manner as to induce them to form a regular, globular root: sufficiently small to be removed with their plant; yet sufficiently large to give it firmness and vigour in the plantation.

"If the raising or improvement of varieties be the object in view, the nursery-ground should be naturally deep and well soiled, and highly manured; and the plants repeatedly moved at every second, third, or fourth year, that they may luxuriate, not only in rich, but in fresh pasturage; thereby doing, perhaps, all that art can do, in this stage of improvement, towards giving freedom to the sap-vessels, and size and richness of the fruit.

"The intervals may, while the plants are small, be cropped with such kitchen-garden produce as will not crowd or overshadow the plants; the rows being kept perfectly free from weeds.

"In pruning the plants, the leader should be particularly attended to. If it shoot double, the weaker of the contending branches should be taken off. If the leader be lost, and not easily recoverable, the plant should be cut down to within a hand's breadth of the soil, and a fresh stem trained. Next to the leader, the stem boughs require attention. The undermost boughs should be taken off by degrees; going over the plants every winter; always cautiously preserving sufficient heads to draw up the sap; thereby giving strength to the stems, and vigour to the roots and branches: not trimming them up to naked twigs, as in the common practice; thereby drawing them up prematurely tall, and feeble in the lower part of the stems.

"The length of the stem, to which stocks are usually trained in this district, is six feet; sometimes to near seven feet; a height which is much preferable: half a rod high would be still more eligible. A tall-stemmed tree is out of the reach of stock, and is much less injurious to whatever grows under it, than a low-headed tree; which, while it is the cause of mischief, is itself in harm's way.

"The thickness of the stem ought to be in proportion to its height: a tall stock, therefore, requires to remain longer in the nursery than a low one. The usual size, at which stocks of the ordinary height are here planted out, is four to six inches girth, at three feet high: a size which they will reach, with proper management, in seven or eight years. The price of such stocks, in this district, at present, (ungrafted) is eighteen pence each.

"If a mere orchard be the object, namely, a plantation of fruit trees, placed in as close order as the nature of fruit trees will admit, the distance may be much shorter than in a fruit-ground, which, notwithstanding the plantation, is intended to remain an object of husbandry.

"In this district, we see fruit trees standing at all distances. In close orchards, ten yards seems to be a prevailing distance. But the proper distance in this case depends on

the natural growth of the given trees: from ten to twelve yards (half a chain) may, in this intention, be an eligible distance.

"In the grass grounds of Gloucestershire, and the arable fields of Herefordshire, twenty yards is a common distance: some I have observed with intervals of twenty-five yards. A chain's length (twenty-two yards) may be taken as a good medium distance.

"In this case each acre sustains ten trees; in that forty.

"In grounds, the trees should be planted in cross lines, for the convenience of plowing. In orchards, they ought to be set in the quincunx manner, that they may have equal room to spread on every side.

"The time of planting fruit trees is October, and November; or February, March, or April; according to the season and the soil. Where the soil is dry and light, autumn is preferable; as during winter, the soil has time, assisted by the winter's rains, to settle firmly to the roots. On the contrary, in a cold, wet situation, where the soil is tenacious, and the substratum retentive of moisture, the spring months are a more eligible season of planting.

"In taking up the plants, more attention is requisite, than is usually paid to this operation. Their future progress rests principally upon it. The roots ought to be as numerous, and as long as possible. For the purpose of affording immediate sustenance to the plant, and of giving it firmness and stability in the soil. Hence the impropriety of crowding the plants in the nursery: and hence the utility of transplanting them previous to the final planting.

"In pruning the plants, the roots ought not to be touched (except taking off the downward roots in the center), but the top should, at this time, receive the form which it afterward ought to take. The leader should be shortened, and the smaller side-boughs be taken off; leaving a proper choice of the larger side-boughs entire and untouched; except, when the root, for want of due transplantation, is weak. In this case, the top ought to be reduced in proportion, to draw up the sap; and in due time, to furnish proper wood for grafting. Hence these boughs should have a proper elevation; and should stand in different directions; that the tree, after it be grafted, may take a regular head. This pruning of the head lessens the power of the wind, and, at the same time, by assisting the roots, ensures, with common care, the success of the plant.

"The method of planting requires particular notice. The ordinary method in the Gloucestershire cow-grounds, is to dig a hole, wide enough to take the roots (if not very long); which being placed within it, the mould is returned upon them in the order in which it came out; carefully replacing the sods on the surface, that no grazing ground may be lost. A mode of planting, which is too common throughout the kingdom.

"A method, which is more likely to succeed, is this: the ground being set out with stakes, driven in the centers of the intended holes, describe a circle, five or six feet in diameter, round each stake. If the ground be in a state of grass, remove the sward, in shallow spits; placing the sods on one side of the hole. The best of the loose mould, place by itself, on another side; and the dead earth, from the bottom of the hole, in a third heap.

"The depth of the holes should be regulated by the nature of the subsoil. Where this is cold and retentive, the holes should not be made much deeper than the cultivated soil. To go lower is to form a receptacle for water, which, by standing among the roots, is very injurious to the plants. On the contrary, in a dry, light soil, the holes should be made considerably deeper; as well to obtain a degree of coolness and moisture, as to be able to establish the plants firmly in the soil. In soils of a middle quality, the hole should be of such a depth, that, when the sods are thrown to the bottom of it, the plant will stand at the same depth in the orchard, as it did in the nursery. Each hole, therefore, should be of a depth adapted to the particular root which is to be planted in it. The holes, however, ought, for various reasons, to be made previous to the day of planting. If the season of planting be spring, and the ground and the weather be dry, the holes should be watered, the evening before the day of planting, by throwing two or three pailsful of water into each: a new, but an eligible practice.

"In planting, the sods should be thrown to the bottom of the hole, chopt with the spade, and covered with some of the finest of the mould. If the hole be so deep that, with this advantage, the bottom will not be raised high enough

for the given plant, some of the worst of the mould should be returned, before the sods be thrown down.

"The bottom of the hole being raised to a proper height, and adjusted, the lowest tire of roots are to be spread upon it; drawing them out horizontally; and spreading them, in different directions, as the bird spreads its foot when it stands on a level surface; drawing out the rootlets and the fibres, which severally belong to them; spreading them out as a feather, or as the frond of the fern; pressing them evenly into the soil; and covering them, by hand, with some of the finest of the mould: one person steadying the plant, another adjusting and bedding the roots, and a third supplying the mould; which being raised high enough to receive another root, or another tire of roots, they are to be spread out horizontally upon it, and bedded in a similar manner: thus continuing, until every root be bedded, separately, horizontally (or somewhat declining), freely, yet firmly, among the best of the soil; great care being had to work the mould well in, by hand, among the roots beneath the crown, that no hollows nor false filling may be left: to prevent which, the mould, after the roots are all bedded, and covered some depth, should be pressed or trodden hard (according to the nature of the soil and the state of the season) with the foot: the remainder of the mould being raised into a hillock round the stem; for the triple use of affording coolness, moisture and stability to the plant.

"In forming these hillocks some little skill is requisite. The soil ought not to press against the stem much higher in the orchard, than it did in the nursery: yet it is proper that there should be a descent for rain water, from the stem; not toward it. To this end a dimple or little dish should be made on the top of the hillock; and, from the rim of this, the slope should be gentle to the circumference of the hole; where the broken ground should sink some few inches below the level of the orchard.

"Much of this will, no doubt, be deemed tedious and unnecessary; by those, I mean, who have been accustomed to bury the roots of plants, in the grave-digger's manner: but I can recommend every part of it, to those who wish to ensure success, from my own practice; in which this method of bedding the roots arose; and, in which only, I believe, it has been used.

"Plants which have been properly transplanted, in the manner recommended foregoing, whose heads have been judiciously lessened, and which have been planted in the manner here described, seldom require any other stay than their own roots. If, however, the stems be tall, and the roots few and short, they should be supported, in the usual manner, with stakes, or in a manner which will presently be mentioned.

"The methods of guarding young trees from live stock, in this district, are various: the cheapest, and perhaps the most common way, is that of sticking some tall thorns round the plant, at a distance from the root; binding the tops of the thorns with a withe, and the middle of them with another; forming them into a sort of cone round the plant. This, however, is only a slender guard; and the thorns are liable to chafe the stem of the plant. I have seen many plants materially injured by this method of defending them.

"Opposed to this, the most expensive guard, not unfrequently made use of in the cow-grounds of Gloucestershire, are four posts, put down, in a square, about the plant; with five or six short rails on either side. The expence of this, if done in a strong workmanlike manner, is too great for common practice.

"The next is three posts, set in a triangle, with rails in a similar manner.

"In Herefordshire, and on the Herefordshire side of Gloucestershire, where young orchards are kept under the plough, two posts only are in use; namely, one large post, slit with a saw, and placed flatway, with the faces to the plant; and about two feet apart; with rails on each side, nailed upon the edges of the posts. This is beautifully simple, strong, a sufficient guard, if carried high enough, and out of the way of the plough; which has, in this case, nearly the same possession of the ground, as if no trees were planted.

"In this case, however, the upper rails should be compassing (bowing outward) equally to protect the tops from cattle, and to prevent the stems from being chafed against them. If these posts were put down at the time of planting, setting them within the planting holes, the roots would not be afterwards disturbed; and, by means of hay-ropes,

the plants might be steadied between the lower rails, without the trouble or the danger of staking.

"In this and every other case, unless the lower rails be placed very near to each other, the bottom of the stem should be guarded against sheep; which, in winter, especially while snow is upon the ground, will peel off the bark of the young trees; and, in a few hours, destroy the whole plantation.

"The after-management of the stocks consists in watering them (if requisite) the first summer: not, however, in the ordinary manner, by pouring small quantities, from time to time, against their stems; but by throwing as much at once as the hole will imbibe, into the trench left within the outer ring, round the skirts of the hillocks: thus communicating coolness, and a lasting moisture, rather than a temporary wetness, to the immediate region of the feeding fibres. And, secondly, in cultivating the hillocks, so far as to keep the surface over the roots free from grass and weeds, and the skirts of the hillocks in a loose pulverous state, to induce the roots to spread horizontally on every side.

"In a plantation, whose soil is kept in tillage, less care is requisite than in a grass-ground plantation; in which the circles of broken surface, round the plants, should be kept hoed as a garden; and the covering of soil be from time to time carefully worked over with the spade. As the roots extend, the circles should be enlarged, by fresh rings of sward being cut off and inverted; in order to encourage, by air and pasturage, their farther extension.

"By old orchards, it appears that whip-grafting near the ground (letting the young plants remain in the nursery until fit to be planted out), has formerly been the prevailing practice. But, in this case, the planter must take the nursery-man's word as to the sorts, when he wishes to be on a certainty. He likes to see the grafts taken from a tree whose fruit he knows. Besides, it is thought that whip-grafting, upon free stocks, has injured some of the more valuable varieties of fruit. Be this as it may, the practice, at present, is in disrepute.

"The practice, which has lately prevailed, and which is still prevalent, is this: the stocks, having stood some two, three, or four years in the plantation, until they have established themselves firmly in the soil, and have acquired a fulness of growth, are cleft-grafted, in the following extraordinary manner:

"The entire head of the stock is cut off, horizontally, with a saw, about six feet high: higher if the stock will admit of it, and the sort to be grafted be inclined to form hanging boughs: while an upright close-headed sort may, it is thought, be grafted upon a still lower stock. The top of the stump, being cleft, the grafts are inserted, in the usual manner; by men who go about the country, in the grafting season, for this purpose.

"The method of defending the grafts put in, in this manner, is perhaps peculiar to this district. They are inclosed within a kind of open-work wicker basket, made somewhat in the manner of the bottle-maker's baskets (prickles), with split osier twigs, about the size of the finger. When they are put upon the stock, they resemble the top of a tunnel; about two feet high, and about one foot diameter at the top: they are, however, worked flat; somewhat in the form of the mount of a lady's fan; much broader at the top than at the bottom. The compost used in grafting having remained a few days to stiffen, the bottom part of the guard is wrapt tight round the stem, immediately below the loam, upon which it is bound with rope-yarn; fixing it in such a manner that the upper edge forms the largest circle its length will allow.

"These wicker guards, provincially called braids, are most ingeniously adapted to this mode of grafting; they not only guard against cattle, but prevent rooks and other birds from disturbing the grafts, before they be established in the stock; and, what is of singular advantage to some sorts of apple-trees, they set up a dropping head, giving the shoots (which afterward become boughs) an upward tendency.

"But this method of grafting has its disadvantage: in a fine young orchard, which has been grafted in this manner in the Vale of Gloucester, I observed, that several of the trees are faulty in the crowns of the stems, which are now eight or nine inches diameter. The defect is owing to one of the grafts having miscarried; by which means a lodgment being made for water, a decay of that side of the stump of the stock has taken place; creating a sore, which the surviving graft has not been able to heal; there

being now holes nearly large enough to admit the hand, almost to the center of the stem : a premature decay of the tree must be the inevitable consequence.

" In Herefordshire, I saw another orchard, (which has been planted in the same manner, and which has got about the same growth), in which the trees cleave in the crowns ; both grafts having in this case succeeded. The wind having split some of them, and others being in danger of sharing the same fate, the judicious occupier of this orchard has secured them with iron bolts, put through the crowns ; having a broad head at one end, and a long iron pin or key at the other. The heads are already overgrown, and some of the keys nearly buried.

" By letting the stocks remain until they be large enough to be grafted in the boughs ; namely, until the trained boughs be about an inch in diameter ; those evils are avoided, the grafting becomes more certain, there being more chances of success ; and the trees, by forming their ramifications in the natural way, are much less liable to be torn to pieces by the winds. Some time, it is true, may seem to be lost ; the trees certainly will not come so soon to bear ; but it is highly probable, that they will begin to bear a burden of fruit sooner, and will it is much more than probable, continue to bear longer than trees grafted in the stock.

" It has been already mentioned, that, in Herefordshire, the soil of orchards is generally kept under tillage ; in Gloucestershire, in grass. Not, however, I apprehend, so much in pursuance of different principles in the managing of orchards, as from the circumstances of Herefordshire being an arable, Gloucestershire a grass-land country.

" Either practice has its disadvantage. Fruit trees, when fully grown, especially if they are of a spreading growth, and are suffered to form drooping branches, are very injurious to arable crops : their roots, their drip, and their shadows, are destructive, not to corn only, but to clover and to turneps : besides being, under these circumstances, still farther injurious, by preventing a free circulation of air ; and in being in the way of the plough-teams ; which, when the trees are loaded with leaves and fruit, can frequently with difficulty creep under them.

" It is observable, however, that tillage is favourable to the trees ; especially to the growth of young trees. While in grass grounds (under ordinary management) their progress is comparatively slow ; for want of the earth's being stirred about their roots ; and by being injured by the grazing stock ; especially low-headed, drooping trees.

" After the trees begin to bear, stock are equally inconvenient, in a fruit ground. Cattle not only destroy all the fruit within their reach, but the fruit is dangerous to the cattle by being liable to lodge in their throats, in the manner of small turneps. In the fruit season, especially in windy weather, the cows are frequently obliged to be kept out of their grounds, at a time, perhaps, when the grass is wanted. Prudent men, however, endeavour to provide against this inconveniency, by eating the fruit-grounds bare, before the gathering season : and every prudent man ought to keep the boughs out of their reach, that no injury may be sustained, previous to that season ; as well as to give air and sun-beams to his grass.

" From these circumstances we may conclude, that, in situations, in which fruit grounds can with propriety and conveniency be kept either in tillage or in grass, they ought, while the trees are young, to be kept under the plough ; and that, when the trees become particularly injurious to the arable crops, the ground ought to be converted to a state of grass.

" In the deep-soiled district about Dymmock and Marcle, where the whole country may be said to be a forest of fruit trees, the occupiers of fruit grounds, experiencing the evil of trees, in arable lands, are planting in their grass grounds. This, however, appears to be a wrong principle. Let them lay their old orchards to grass : and, if they plant, breaking up their young orchards to arable : this will be changing the course of husbandry, and be at once beneficial to the land and the trees.

" In the Bromyard quarter of Herefordshire, where considerable quantities of hops are raised, it is common to plant young fruit trees in the hop-grounds. The trees, while young, do little injury to the hops ; while the mowing and cultivation of the hop-grounds is highly beneficial to the young trees. Before they acquire an injurious size, the grounds are worn out for hops, and returned to the common course of husbandry.

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out, we may safely conclude, that after the trees are out of danger of being thrown down by cattle, no attention whatever is paid to them, other than that of collecting the fruit, when they happen to hit.

" Water boughs are seen dangling, as bell-ropes, perhaps to the ground, while the upper part of their heads are loaded with wood, as impervious to the sun and air as the heads of pollard oaks, or neglected gooseberry bushes ; with, perhaps, an additional burden of mistletoe and moss to bear.

" Indolence and false economy are, no doubt, the principles on which this slovenly conduct is pursued. The improvident occupiers of those neglected orchards, unmindful of the damage they annually sustain by the incumbrance of the trees, refuse to bestow a little leisure time, or lay out a few shillings, to render them productive.

" This shameful management, however, is not universal. There are orchards in every quarter of the district, which appear to have some little attention paid them ; and some few, which are in a degree of keeping, equal to the Kentish orchards.

" By taking a view of the natural enemies of fruit trees, we shall be the better able to judge of the art requisite to their preservation.

" The enemies of the fruit trees under notice are, a redundancy of wood ; the mistletoe ; moss ; spring frosts ; blights ; insects ; an excess of fruit ; old age.

" Some of them are beyond human reach ; but most of them are within the controul of art.

" A redundancy of wood is the cause of numerous evils. The roots, or rather the pasturage, which supports them, is exhausted unprofitably ; the bearing wood robbed of part of its sustenance, and the natural life of the tree unnecessarily shortened ; while the superfluous wood, which is the cause of this mischief, places the tree in perpetual danger, by giving the winds additional power over it ; and is injurious to the bearing wood, by retaining the damps, and preventing a due circulation of air.

" The underhanging boughs weigh down, especially when loaded with leaves, the fruit-bearing branches they are preying upon ; giving them a drooping habit ; or at least preventing their taking, as they ought, and otherwise would, an ascending direction ; while those which grow within the head are equally injurious in crossing and chafing the profitable branches.

" The outer surface, only, is able to mature fruit properly. Every inward and every underling branch ought therefore to be removed : and, in some cases, part of those, which reach the surface, might with propriety be taken out, to give due health and vigour to those which were left. It is no uncommon sight to see trees, in this district, with two or three tires of boughs pressing down hard one upon another ; with their twigs so intimately interwoven, that, even when the leaves are off, a small bird can scarcely creep in among them. Trees, thus neglected, acquire, through a want of due ventilation and exercise, a runty, stunted habit ; and the fruit they bear becomes of a crude, inferior quality.

" The great object of the fruit farmer is to produce a crop every year : and nothing is more likely to obtain it than keeping the trees in perfect health, and endeavouring to prevent their bearing beyond their strength, in a general fruit year.

" The mistletoe is, in this country, a fatal enemy to the apple-tree. The native crab-tree is frequently killed by it, and apple-trees too often injured ; and this, notwithstanding it is easily overcome, and is applicable to a profitable purpose, sheep affecting it as they do ivy : yet such is the power of indolence, and such the plentifulness of hay in this country, that a considerable portion of the produce of many orchards, is cut off by this singular plant.

" The ordinary method of clearing trees from it is to pull it out with hooks, in frosty weather ; when being brittle, it readily breaks off from the branches.

" Moss is chiefly, perhaps, owing to the nature of the soil, and cannot be altogether prevented ; but it may in most cases be checked, and its evil effect in a great measure avoided. In Kent, there are men who make a business of cleaning orchard trees ; being paid so much a tree, or so much for the orchard, according to the state of foulness.

" In Herefordshire, I saw several orchards, in which the trees were almost entirely subdued by this vegetable vermin. Some of the trees, perhaps, with only one bough left alive, and

and others entirely killed; yet suffered to remain an incumbrance to the ground, and a disgrace to the country.

"What avails the number of trees, if they are not productive? It is healthy, bearing trees, which fill the drink-house, and send a surplus to market. Their encumbrance on the soil is nearly the same, whether they are barren or fruitful; and it may be a moot point, whether, even many of those which are productive, much more than pay for their encumbrance: how ridiculous, then, to spare any reasonable expence in preserving them in a state of health and productiveness; or to suffer those to encumber the soil, which are past recovery.

"Spring frosts are an enemy against which, perhaps, it is most difficult to guard orchard trees. Dry frosts are observed to have no other effects than keeping the blossoms back; consequently, are frequently serviceable to fruit-trees. But wet frosts, namely, frosts after rain or a foggy air, and before the trees have had time to dry, are very injurious even to the buds. An instance is mentioned in which a flying, hazy shower, in the evening, was succeeded by a smart frost: that side of the trees, against which the haze drove, was entirely cut off; while the opposite side, which had escaped the moisture, likewise escaped the effect of the frost.

"Much, however, may depend on the strength of the blossoms. The spring of the year (1788) had its frosts; and all hope of fruit was more than once given up; yet for quantity and quality, taken jointly, there has seldom perhaps been so favourable a fruit year. But this year, the buds formed, and the blossoms broke forth with unusual vigour; and were enabled, in their own strength, to set common enemies at defiance. On the contrary, the preceding spring, many of the blossoms sickened in the bud; and those which opened were weak and languid: the consequence was, in the instances I observed, scarcely an apple succeeded.

"The assistance, therefore, required from art, in this case, is by keeping the trees in a healthful, vigorous state, to enable them to throw out a strength of bud and blossom; and by keeping them thin of wood, to give them an opportunity of drying quickly before the frost set in.

"The term *blight* is as common and as vague in this as in other districts. Black blighting winds are talked of every where; but no definite idea is anywhere affixed to the expression. That corn and fruit become unproductive without any visible cause, and that fruit trees are liable to be infected with insects, are certainly facts. But whether the insects be the cause or the effects of blights does not seem to be yet settled.

"This year, if the alarm from spring frosts was great, that from black blighting winds was terrible. Yet the consequence is an excess of fruit. The cause appears to me evident in the acquired strength of the trees: they had not borne fruit during four years. The great hit, in 1784, had exhausted them. They were unable to withstand the attack of common enemies. But having, by three years rest, fully recovered their strength and vigour, they this year set the same black blighting winds at defiance, which, next year, may render them altogether unfruitful.

"Two bearing years seldom come together. Next year, however, will have more than a fair chance to set this rule aside, as the interval of rest has been unusually long. A full fruitage every second or third year is all that is expected.

"Are we to suppose, from these circumstances, that because insects are abundant one year, they become few in number the year ensuing? Or, on the contrary, that because they were few in number this year, they shall be numerous the next? It would be much more reasonable to infer, that the trees having been exhausted the preceding year, by an excessive burden of fruit, are not, without some extraordinary circumstances, able to throw out the succeeding season a sufficient strength of blossom, to withstand the natural enemies, with which they are every year assailed: or if, through extraordinary circumstances, they should throw out sufficient blow, that the fruit, for want of a due supply of sustenance, drops abortively from the boughs.

"Hence, perhaps, with respect to blights, all the assistance which art can render, is to keep the trees in a state of healthfulness; and prevent, as much as possible, an excess of fruit.

"Insects are not only hurtful to the blossoms and the leaves, but the larger species are destructive of the fruit; especially of pears. In 1783, a scarce year of fruit, the wasps, which were that year particularly abundant, destroyed

a great share of the pears that were produced. In a fruit-liquor country, it might be prudent to set a price on the female wasps in the spring; by which means the number of nests might be considerably lessened.

"An excess of fruit has several injurious effects: it stunts the growth of young trees, and renders trees in general barren for two or three years afterwards; while the weight of the fruit is frequently fatal. I have this year seen numberless instances, in which the main branches of trees have been split off, solely by the weight of fruit; and many, in which the entire tree had sunk under the weight of its burden.

"The ordinary guards against the mischievous effect of an excess of fruit, are props, forked poles, set under the boughs. Twenty of these props are sometimes employed in supporting the branches of one tree. These, however, are chiefly used in close orchards, where the lower boughs, being less broken by cattle, are longer and more luxuriant than they are in cow-grounds, where props cannot conveniently be used.

"It would be difficult to describe the burden which many trees, this year, had to bear. Notwithstanding the trees were as full of wood as neglect could fill them, every twig, within and without, was loaded with fruit. Of trees of luxuriant growth, the most upright shoots, even to the summit, were rendered pendant with the weight of their produce, hanging down on every side as strings of onions; the fruit appearing, to the distant eye, to cover the entire surface of the tree. I have nowhere else seen fruit trees bear such extraordinary burdens.

"The means of preventing, as much as may be, the evil consequences of an inordinate quantity of fruit, in any one year, is to graft in the boughs; and, when the trees are fully grown, to thin the bearing branches; thereby endeavouring, like the gardener, to grow fruit every year. Young trees which have been whip-grafted, planted out while weak in the stem, and had afterward shot freely, I have seen bowing with their heads to the ground with the weight of fruit, which had been injudiciously suffered to mature upon them.

"Old age cannot be prevented; but the natural life of fruit trees may, no doubt, be protracted, by proper management. Stocks of the native crab, grafted in the boughs, is, in this intention, the most eligible basis; as taking off the underling and crossing boughs while growing, keeping the head within due bounds, and lessening the quantity of bearing wood when the heads are fully grown, are the most likely means to give a lasting superstructure.

"The stage of decline will nevertheless arrive, and a deficiency in fruitfulness will long precede the general decay.

"During the decline of fruitfulness, there is a stage, in which the fruit no longer repays the encumbrance which the ground is subjected to by the tree. Nevertheless, we see trees standing, a burden to the soil, in every stage of decay. But how injudicious, in such a case, is the conduct of their occupiers! If it be a disputable point, whether trees in full fruit be beneficial to a farmer, he may safely conclude, that, after their fruitfulness has in great part declined, they become injurious to him; and if the occupier, through friendship from long acquaintance, or gratitude arising from the many comfortable draughts they have afforded him, cannot muster up resolution to remove them, those who have the management of the estate should see them taken down, while the wood remains in a valuable state; and not suffer them, while the wood is wasting, to remain an incumbrance to the estate.

"In the Vale of Gloucester, I saw an instance of some healthy bearing apple-trees, which now wear the second tops to the same stems. The first tops, being worn out, were cut off, and the stumps saw-grafted. In orchards about a house this expedient may frequently be eligible.

"It is here observable, that the same judicious manager, in whose practice I saw this instance of renewing the heads of trees, could never raise young trees with any success, in an old orchard ground. If, in a close orchard, convenient to an habitation in a country where fruit is scarce, such an attempt should be made, the species of fruit ought certainly to be changed; as from apples to pears; or pears to apples.

"It is likewise observable, in this place, that pear-trees, especially in a strong deep soil, are of much longer duration than apple-trees; outliving, it is said, two or three generations; consequently the two species ought never to be mixed together in the same fruit ground.

"Supposing the ground to have been in grass since the

being now holes nearly large enough to admit the hand, almost to the center of the stem : a premature decay of the tree must be the inevitable consequence.

" In Herefordshire, I saw another orchard, (which has been planted in the same manner, and which has got about the same growth), in which the trees cleave in the crowns ; both grafts having in this case succeeded. The wind having split some of them, and others being in danger of sharing the same fate, the judicious occupier of this orchard has secured them with iron bolts, put through the crowns ; having a broad head at one end, and a long iron pin or key at the other. The heads are already overgrown, and some of the keys nearly buried.

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"During the decline of fruitfulness, there is a stage, in which the fruit no longer repays the encumbrance which the ground is subjected to by the tree. Nevertheless, we see trees standing, a burden to the soil, in every stage of decay. But how injudicious, in such a case, is the conduct of their occupiers! If it be a disputable point, whether trees in full fruit be beneficial to a farmer, he may safely conclude, that, after their fruitfulness has in great part declined, they become injurious to him; and if the occupier, through friendship from long acquaintance, or gratitude arising from the many comfortable draughts they have afforded him, cannot muster up resolution to remove them, those who have the management of the estate should see them taken down, while the wood remains in a valuable state; and not suffer them, while the wood is wasting, to remain an incumbrance to the estate.

"In the Vale of Gloucester, I saw an instance of some healthy bearing apple-trees, which now wear the second tops to the same stems. The first tops, being worn out, were cut off, and the stumps saw-grafted. In orchards about a house this expedient may frequently be eligible.

"It is here observable, that the same judicious manager, in whose practice I saw this instance of renewing the heads of trees, could never raise young trees with any success, in an old orchard ground. If, in a close orchard, convenient to an habitation in a country where fruit is scarce, such an attempt should be made, the species of fruit ought certainly to be changed; as from apples to pears; or pears to apples.

"It is likewise observable, in this place, that pear-trees, especially in a strong deep soil, are of much longer duration than apple-trees; outliving, it is said, two or three generations; consequently the two species ought never to be mixed together in the same fruit ground.

"Supposing the ground to have been in grass since the

trees first acquired their growth, it will, on their removal, be ready for a change of management. The larger roots being removed, suffer the ground to remain in grass, until the smaller roots be decayed; and then break it up for a course of arable crops; in order to assimilate the roots with the soil, and do away the sownness of sward, which low-spreading trees, as those of fruit, will always produce.

"Thus, considering the fruit trees as a crop in husbandry, the general management appears to be this. Plant upon a recently broken up, worn-out sward. Keep the soil under a state of arable management, until the trees be well grown; then lay it down to grass, and let it remain in sward until the trees be removed, and their roots be decayed; when it will require a course of arable management."

Mr. Young, in his *Annals of Agriculture*, vol. V. says, that "Mr. Chevallier, of Aspal in Suffolk, has by much the finest orchards he has seen in the county. A few particulars of them will shew, that the deficiency in this branch of rural œconomy, general through the eastern part of the kingdom, is very unpardonable. In the year 1727, Clement Chevallier, esq. brought from Jersey 144 apple-trees, which were planted on two acres of land; and between that time and 1743, he planted, by grafting, ten acres more, of various sorts; and in order to be able to make the cyder in perfection, he erected such a mill as is used in that island. A circular stone like a mill-stone is drawn round, moving in a circular stone trough, for mashing the apples. The three stones of this trough cost 7l. ready cut and hollowed, in the isles of Chausee, on the coast of Normandy. The mash is taken from the trough, and laid on a square platform, in layers four inches thick, between clean wheat straw, the whole five feet high. The trough holds 20 bushels, and the platform five troughs full; the heap is cut by a hay-knife to three feet square, and the cuttings laid at top. The power of pressure by a lever and screw is so great, that the marc of the apples will burn immediately on taking from the press. A bushel of apples yields four gallons, and the quantity is one sixth more than can be gained by any other press in this country. By means of it, 150 hhds. have been made in three months, of Mr. Chevallier's own crop; and 54 hhds. for his neighbours, at 1d. a gallon; which produced 14l. or enough to pay for the labour of the whole. One man does all; who being a cooper, and working at the casks two days in six, has 2s. a day. The expence of the whole, on an average, is about 1s. 2d. an hhd. The year the orchards produced the 150 hhds. which was 1778 or 1779, it sold in this beer country at 1l. 11s. 6d. per hhd. and some years so high as 3l. 3s. But in 1775 the produce not 1 hhd. For seven years the average has been 40 hhds. and the price we may call 2l. 2s. This is 80 guineas from 12 acres, or 7l. an acre. Now to shew the vast profit of orchards, it is to be noted, that the land occupied by the trees is worth as much as the adjacent grounds within, 3s. an acre; so that, properly speaking, the rent of that ground, which yields this crop of 84l. per annum, is just 1l. 16s. a year.

"The Jersey trees have, upon the whole, produced more fruit than the others. Mr. Chevallier's uncle has trees brought also from thence, that have yielded 15 bush. each tree in a year, or 1 hhd. of cyder.

"Expressing a doubt, whether the mixture of straw with the apples, which is necessary to keep the heap together on an open platform, did not affect the taste of the Cyder, I was assured not; and also that juice, which came first with little or no pressure, was not at all better than that which received the most."

ORCHARD-GRASS, the name of a small, coarse, but very sweet grass. It is of very quick growth, and may possibly hereafter be cultivated to advantage.

There is not any thing which purges a beast so naturally as the green weedy grass which grows under trees in orchards; nor any medicine better than tar, butter, and sugarcandy mixt, and given in balls as big as a hen's egg.

ORE-WEED, a general name for weeds growing at the bottom of the sea, and also on the muddy and rocky parts of the shore.

Sea-weeds are so beneficial a manure, that farmers ought not to grudge the expence of carrying them a few miles. In Devonshire, Cornwall, and other maritime parts of England, these weeds are laid in heaps till they are rotten, and then spread upon the land, about a load to three rods; but this lasts only one year, unless sand, or a stiff earth,

according to the quality of the soil intended to be improved, be laid on or mixed with them; and then they become a lasting manure. In some places these weeds are gathered in heaps, and burnt as soon as they are dry; after which about a bushel of their ashes is laid on upon, three rods of ground. But these, like all other ashes, should be mixed with sand, or stiff earth, if you would have the land last good: otherwise, they are only an improvement for a year. These ashes are particularly good for grass grounds over-run with moss. Loose sandy soils are likewise peculiarly benefited by this weed; but being a submarine plant, the wind and soil soon exhale its moisture; so that the more speedily it is taken from the shore, where storms often throw it up in great quantities, the better it is. When spread on the ground, and afterwards covered over, it soon dissolves into a salt oily slime, proper to fertilize and bind light soils. This is the most approved way of applying it: though some lay it naked and fresh from the sea, upon their barley land, towards the end of March and beginning of April, and have a good crop of corn: but such quantities of rank weeds are apt to shoot up afterwards, that no wholesome plant is to be expected that year.

The value of the lands all along the coast of Scotland has been more than doubled by the use of this excellent manure. It is chiefly used there for barley; and the farmers watch every opportunity, when it is thrown in by the sea, and lay it on at all seasons, in autumn, winter, and spring. But if they could choose their time, it would probably do best about the month of March; for being then ploughed into the ground, and afterwards ploughed up again to the seed, it would be incorporated and blended with the soil; whereas, if it be laid on in autumn, before the fallowing or first ploughing, it is too much wasted before the spring; and if it be laid on the seed furrow, it is apt to burn the ground in a dry season, though it will do very well in this method in a wet summer. Its effects are but just felt the second year; though it is laid on thicker upon strong clay land, which receives no other manure for three crops, viz. barley, oats, pease, and beans; a method which might, perhaps, be altered for the better, by omitting the oats, and sowing alternately barley, and pease and beans, and laying on the sea-ware, as these weeds are commonly called, for every second crop of pease and beans.

We see, by the abridgement of Mr. Scott's account of the manner of using sea-ware in Scotland (published by Mr. Maxwell in his *Miscellaneous Papers*), that much of this valuable manure must necessarily be lost through want of proper management: for they have no reservoirs to keep it in, when thrown ashore at a season in which they cannot use it, or where there is no ground in tilth, as is generally the case in winter, and during the busy part of their hay and corn harvest. It should be collected on these occasions, and lodged in a place free from any running water; and, as it is equally beneficial to strong or light lands, it might be there covered with sand or clay, according to the nature of the soil for which it is intended. This will prevent its being parched by the sun, or its dissolving into a putrid mass, which if not secured in this manner, would either be washed away by rains, or fly off into the air; whereas, when thus covered, it would greatly enrich the clay or sand, and render them good manures for their opposite soils. If it be thrown ashore at a time when it can be ploughed in directly, that is certainly the best manner of using it.

Mr. Scott observes, that there is a kind of land all along the coast, which is gravelly, and covered over so thick with sea-stones, that, to look at it, one would not think corn could spring through them; and another sort of land, which is a deadish sand. To both these grounds sea-ware is the only manure; for dung of all kinds has been often tried, but with no success; and yet sea-ware makes them bring excellent crops of barley. This kind of ground is seldom ploughed more than twice, and the sea-weed is generally laid on before the first ploughing. Barley is sowed during two years, and pease the third; a fresh manure of sea-weed being laid on each year that barley is sown. As little wheat is cultivated in the country where Mr. Scott lived, the farmers there might probably improve their practice of raising barley and pease, by sowing them alternately, and laying the sea-ware to the pease. In the summer it is carried to a distance from the sea, and laid upon ley-ground, (arable land under grass), which, though in very ill heart, will bear a good crop of oats with only once ploughing, or of barley if ploughed again in the spring.

Another

Another kind of sea-ware, of a much stronger nature than that which is thrown up by the waves, is cut from the rocks at low water, and will last three years. It costs more labour, but brings greater recompence. Mr. Scott thinks the best time of laying this on the ground would be in autumn, before the land is ploughed rough for a spring crop.

The farmers on the coast of Scotland (and I believe the same may be said, in general, of those in most of the maritime parts of England) prefer this manure to any other, especially for their light grounds; and it has the advantage of being much more easily transported, because one load of it will go as far as two of dung.

It does very well in kitchen gardens, where Mr. Scott says he has seen pot-herbs and roots of an extraordinary size produced by its help; to which he adds, that he has known fruit-trees, perfectly barren before, rendered extremely fruitful by laying this manure about the roots.

Mr. Duhamel likewise informs us, that these sea-weeds are used with great success in the maritime provinces of France.

OSSELETS, are little bones and hard excrescences in the knees of some horses, so called in French.

There are also three kinds of osselets, which are of the same nature as splints, and some persons take them for the same thing; but there is this difference, however between them, that splints come near the knees, and osselets near the fetlocks. Their seat is indifferently within or without the leg.

The first is the simple osselet, which does not grow near the joint of the fetlock or the nerve.

This need not hinder any man from buying a horse, because it puts him to no inconvenience, and very often goes away of itself without a remedy. The second is, that which descends into the fetlock, and hinders the motion of that joint; this occasions a horse to stumble and fall, and with a very little work to become lame. The third has its seat between the bone and the nerve, and sometimes upon the nerve; it so much incommodes a horse that he cannot stand firm, but limps on every little occasion.

OST, *Oost*, or *Oust*. See **OUST**.

OTTER. Some are of opinion, that the otter is of the beaver kind, being an amphibious creature, living both in the water and on the land; besides, the outward form of the parts bears a likeness of the beaver; some say, were his tail off, he were in all parts like the beaver, differing in nothing but habitation; for the beaver frequents the salt water as well as the fresh, but the otter never goes to the salt.

Though the otter lives in the water, yet he does not, like fishes, breathe through the benefit of the water; he taketh breath like other four-footed beasts; yet will remain a long time underneath the water without respiration.

These animals are great devourers of fish, and will travel ten or twelve miles in the space of a night. Their chief haunts are under the roots of trees near the water. Some take them with hunting-dogs; some by means of snares; and others kill them with spears.

The shortest way of destroying them is to lay, near their haunts, an eel, slit on the back, with raskane put in the slit, and then sew it up again. Place the eel, from the navel upwards, out of the water, and the Otter will eat it so far, but seldom farther; and his destruction is certain.

If he wants prey in the waters, then he will quit them for the land; and if by painful hunting on shore he cannot fill his belly, he will feed on herbs, snails, or frogs; neither will he take less pains in the water to satisfy his hunger; for he will swim two miles together against the stream, that so, when he has filled his belly, the current may carry him down again to his designed lodging, which is always near the water, very artificially built with boughs, sprigs, and sticks couched together in excellent order, wherein he sits to keep him from the wet.

In the hunting of fish, he often puts his nose above water to take breath: he is a creature of wonderful swiftness and nimbleness in taking his prey; and for greediness, takes more than he knows what to do with.

He is a very crafty and subtle beast, and endowed with a wonderful sagacity and sense of smell.

The flesh of this beast is both cold and filthy, because it feedeth on stinking fish.

OVER-DONE, **OVER-RID**, or **OVER-WORKED**; a

horse is so called, when his wind and strength are broken and exhausted with fatigue.

OVER-REACH. A Horse is said to over-reach, when he brings his feet too far forwards, and strikes his hinder toes against the spunges of his fore-shoe.

A horse over-reaches through a weakness in the back, or by being suffered to bear too much upon the shoulders.

OVER-REACH, is also a wound in the fore-heel of a horse, made by the point of the hind-shoe.

When this wound is only slight or superficial, it is, in general, very easily cured by washing it clean, and applying the wound-ointment: but it should be observed, from the nature and manner of the injury, where the blow has been smart, that it differs widely from a common cut; the part here being both torn and bruised, and consequently it requires to be properly digested, in order to lay a good foundation for healing.

For this purpose, after washing out any dirt or gravel with sope-suds, &c. let the wound be digested, by dressing it with dossils of lint dipped in an ounce of Venice turpentine, divided with the yolk of an egg, to which half an ounce of tincture of myrrh may be added: over this dressing it would be advisable to apply the turnep poultice, or that with strong-beer grounds and oatmeal, three or four times, or oftener, till the digestion is procured, and then both these dressings may be changed for the precipitate medicines, or the lime-water mixture: observing always to apply the dossils carefully to the bottom, to fill up the sore with the same, even to the surface, and to bind all on with a compress and roller: and if any cavities appear that cannot conveniently be dressed to the bottom, they should always be laid open, or no proper foundation for healing can be obtained. The hoof also should be kept supple, or pared away, when the growth of it interrupts this end, as is sometimes the case. *Bartlett's Farriery*, page 244.

OUGHTS, leavings.

OUST, a kiln, generally applied to that used in drying hops.

It is built with fire-places, in the nature of malt-kilns; and at a proper distance over the fire is an hair-cloth strained upon laths; and thereon the hops are laid, and raked even, to the depth of about six or seven inches, for the better conveniency of drying them equally: and when they are properly cured on the under side, they are carefully turned; and by that means the upper side becoming the under, the whole shares the fire alike. The person that performs this part is called the dryer, whose business it is to manage the fires.

The fuel commonly made use of is charcoal, for its freedom from smoke, and affording a steady heat. Great nicety is required in this part; a small fire being to be made, at first, that they may heat gradually, and so raised as they dry, that it may be done without scorching; and the fire is to be lowered by degrees, against they are ready to be taken off: the time required is about eight hours.

But as charcoal is very dear, being three or four pounds per load, many people have adopted the method of drying with sea-coal, upon what they call cockle-ousts, which are square iron boxes placed upon brick-work, and a flue and chimney in the back part of the building for the smoke to go off. The computation is, that a chaldron of sea-coal, at about twenty-four shillings, will dry a load of hops, and that a load of charcoal will do no more. It is indeed expensive to erect such ousts, as there must be no timber near them; and an iron beam and iron laths are to be used, and they covered with plates of tin or iron properly fastened together.

A gentleman has lately claimed the merit of having invented a new method of drying hops with sea-coal, or any kind of fuel whatever, by means of a moveable iron furnace: it is in form of an horizontal cylinder, stopped at both ends: it lies on an iron carriage, which rolls on four iron wheels: in the fore-end of the cylinder is the furnace door, and a hollow iron flue runs in an horizontal direction along the upper surface of the cylinder from the back, till it reaches the fore-end of it, when it takes a vertical direction, and is carried as high as is necessary to convey the smoke out of the oust. We cannot pretend to say what are the particular advantages resulting from the use of this rolling furnace, never having seen it at work.

OUST-HOUSES, out-houses, or such as belong to, and are adjoining to the dwelling-houses.

OX, the name of an animal well known, being a bull castrated.

Oxen, like other domestic animals, vary in colour, though the dun seems the most common; and the redder it is, the more it is esteemed. A black coat is also valued; and bay oxen are said to be vigorous and long-lived; whereas the brown soon decay. The grey, the dappled, and the white, are proper only for slaughter; no care can render them fit for labour; but whatever be the colour of an ox's coat, it should be glossy, thick, and smooth to the touch; for if it be harsh, tough, or thin, there is reason to suppose that the animal is out of order, or at least not of a strong constitution. A good ox for the plough must be neither too fat nor too lean; the head short and thick; the ears large and shaggy; the horns strong, glossy, and of a middling size; the forehead wide; the eyes full and black; his muzzle large and flat; the nostrils wide and open; the teeth white and even; the lips black, a fleshy neck, large and heavy shoulders; the breast broad; the dew-lap hanging down to the knees; the reins very broad; a spacious descending belly; the flanks firm; the haunches large; and the rump thick; large and nervous thighs and legs; the back straight and full; the tail reaching to the ground, and well covered with thick and fine hair; the feet firm; the hide thick and pliable; the muscles raised; the hoof short and broad: he must also answer to the goad, be obedient to the voice, and well trained; but it is only gradually, and by beginning early, that the ox can be brought willing to bear the yoke, and be easily governed. At the age of two years and a half, or three at the latest, you must begin to tame him and bring him under subjection; if delayed longer, he becomes froward, and often ungovernable. The only method of succeeding is, by patience, mildness, and even caresses; for compulsion and ill treatment will only disgust him irreclaimably; stroaking him gently along the back, clapping him, giving him occasionally boiled barley, ground beans, and such other aliments as please him best, all of them mingled with salt, of which he is very fond, will prove of the greatest use. At the same time his horns should be often tied, and some days after, the yoke is to be put on his neck, and fastened to a plough, with another ox of the same size ready trained; these are to be tied together at the manger, and in the same manner led to the pasture, that they may become acquainted, and accustomed to have one common motion. The goad is never to be made use of in the beginning, as that would only render him more untractable; he must also be indulged, and labour only at short intervals: for till he is thoroughly trained, he tires himself very much; and for the same reason he is to be fed more plentifully than at other times.

Mr. Marshall made several experiments on their utility in the plough, and strongly recommends the use of them for most draft purposes, as no horses draw better. He remarks that full grown oxen in general are much longer made than horses, too long for common shafts, not having room to back the Cart; for which reason the shafts should be made long enough to admit it. Ox-collars are strongly recommended. See COLLARS.

The comparative merits and demerits of beasts of labour, depend on their first cost, their keep, their work, and their value after working.

A powerful, handsome, six-years-old ox, may be purchased for ten or twelve guineas; but a powerful handsome six-years-old horse will cost from twenty to twenty-four guineas. Suppose that ten guineas a head are saved by purchasing oxen instead of horses, and that a farmer has occasion for three teams, he will have an addition, every ten or twelve years, of one hundred and twenty-guineas to stock and manage his farm with.

Their keep depends in some measure on the prices of hay and corn, and on the size and voraciousness of the beast to be fed. Taking into the account the unavoidable pilfering of carters, perhaps, on an equality of time, an ox may be kept at two thirds of the expence of a large cart-horse.

In their work, it is unnecessary here to contend for superiority, but you may aspire at equality. Oxen are equally tractable and equally versatile. Their strength depends upon their age and breed, and their activity on their make and strength.

A two-years-old ox is as worthless in work as a two-years-old horse; and the working of either is unpardonable. An ox does not arrive at full strength, especially if worked while young, until he be six years old. At that

age, a large deep-chested ox is equal in strength to a strong well-made cart-horse. Mr. Marshall says he is not so partial to oxen as to imagine that they can do whatever horses can do: he is nevertheless nearly positive, that whatever farming-horses do, oxen (of a proper age and properly managed) can do. On the road they are beyond all doubt, equal to horses, and at plough they are not inferior, except their work be very heavy. In heavy work they will not strive like horses, but will in defiance keep their steady pace. In this point of view, and in this only, oxen are unequal to horses. Indeed also, he never worked oxen all the year round, as horses are done, but he has always given a month's marshing in the spring, and they have generally had some idle days in winter; their fodder however, in this case, has been proportionable.

For their value after working, see CART-HORSE.

In his Rural Economy of Yorkshire he says, "the long-agitated dispute about the superiority of oxen or horses, as beasts of draught, may here be considered with singular propriety. But I am afraid even this country will not furnish sufficient evidence for a final decision.

"Formerly, and from time immemorial, four or six oxen in yokes, led by two horses, also double, were the invariable draught or team of the country; not only upon the road, but in ploughing. Even in stirring a fallow, four oxen and two horses were generally considered as requisite. And in breaking up a fallow, two men and a boy were the common attendants of this unwieldy, expensive team.

"At present, there is not perhaps, throughout the Vale, a single ox employed in tillage: two horses with whip-reins, without a driver, is now the universal plough-team for all soils, in almost every state.

"Upon the road, however, that is to say, in farm carriages, oxen are still in use: but seldom more than a single pair to a carriage; generally at the pole, with two or three horses at length before them. Beside, a number of entire horse-teams now travel upon the roads; things which formerly were unknown in the country.

"Even the timber-carriers (an industrious, wary set of men) continue to use them; though their sole employment be upon the road. They not only find them able to stand working every day, provided their feet do not fail them; but, what is much in their favour, they are found to stand long hours better than horses going in the same pasture. An ox in a good pasture soon fills his belly, and lays himself down to rest; whereas a short summer's night scarcely affords a horse time enough to satisfy his hunger.

"Another advantage of oxen is here held out. In stiff pulls of every kind, most especially in going up steep hills, a pair of oxen are considered as a sheet-anchor. Horses, it is argued, are fearful, and soon lose their feet in a steep slippery road; while oxen, where they are unable to proceed, will always stand their ground. Indeed oxen seem to be considered as essentially necessary in an awkward hilly country.

"If we had no other species of animals adapted to the purpose of draught in the island, nor any one which could be naturalized to the climate, cart-horses would be truly valuable; they being much superior to the breed of saddle-horses for the purpose of draught.

"But it appears to me evident, from the experience I have had, and the observations I have made, that were only a small share of the attention paid to the breeding of draught oxen, which now is bestowed on the breeding of cart-horses; animals equally powerful; more active; less costly; equally adapted to the purposes of husbandry, (if harnessed with equal judgment); less expensive in keep and attendance; much more durable; and infinitely more valuable after they have finished their labours, might be produced."

An ox is to draw the plough only from his third to his tenth year, when it will be advisable to fatten and sell him, as being then of a better flesh than if he was kept longer. The age of this creature is known by his teeth and horns. The first fore-teeth, which he sheds at the end of ten months, are replaced by others, larger, but not so white; at six months the teeth next to those in the middle, fall out, and are also replaced by others; and in three years all the incisive teeth are renewed. They are then equal, long, and pretty white; but as the ox advances in years, they wear, become unequal, and black. It is the same

same in the bull and cow : so that the growth and shedding of the teeth are not affected by castration, or the difference of sexes. Nor is the shedding of the horns affected by either; as both bull, ox, and cow, lose them alike at the end of three years; and these also are replaced by other horns, which, like the second teeth, remain; only those of the ox and cow are larger and longer than those of the bull. The manner of the growth of these second horns is not uniform, nor the shooting of them equal. The first year, that is the fourth of the ox's age, two small pointed horns make their appearance nearly formed, smooth, and towards the head terminated by a kind of button. The following year, this button moves from the head, being impelled by a corneous cylinder, which also lengthening, is terminated by another button; and so on; for the horns continue growing as long as the creature lives. These buttons become annular joints, which are easily distinguished in the horn, and by which the age of the creature may be readily known; counting three years for the point

of the horn to the first joint, and one year for each of the other intervals.

OX-BOOSE, an ox-stall, or cow-stall, where these creatures stand in the winter.

OX-HARROWS, very large harrows, called in some counties, drags.

OX-GANG, or *Ox-gate*, a quantity of land measuring fifteen acres, being as much ground as a single ox is supposed to be capable of ploughing in a year.

OX-FEET, in a Horse, is when the horn of the hind-foot cleaves just in the very middle of the fore-part of the hoof, from the coronet to the shoe: they are not common, but very troublesome, and often make a horse halt.

OX-LEGS. An imperfection in some horses, which, though they have the back sinew of their fore-legs somewhat separate from the bone, yet their sinews are so small, and so little set off, that their legs will become round, after small labour.

P.

P**ACK-SADDLE**, a saddle adapted to the carriage of heavy packs or burdens.

PAD, the road, a foot-path; also an easy-paced horse; likewise a low saddle.

PADLLE-STAFF, an instrument used by the ploughman to free the share from stubble, clay, &c. which hinder its action.

PADDOCK, a small field or inclosure. It also signifies a large frog or toad.

PAIGLE, a cowslip.

PAIL, a wooden vessel in which milk or water is commonly carried.

PAINTING CHEESES. See **CHEESE**.

PALATE, the upper part or roof of the mouth.

In a horse, the palate should be lean, for if it be fat, i. e. full and high, so as to be almost equal with the extremities of his upper teeth, the least height in the liberty of a bitt will be troublesome, and make him either chack in the bridle, and be always throwing up his head, or otherwise carry it too low, which, besides the unsightliness, will much annoy the rider's hand.

Horses are commonly bled in the palate with a sharp-pointed horn, to refresh and give them an appetite.

PALMS, the male flowers of the willow.

PALSY, a disease common to horses, wherein the body, or some of its members, lose their motion, and sometimes their sensation of feeling.

In paralytic disorders, where the use of a limb or limbs is taken away, the internals (recommended under the article **STAGGERS**) should be given in order to warm, invigorate, and attenuate the blood; and the following stimulating embrocation should be rubbed into the parts affected:

Take oil of turpentine four ounces; nerve ointment and oil of bays, of each two ounces; camphor rubbed fine, one ounce; rectified oil of amber, three ounces; tincture of cantharides, one ounce.

With this liniment the parts affected should be well bathed for a considerable time, to make it penetrate; and when the hind parts are chiefly lame, the back and loins should be well rubbed with the same: to the nervous medicines above recommended, may be added snake-root, contrayerva, mustard-seed, horse-raddish root steeped in strong beer, or wine, where it can be afforded. Take the following for an example, which may be given to the

quantity of three pints a day alone, or two hornsfull may be taken after the nervous balls:

Take snake-root, contrayerva, and valerian, of each half an ounce; mustard-seed and horse-raddish root scraped, of each two ounces; long-pepper two drams: infuse in three pints of strong beer or wine.

When the horse is recovering from any of the above disorders, the following alterative purge may be repeated two or three times, as it operates very gently:

Take succotrine aloes one ounce; myrrh half an ounce; assa foetida and gum ammoniacum, of each two drams; saffron one dram: make into a ball with any syrup.

Where a retention of dung is the cause of this disorder, the great gut should be first raked thoroughly with a small hand; after which plenty of emollient oily clysters should be thrown up, and the opening drink given, till the bowels are thoroughly emptied of their imprisoned dung. Their diet should for some days be opening, and consist chiefly of scalded bran, with flour of brimstone, scalded barley, &c.

PANIC, a plant resembling millet in its stalks, leaves, and roots; but differing in its spikes, or ears, which are about the thickness of a man's finger at their base, and growing taper toward their points. They are about eight or nine inches long, and closely set with a small roundish grain, sometimes white, sometimes red and purple, and sometimes yellow. It is raised and reaped in the same manner as millet, but does not require so much rain. This plant grows naturally in both the Indies, and is cultivated in several parts of Europe for the food of men. Cakes and bread are made of it in Germany, Italy, and the southern parts of France; but it is not reckoned so good nourishment as millet; nor is the German sort so much esteemed as the Italian; though the former ripens best in cold countries, where it is frequently sowed in land which will not produce better grain. It thrives most in a dry stiffish soil, such as the sides of hills, and even in stony ground; grows to the height of about four feet, and branches very much; for which reason the horse-hoeing husbandry is by far the fittest for it. The plants, if managed rightly, should stand at least eighteen inches asunder, in rows three feet apart, that

that there may be room to hoe the ground between them, and to keep them clear from weeds. When grown pretty tall, they should be supported by stakes, lest the wind break them down, and particular care must be taken to guard against birds, when their seeds begin to ripen.

PANNAGE, the food which swine feed upon in woods, as acorns, and the mast of beech. It also signifies the money taken by the king's agiftors, for the privilege of feeding hogs in the king's forests.

PANNEL, a low saddle.

PARING *the sole.* See the article **SHOEING HORSES.**

PARSNAP, the name of a plant propagated for the sake of its root.

Parsneps require a rich, mellow, and deep soil; in order that their roots, according to the bigness and length of which they are esteemed, may have full room to thicken and run downward. The seeds of these plants should be sown in February or March, either alone or with carrots, especially if it be intended to draw these last very young; because parsneps seldom spread much before the latter end of summer, by which time the carrots will, in this case, be gone. The practice of those gardeners who sow leeks, onions, and lettuces, with parsneps, is very wrong; because so many different growths must impoverish one another.

The young parsneps must be hoed and weeded, or if they were sown in rows, the ground between those rows must be dug three or four times in the spring, or whenever else many weeds appear. By the latter end of the summer their leaves will cover the ground, and prevent the farther growth of weeds; so that they will not require any more care after that season.

When their leaves begin to decay, their roots may be dug up for use: but they are seldom well tasted before that time; nor are they good for much late in the spring, after they have shot out again. They, therefore, who would preserve them for spring use, should dig them up in the beginning of February, and bury them in sand in a dry place, where they will remain good until the middle of April, or later.

To save the seeds of this plant in the most advantageous way, some of the longest, straightest, and largest roots should be singled and planted out about two feet asunder, in a place where they will be defended from the strong south and west winds; for the stems of the parsneps generally grow to a great height, and are very apt to be broken by strong gusts of wind, if they are exposed thereto. This ground should also be kept clear from weeds; and if the season should prove dry, watering of these plants moderately, twice a week, will increase the quantity, and improve the quality of their seeds, which will be about the end of August or the beginning of September, when the heads should be carefully cut off, and spread upon a coarse cloth for two or three days to dry. The seeds should then be beaten off, and put up for use. But neither these nor carrot-seeds should be depended on after they are above a year old.

Parsneps are an excellent, wholesome, and very nourishing food for cattle. Their culture, as I have just observed, is exactly the same as that of carrots, with which they may be sown in the same ground. Their leaves will decay at nearly the same time, when the roots may be dug up, and laid by for use; likewise buried in dry sand, in a dry place.

Parsnep-seeds seldom grow after they are above a year old.

It has long been a custom, in some parts of Britany, to sow parsneps in the open field for the food of cattle; as we are informed by the first volume of the Transactions of a society instituted in that province, for the encouragement of the economical and commercial interests of their country. "It is of great importance," say they, "that parsneps should be universally cultivated; because they afford an excellent and wholesome food for all kinds of cattle during the winter, and may be used to great advantage to fatten them. Our hogs have no other food in all that season, and our bullocks and oxen thrive well upon it. Our cows fed with parsneps, give more milk than with any other winter fodder, and that milk yields better butter than the milk of cows nourished with any other substance. Our horses fatten with this food: though some pretend that it renders them less mettlesome, and hurts their legs and eyes.

"Cattle eat these roots raw at first, sliced lengthwise; and when they begin not to relish them, they are cut in pieces, put in a large copper, pressed down there, and boiled with only so much water as fills up the chafins be-

tween them. They then eat them very greedily, and continue to like them."

PARTERRE, a level division of ground, which, for the most part, faces the south and best front of the house, and is generally furnished with greens, flowers, &c.

There are several sorts of parterres; as plain grass with borders, and parterres of embroidery, &c.

Plain parterres are more beautiful in England than in any other country, by reason of the excellency of our turf, and that decency and unaffected simplicity that it affords to the eye of the spectator. Other parterres are cut into shell and scroll work, with sand alleys between them; which sort of parterres are esteemed finest in France.

As to the general proportion of parterres, an oblong, or long-square, is esteemed the best: therefore, a parterre should not be less than twice as long as it is broad; twice and a half is accounted a very good proportion; and it is very rare that three times is exceeded. As to the breadth of a parterre, it is to take its dimensions from the breadth of the front of the house; if the front of the house is one hundred feet long, the breadth of the parterre should be one hundred and fifty feet; and if the front of the house be two hundred feet, the parterre should be fifty feet broader; but where the front exceeds the breadth of this parterre, it will be a good proportion to make the parterre of the same dimensions with the front.

There should be a terrace-walk on each side of the parterre, for an elevation proper for view; and therefore, there should never be the flat of a parterre between terrace-walk and terrace-walk, above three hundred feet; nor can it be well made less than one hundred and forty. As to the adorning and furnishing these parterres, whether it be plain or with embroidery, that depends much upon the form of them, and therefore must be left to the judgment and fancy of the designer.

PARTRIDGE, a timorous and simple bird, and is so valuable at the table, that there are a great many ways of taking it, invented by the sportsmen; all of which succeed, from the folly and fear of the animal.

The places that partridges most delight in, are cornfields, especially while the corn grows; for that is a safe retreat, where they remain undisturbed, and under which they usually breed. They frequent the same fields after the corn is cut down, and that with another intent; for they then feed on the corn that has fallen from the ears, and find a sufficient shelter for them under covert of the stalks, especially of those of wheat stubble. When the wheat stubble is much trodden by men or beast, they retire to the barley stubble, and will there hide themselves in coveys of twenty or thirty. When the winter comes on, and the stubble-fields are trodden down or ploughed up, they then retire to the upland meadows, where they lodge in the high grass, and among rushes; sometimes they resort to the low coppice woods, especially if there be corn-lands near them.

PASTERN *of a horse*, the distance between the joint of the mane and the coronet of the hoof.

This part should be short, especially in the middle-sized horses, because long pasterns are weak, and cannot so well endure travel: some have pasterns so long and flexible, that the horse in walking almost touches the ground with them, which is a great imperfection, and a sign of little or no strength, such horses not being fit for any kind of toil and fatigue.

PASTERN-JOINT, the joint next a horse's foot, which is said to be crowned, when, without being galled or hurt, there is a swelling round it beneath the skin, in form of a circle, about half the breadth of one's finger.

It proceeds from a humour gathered by much travel, and shews that the horse's legs have been too much used.

When the pastern-joint swells after travelling, chase it every morning and evening with a mixture of two parts of brandy and one of oil of nuts.

If the swelling be large, apply the red honey-charge with a convenient bath; and if it be hard, lay on a poultice of rue boiled in thick wine.

PASTURE, or **PASTURE LAND**, a general name for all sorts of land reserved for the purposes of feeding cattle.

Pasture ground is of two sorts: the one is low meadow land, which is often overflowed; and the other is upland, which lies high and dry. The first of these will produce a much greater quantity of hay than the latter, and will not require manuring or dressing so often: but then the hay produced on the upland is much preferable to the other;

other; as is also the meat which is fed in the upland more valued than that which is fattened in rich meadow: though the latter will make the fatter and larger cattle, as is seen by those which are brought from the low rich lands in Lincolnshire. But where the people are nice in their meat, they will give a much larger price for such as hath been fed on the downs, or in short upland pasture, than for the other, which is much larger. Besides this, dry pastures have an advantage over the meadows, that they may be fed all the winter, and are not so subject to poach in wet weather; nor will there be so many bad weeds produced; which are great advantages, and do, in a great measure, recompense for the smallness of the crop.

We have already mentioned the advantages of meadow land, or such as is capable of being overflowed with water, and given directions for draining and improving low pasture land, under the article LAND; therefore shall not repeat that here, but just mention some methods for improving of upland pasture.

The first improvement of upland pasture is, by fencing it, and dividing it into small fields of four, five, six, eight, or ten acres each, planting timber trees in the hedge-rows, which will screen the grass from the dry pinched winds of March, which will prevent the grass from growing in large open lands; so that, if April proves a dry month, the land produces very little hay; whereas in the sheltered fields the grass will begin to grow early in March, and will cover the ground, and prevent the sun from parching the roots of the grass, whereby it will keep growing, so as to afford a tolerable crop, if the spring should prove dry. But, in fencing of land, it must be observed, as was before directed, not to make the inclosures too small, especially where the hedge-rows are planted with trees; because, when the trees are advanced to a considerable height, they will spread over the land; and, where they are close, will render the grass sour; so that, instead of being of an advantage, it will greatly injure the pasture.

The next improvement of upland pasture is, to make the turf good, where, either from the badness of the soil, or for want of proper care, the grass hath been destroyed by rushes, bushes, or mole-hills. Where the surface of the land is clayey and cold, it may be improved by paring it off, and burning it in the manner before directed: but, if it is an hot sandy land, then chalk, lime, marle, or clay, are very proper manures to lay upon it: but this should be laid in pretty good quantities, otherwise it will be of little service to the land.

If the ground is over-run with bushes or rushes, it will be a great advantage to the land to grub them up towards the latter part of summer; and after they are dried to burn them, and spread the ashes over the ground just before the autumnal rains; at which time the surface of the land should be levelled, and sown with grass-seed, which will come up in a short time, and make good grass the following spring. So also, when the land is full of mole-hills, these should be pared off, and either burnt for the ashes, or spread immediately on the ground, when they are pared off, observing to sow the bare patches with grass seed, just as the autumnal rains begin.

Where the land has been thus managed, it will be of great service to roll the turf, in the months of February and March, with an heavy wood roller; always observing to do it in moist weather, that the roll may make an impression: this will render the surface level, and make it much easier to mow the grass, than when the ground lies in hills; and will also cause the turf to thicken, so as to have what the people usually term a good bottom. The grass, likewise, will be the sweeter for this husbandry, and it will be a great help to destroy bad weeds.

Another improvement of upland pastures is, the feeding of them: for where this is not practised, the land must be manured at least every third year: and where a farmer hath much arable land in his possession, he will not care to part with his manure to the pasture. Therefore every farmer should endeavour to proportion his pasture to his arable land, especially where manure is scarce, otherwise he will soon find his error; for the pasture is the foundation of all the profit which may arise from the arable land.

Whenever the upland pastures are mended by manure, there should be a regard had to the nature of the soil, and a proper sort of manure applied: as for instance, all hot sandy land should have a cold manure; neat's dung and swine's dung are very proper for such lands; but, for cold lands, horse-dung, ashes, and other warm manures,

are proper. And when these are applied, it should be done in autumn, before the rains have soaked the ground, and rendered it too soft to cart on; and it should be carefully spread, breaking all the clods as small as possible; and then harrowed with bushes, to let it down to the roots of the grass. When the manure is laid on at this season, the rains in winter will wash down the salts, so that the following spring the grass will receive the advantage of it.

There should also be great care had to the destroying of weeds in the pasture every spring and autumn; for, where this is not practised, the weeds will ripen their seeds, which will spread over the ground, and thereby fill it with such a crop of weeds as will soon overbear the grass, and destroy it; and it will be very difficult to root them out, after they have gotten such possession; especially ragwort, and such other weeds as have down adhering to their seeds.

These upland pastures seldom degenerate the grass which is sown on them, if the land is tolerably good whereas the low meadows, which are overflowed in winter, in a few years turn to an harsh rushy grass, though the upland will continue a fine sweet grass for many years without renewing.

There is no part of husbandry, of which the farmers are in general more ignorant than that of the pasture: most of them suppose, that when old pasture is ploughed up, it can never be brought to have a good sward again; so their common method of managing their land, after ploughing, is, to sow, with their crop of barley, some grass seeds, as they call them; that is, either the red clover, which they intend to stand two years after the corn is taken off the ground, or rye-grass, mixed with trefoil: but as all these are, at most, but biennial plants, whose roots decay soon after their seeds are perfected; so, the ground, having no crop upon it, is again ploughed for corn: and this is the constant round which the lands are employed in, by the better sort of farmers; for I never have met with one of them who had the least notion of laying down their land to grass for any longer continuance; therefore, the seeds which they usually sow, are the best adapted for this purpose.

But, whatever may have been the practice of these people, I hope to prove, that it is possible to lay down land, which has been in tillage, with grass, in such a manner, as that the sward shall be as good, if not better than any natural grass, and of as long duration. But this is never to be expected, in the common method of sowing a crop of corn with the grass seeds: for, wherever this has been practised, if the corn has succeeded well, the grass has been very poor, and weak; so that, if the land has not been very good, the grass has scarcely been worth saving: for the following year it has produced but little hay, and the year after the crop is worth little, either to mow or feed. Nor can it be expected to be otherwise; for the ground cannot nourish two crops: and, if there were no deficiency in the land, yet the corn, being the first, and most vigorous of growth, will keep the grass from making any considerable progress; so that the plants will be extremely weak, and but very thin, many of them which came up in the spring, being destroyed by the corn: for, whenever there are roots of corn, it cannot be expected there should be any grass. Therefore the grass must be thin, and, if the land is not in good heart, to supply the grass with nourishment, that the roots may branch out after the corn is gone, there cannot be any considerable crop of clover: and, as their roots are biennial, many of the strongest plants will perish soon after they are cut; and the weak plants, which had made but little progress before, will be the principal part of the crop for the succeeding year: which is many times not worth standing.

Therefore, when ground is laid down for grass, there should be no crop of any kind sown with the seeds; and the land should be well ploughed, and cleaned from weeds, otherwise the weeds will come up the first, and grow so strong, as to overbear the grass, and if they are not pulled up, will entirely spoil it. The best season to sow the grass seeds upon dry land is about the middle of September, or sooner, if there is an appearance of rain: for the ground being then warm, if there happen some good showers of rain after the seed is sown, the grass will soon make its appearance, and get sufficient rooting in the ground before winter, so will not be in danger of having the roots turned out of the ground by frost, especially if the ground is well rolled before the frost comes on, which will press it down, and fix the earth close to the roots. Where this hath not been practised, the frost has often loosened the ground so much, as to let in the air to the roots of the grass, and done it great damage; and this has been brought as an

objection to the autumnal sowing of grafs : but it will be found to have no weight, if the above direction is practised : nor is there any hazard of sowing the grafs at this season, but that of dry weather, after the seeds are sown ; for if the grafs comes up well, and the ground is well rolled in the end of October, or the beginning of November, and repeated again the beginning of March, the sward will be closely joined at bottom, and a good crop of hay may be expected the same summer. But, where the ground cannot be prepared for sowing at that season, it may be performed the middle or latter end of March, according to the season's being early or late ; for, in backward springs, and in cold land, we have often sowed the grafs in the middle of April, with success : but there is danger, in sowing late, if dry weather, and especially if the land is light and dry ; for we have seen, many times, the whole surface of the ground removed by strong winds at that season ; so that the seeds have been driven in heaps to one side of the field. Therefore, whenever the seeds are sown late in the spring, it will be proper to roll the ground well soon after the seeds are sown, to settle the surface, and prevent its being removed.

The sorts of seeds which are the best for this purpose, are, the best sort of upland hay-seeds, taken from the cleanest pastures, where there are no bad weeds : if this seed is sifted to clean it from rubbish, three bushels will be sufficient to sow an acre of land. The other sort is the *trifolium pratense album*, which is commonly known by the names white Dutch clover, or white honeyfuckle grafs. Eight pounds of this seed will be enough for one acre of land. The grafs seeds should be sown first, and then the Dutch clover-seed may be afterwards sown : but they should not be mixed together ; because the clover-seeds, being the heaviest, will fall to the bottom, and consequently the ground will be unequally sown.

When the seeds are come up, if the land should produce many weeds, these should be drawn out before they grow so tall as to overbear the grafs : for where this has been neglected, the weeds have taken such possession of the ground, as to keep down the grafs, and starve it ; and, when these weeds have been suffered to remain until they have shed their seeds, the land has been so plentifully stocked with them, as entirely to destroy the grafs : therefore it is one of the principal parts of husbandry, never to suffer weeds to grow on the land.

If the ground is rolled two or three times, at proper distances after the grafs is up, it will press down the grafs, and cause it to make a thicker bottom : for, as the Dutch clover will put out roots from every joint of the branches which are near the ground, so, by pressing down of the stalks, the roots will mat so closely together, as to form a sward so thick as to cover the whole surface of the ground, and form a green carpet ; and will better resist the drought. For, if we do but examine the common pastures in summer, in most of which there are patches of this white honeyfuckle grafs growing naturally, we shall find these patches to be the only verdure remaining in the fields. And this, the farmers in general acknowledge, is the sweetest feed for all sorts of cattle ; yet never had any notion of propagating it by seeds : nor has this been long practised in England ; for, till within a few years that some curious persons imported the seed from Brabant, where it had been long cultivated, there was not any of the seeds saved in England : though now there are several persons who save the seeds here, which succeed full as well as any of the foreign seeds which are imported.

As the white clover is an abiding plant, so it is certainly the very best sort to sow, where pastures are laid down to remain : for as the hay seeds which are taken from the best pastures, will be composed of various sorts of grafs, some of which may be but annual, and others biennial ; so, when those go off, there will be many large patches of ground left bare and naked, if there is not a sufficient quantity of the white clover, to spread over and cover the land. Therefore, a good sward can never be expected, where this is not sown : for in most of the natural pastures we find this plant makes no small share of the sward ; and it is equally good for wet and dry land, growing naturally upon gravel and clay, in most parts of England : which is a plain indication how easily this plant may be cultivated, to great advantage, in most sorts of land throughout the kingdom.

Therefore, the true cause why the land which has been in tillage, is not brought to a good turf again, in the usual method of husbandry, is, from the farmers not dis-

tinguishing which grasses are annual from those which are perennial : for, if annual or biennial grasses are sown, these will of course soon decay ; so that, unless where some of their seeds may have ripened and fallen, nothing can be expected on the land but what will naturally come up. Therefore this, with the covetous method of laying down the ground with a crop of corn, has occasioned the general failure of increasing the pasture in many parts of England, where it is now much more valuable than any arable land.

After the ground has been sown in the manner before directed, and brought to a good sward, the way to preserve it good is, by constantly rolling the ground with an heavy roller, every spring and autumn, as hath been before directed. This piece of husbandry is rarely practised by farmers : but those who do, find their account in it ; for it is of great benefit to the grafs. Another thing should also be carefully performed ; which is, to cut up docks, dandelion, knapweed, and all such bad weeds, by their roots every spring and autumn : this will increase the quantity of good grafs ; and preserve the pastures in beauty. Dressing of these pastures every third year is also a good piece of husbandry ; for otherwise it cannot be expected the ground should continue to produce good crops. Besides this, it will be necessary to change the seasons of mowing, and not to mow the same ground every year ; but to mow one season and feed the next ; for, where the ground is every year mown, it must be constantly dressed, as are most of the grafs grounds near London, otherwise the ground will be soon exhausted. *Miller's Gard. Dict.* See the article MEADOW.

The following Methods of improving wet Pastures, will, we doubt not, be very acceptable to our Readers, as they are founded on Experience, and consequently have no tendency to deceive the Husbandman.

" As I have, says our ingenious husbandman, within a few years, not only had some experience in my own farm, but observed the methods employed by many neighbouring gentlemen and farmers in mending their pastures, I shall communicate a few of my remarks to you on the improvement of wet pastures ; a subject which may prove, perhaps, of some little utility, as I shall speak of nothing but what I have either performed myself, or seen hereabouts.

" The particular lands of which I speak are loose, woodcock, brick-earth soils for about eighteen or twenty inches, and under that, clay to a great depth.

" Some that I have improved myself were exactly level, so as to be quite poisoned with the wet, which could not drain off.

" From the best observations I could make on many experiments, the following is the method which answers best to improve them. I shall also give you the expence with us.

" The first thing to be done is, to make large, deep ditches round every field, and if the fields are large, to divide them into smaller, of five, six, or seven acres each, by new ditches ; nothing is attended with a more sudden improvement of all the ground near the borders of the fields, than good ditches.

" I generally make mine six feet perpendicular deep, seven wide at top, and three at the bottom. I never pay for them by the rod (which is customary) but give twopence halfpenny per load, of thirty bushels, for all the clay, &c. that is thrown out of them, and two shillings and sixpence a score loads for filling and spreading it.

" These ditches should be made in such a manner that no water can remain in them, but a descent from one to another to carry it quickly off.

" It may be easily imagined how much these must drain the land, besides the quantity of excellent manure (clay) which arises out of them. Add to this the great convenience of having such fences about a farm, that the farmer is sure to find his cattle wherever he turns them, instead of their breaking perpetually into his corn or hay fields, which, in multitudes of farms, is so often the case : it is sometimes the work of a boy, only to be hunting after hogs or sheep that go astray for want of good fences.

" In the banks of new ditches we always lay white-thorn, fifty roots to a rod (the workmen are allowed sixpence per hundred for gathering them ;) but I always avoid intermixing any thing with it, especially hazel, for in the nut season fences are pulled in pieces for the fruit by all the boys and girls in the neighbourhood ; and oak, ash, &c. only give an opportunity to get over the hedges with greater ease.

ease. Sallow, willow, elder, &c. are to be avoided in the hedge, or by way of hedge-stake for the dead hedge, as they grow so fast as quite to overshadow the quick, and even destroy it. After frequent cuttings, to render the plants thick and strong, I keep the quick regularly clipped, which, in few years, render the fence impenetrable to man or beast, considering the largeness of the ditch.

" If an old fence is grown bad and thin, or composed of improper plants, I never yet observed it improved by planting quick in the gaps: the best way is, to reverse the bank, and plant fresh quick.

" One advantage arising from good fences is not apparent at first sight. To the disgrace be it spoken of most of the gentlemen of large fortunes round Bury, the game is wretchedly destroyed by poachers, who take it with night-nets. These vermin, who are generally labourers, swarm in every village round me. Their method is this: they take the farmer's horses out of his fields, and, after their doing a hard day's work, ride them all night, as fast as they can make them go, over the stubbles, to catch the partridges, blundering over every hedge (except such as I have described) in their way, oftentimes taking the horses (of which two instances have I seen this season) making gaps in the fences, riding over standing corn, clover for seed, or any thing that is a cover for birds, and after damaging the farmer in a most shameful manner, carry the produce of their infamous labour to many, who, to their great dishonour, encourage these rascals for their convenience. The money they get is spent at the next alehouse, and instead of doing the farmer a good day's work, they are drunk, asleep, or idle, the whole day.

" Now there are very few farmers horses that will leap a gate; but most will plunge through such hedges as are common hereabouts: none could pass such ditches as I always make and recommend. A farmer in this parish has so effectually fenced in his fields with prodigious ditches, that I have heard him declare, that not a single night-netter has been on his grounds on horse-back; and were they to attempt it, they would lose more time in passing one ditch than was necessary to drag some whole farms.

" The pernicious effects, to farmers, of this abominable practice, are notorious, and cry aloud for redress: if they would ease themselves, I know of no way but such ditches as I have described.

" But to return.

" When the ditching is done, the next work is to land-drain the whole fields in such a manner that every part of them may be laid dry. In a pasture of six acres I did two hundred rod. If there is the least fall in any part, or any place more wet than others, the drains should be cut through them. If the surface is exactly level, the depth of the drains should vary, so that the water may every where have a descent.

" These drains are made, in general, thirty-two inches deep, twenty inches wide at the top, and four wide at the bottom. They are filled eight inches deep with either stones or wood; but I should ever recommend the former, as the most effectual and lasting, to those who are not desirous of saving the difference of the expence. However, I know many fields in this parish and neighbourhood that are drained with wood, and which answer extremely well; and I have been assured that they will last twenty or thirty years. Nay, in some parts of Essex I hear they do it with straw alone: but this must be of service for only a few years: if stone be used, there can be no doubt of its lasting. The labour of the whole is three-pence per rod; sometimes it is done for two-pence half-penny,

" If with stone of the farmers, a load of thirty bushels will do three rods, which costs one shilling and a half-penny flubbing and picking; so the expence of a rod is seven-pence, besides carriage of the stone, which will not be much: but if he buys his stone, as is much the most probable in this country, we may suppose he must go two miles to fetch it, and give a shilling for eighteen bushels ready picked: the carriage is worth a shilling more, and reckoning the eighteen bushels to do a rod and half (which is near the matter) the stone of it will cost per rod one shilling and four pence.

" If bushes are used, a load of forty faggots will cost, if he buys them, or be worth if he has them, five shillings, and cost cutting one shilling. They will do ten rods; so that the whole expence of doing a rod with them will be ten-pence, and of stone one shilling and seven pence.

" The very first year the prodigious advantage of these

drains appears, especially if the season proves wet. The grafts (or corn if in ploughed fields, for it answers in all) will be fresh, vigorous, and sweet, wherever the pastures are drained.

" I have a field of six acres (mentioned above) which by land-draining, ditching, and manuring, is an exceeding good pasture, and has produced two tons and ten hundred weight of hay per acre, in a very good year, and generally thirty-five hundred weight per acre; whereas the pastures adjoining are scarce worth the farming, and let but at seven shillings per acre, producing scarce any thing but a little feed for lean cattle. The soil is the same in both; the six acres, about twelve years ago, being full as bad as the rest.

" These are the principal points to be observed in improving such wet, cold, loose pastures, as I have described: some that I have quite changed by these means were half over-run with moss and rushes; but draining them thoroughly, and claying them, kills all rubbish of this sort, and presents the farmer with so admirable a view of good pasture for dairy or grazing, where so lately nothing could live, as to be equalled in scarce any thing of the kind.

" But as all improvement ceases to be such when more money is spent in it than the advantages will repay, I shall in a few words display how far this is from being the case here. I will suppose two or three fields are improved by claying and draining, amounting in the whole to twenty acres.

	l. s. d.
" Sixty loads of clay per acre thrown out of the ditches, twelve hundred loads, at two pence halfpenny per load	12 0 0

" I will suppose sixty rod of new ditching done, which before clay is thrown out by the load, will cost one shilling per rod	3 0 0
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" Three thousand quicksets, at sixpence per hundred	0 15 0
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" Land-draining seven hundred rod with bushes (this is the quantity I have now marked out in a field of twenty acres) at ten-pence per rod	29 3 4
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" N. B. I had a great part of my last crop of barley killed in this field with the wet: I had therefore a fine opportunity of marking exactly where the drains should be made, which ought, on such occasions, never to be omitted, were it only for the common water-furrows which are made for every crop. In some fields, unless such a guide offers, it is very difficult to tell exactly where to make the land-drains.

" Turning and mixing one thousand six hundred load of manure	6 8 0
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" Filling and spreading one thousand six hundred loads, at two shillings and sixpence per score	10 0 0
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" I will suppose that the work may be done the sooner if the farmer brings one hundred loads of the four hundred of dung from the nearest town; and as I have not reckoned the horses and driver for the clay cart, I shall not in the bringing the dung: therefore the expences per waggon load will be, the cost three shillings, boy sixpence, and turnpike sixpence. A waggon load is two tumbrel loads (in this country) so fifty loads, at four shillings, are 10 0 0

Total 71 6 4

" This is three pounds eleven shillings and three-pence per acre: and supposing the profit to last but twenty years, although the draining and ditching part will last twice that time, and the clay five and twenty, as good as at first; and the farmers hereabouts seldom change their farms, if tolerable ones, living in them their lives and their sons after them, with leases of seventeen, twenty-one, and twenty-five years: supposing twenty years profit, I say, the expences will then be, per acre per annum, three shillings and six-pence halfpenny.

" So

"So small is the expence divided. But now let us consider the profit.

"Such land as I have described never lets here for more than ten shillings per acre, by far oftener for eight shillings, or eight and sixpence; and it is from my own experience, as well as various observations, that I assert the same land, after the improvements, will let to any tenant for seventeen, eighteen, and twenty shillings per acre.

"I will suppose it only sixteen shillings, though I am certain that is considerably under the mark: he then gains, in point of rent, six shillings per acre; and the whole calculation is absurd if we do not add his whole proportional profit on the acre: supposing his profit on it before improvement was a rent, ten shillings; afterwards, it will undoubtedly be the same at least; which adds six shillings per acre per annum, or eight shillings and sixpence clear, after the improvement is paid.

"Twelve shillings per acre is per annum, for	l.
twenty years	240
"Expences of improvement	71

"Clear profit	169
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"Or eight pounds nine shillings per annum: and if we reckon five per cent. interest for the seventy-one pounds, that is three pounds eleven shillings per annum absolute profit.

"Thus, I think, I have stated the case of this improvement clearly; and I must repeat it, that I speak from experience. The sum to be expended on twenty acres will appear large to most farmers, whose property is not considerable; but the proportion holds for a single acre, and those who cannot afford to improve twenty, may three, four, or five; and I make no doubt but such as attempt it will find their accounts in it greater than I have stated it.

"As I have mentioned a tumbrel-load to be thirty bushels, and a waggon-load to be but two tumbrels, I should observe that we carry away of muck fifty bushels at a time in our tumbrels, and so agree with our men in proportion to the thirty bushel loads.

"I have observed, that in making new ditches, or enlarging old ones, I never pay by the rod, but by the load: however, to those who chuse the former way, I would recommend that they have them worked by a frame of small slit deal, nailed into the exact size of the intended ditch, and agree with the workmen to do their work by it: this will prevent disputes which frequently arise."

PATE, a brock or badger.

PATH. A path across arable land is a great loss, as are crooked hedges. To remedy which, and forming a new straight ditch a quarter of a mile long, which was a nuisance, to a corner of a farm, Mr. Marshall, in his Minutes of Agriculture, has the following advantages stated thus:

	l.	s.	d.
Paid for breaking-up, deep enough for the plough, to pass safely, 86 rods in length, and about a rod in width, at 2s.	8	12	0
—clearing and stacking 28½ stack of wood cankered pollards, and the roots of timber trees taken down for buildings, at 5s.	7	1	3
—binding 320 bavins at 2s. 6d.	0	1	0
—making 79 rod of ditch, five feet wide at top, three feet deep, and ten inches wide at bottom, at 17d. though 16d. is a fair price	5	9	1
The new bank and ditch take up about 55 square rod, worth, during the remainder of a term of a lease, about	5	0	0
	26	10	4

"The wood is worth on the spot 15s. a stack, and the bavins, and spray bavins 10s. per hundred.

28½ stacks of wood is, at 15s. is worth	21	3	9
320 bavins at 10s.	1	12	0

The land reclaimed is about half an acre, which, on a par with the rest of the farm, during the remainder of the lease, 7l. 6s. 3d; but it is fresh virgin soil and will give three or four good crops without manure, and is worth at least	10	0	0
	32	15	9

Thus there is an apparent gain of 6l. 5s. 5d. besides the invaluable advantage of open fields and long ridges. But

the ditch is not a fence; the quick is to be planted, a temporary hedge to be made, and the quick to be weeded and defended; this took up sixteen days work, and cost, with collecting the plants at 8d. per hundred, 2l. 17s. 4d. The plants were placed four inches apart, each rod taking fifty. It was watered with the drainings of the dunghill, as they were planted in a trench, to a great advantage.

PEAR. Nature, as has already been said relative to apples, has furnished us with only one sort, namely the wild pear, from whence all the cultivated varieties are produced. See APPLE. The squash is in much the highest esteem. It is an early fruit; remarkable for the tenderness of its flesh. If it drops ripe from the tree, it bursts to pieces with the fall. The liquor made from this fruit is pale, sweet, yet remarkably clean, and of a strong body: a most excellent liquor, if duly manufactured from a soil which suits it. The Oldfield is a favourite old pear, remarkable for the elegant flavour of its liquor. The Barland pear is in great repute, as producing a perry which is esteemed singularly beneficial in nephritic complaints; as is the red pear for producing a liquor of singular strength. The huffcap and the sack are other pears which have been usually grafted: and besides these, and a variety of others, great numbers of kernel fruits are found among the pear-trees, as well as among the apple-trees, in Herefordshire. See PERRY and ORCHARDS, *Marshall's Rural Economy of Gloucestershire*.

PEARL; called also pin, and web, or any unnatural spot or thick film over an horse's eye, proceeding from some stroke or blow received, or from the fire or dam.

The pearl is known by a little round thick white spot, like a pearl, (from which it took its name) growing on the sight of the eye.

As for the cure, it is the same as for Blood-shot Eyes.

PEASE, a genus of plants cultivated in every part of England, both in the field and kitchen-garden. We shall here give the best instructions in our power for obtaining large crops in the field.

Mr. Lisle, for the greater ease and more certain guidance of country people, who are apt to be perplexed by a long list of particular names of different sorts of field-peas, and of their several numerous varieties, judiciously ranges them under two general heads, viz. the tender and the hardy small sort, and the tender and the hardy great sort: under the one or the other of which classes he thinks all kind of peas may properly be ranked, because they equally agree or disagree with the same soil. The tender pea, for example, is improper for a cold country, or which amounts to the same, for cold ground in a warm country; and the large pea, by reason of its great haulm, is not proper for strong rich land, because its haulm will there increase to so great a length, that it will not be able to bear pods. His own experience in the year 1704, satisfied him fully that the best way to make peas pod well, is to sow them on a mellow mould, rendered light by ploughing; and he thinks it right to roll the ground soon after they are sown.

Even the most general directions cannot but be of service to the husbandman: but more particular observations and actual experiments, properly diversified, are still much wanted in the culture of this, and indeed of all other podded grains and succulent plants, whose importance, as destroyers of weeds, improvers of land, and excellent preparers of it for other crops, is established beyond dispute. It is even a rule with farmers not to sow the same land a second time with peas, till six, or at least five years after the former crop of the same kind; because till then the ground on which they grew will continue so rich as to make them run luxuriantly to haulm, in a manner inconsistent with the bearing of much fruit.

The common white pea does best on light sandy land, or on a rich loose soil. It is generally sown with a broadcast, and only harrowed in. Three bushels of these peas are the usual allowance of seed for an acre of ground; and the common time for sowing them is about the latter end of March, or the beginning of April, on warm land; but a fortnight or three weeks later than this, will be early enough on cold ground. If sown in drills, which is by far the best way, a bushel and a half of seed will be full enough for an acre; and, when they are thus set regularly, the ground may be stirred with a hoe, to destroy the weeds, and earth up the plants, by which they will be greatly improved, and the peas will be much easier to cut in autumn, when they are ripe.

The green and the maple roundivals require a stronger soil

soil than the white, and should be sown a little later in the spring, also in drills, but farther asunder, that is to say, at the distance of at least two feet and a half, or three feet from each other, because they are apt to grow rank, especially in a wet season. The ground between these rows should be stirred two or three times with a hoe, which will not only destroy the weeds, but, by earthing up the peas, will greatly improve them, and also render the land fitter to receive whatever crop is put on it the following season.

The grey and other large winter pease, as they are called, are seldom cultivated in gardens, because they require a great deal of room. The best time for sowing of these is about the beginning of March, when the weather is pretty dry; for if they are sown in a very wet season, they are apt to rot, especially if the ground be cold. The distance between the rows should here be at least three feet, and these pease should be sown very thin in the rows: for if they are sown too thick, their haulm will spread so as to fill the ground, and they will ramble over each other; by which means many of the plants will be rotted, and hindered from bearing. The common allowance of these large pease, is two bushels to an acre: but that is certainly more than confists with the very thin sowing, which is best for them.

The grey peas, in particular, thrive best on a strong clayey land, in which they are commonly sown under furrow. But by this method of sowing, large pease, especially, are always planted too thick, and at unequal depths, which prevent their coming up regularly. For this reason, among many others, all rank-growing plants should undoubtedly be sown in drills, in which their seeds will be distributed much more equally in all respects.

If only a small spot of ground be planted with these pease, a channel about two inches deep may be made with a hoe, guided by a line; the seeds may be dropped therein, and the earth may be drawn over them with a rake. By this means they will be covered equally, and with tolerable dispatch, though not sufficient for large fields, where, for this reason, a shallow furrow is commonly made with the plough, the seeds are scattered in, and the earth is harrowed over them. The greatest trouble then remaining is to keep the plants clear from weeds, and lay the earth up to their roots, which, in countries where labour is dear, is very expensive to have done with the hand-hoe, but may be easily effected by drawing a horse-hoe between the rows. This will entirely eradicate the weeds, stir the soil, render it mellow, and greatly promote the proper growth of the plants.

Mr. Marshall, in his *Rural Economy of Gloucester*, says, "In the Cheltenham quarter of this district, I have observed a singular method of setting pease: not in continued lines, but in clumps; making the holes eight or ten inches from each other, putting a number of pease in each hole. This is called bunching them. The hoe has, undoubtedly, in this case, greater freedom: all the danger arising from the practice is, that the soil is not so evenly and fully occupied by the roots in this case, as they are when the plants are distributed in continued lines."

All sorts of pease love lined or marled land: but, when they are sown late in the season, the soil should be strong and moist; for they will then burn up and perish in hot light land, or at least not produce a crop worth taking off the ground. The authors of the *Maisons Rustiques* approve of steeping them twenty-four hours in water before they are sown, as well to separate the bad and faulty from the good, as to enable these last to rise the sooner by being thus moistened. In general, the larger the pea is, and consequently the later its usual time of ripening, the earlier it should be sown, as experience has directed, and as Mr. Lisle rightly infers from the following curious observation, which, if duly attended to, may be of service to husbandmen and gardeners, and perhaps productive of some improvements in the culture of this plant.

In 1708, when the field and garden pease were near a foot high, he observed on the very top of them a purse or nest of buds of blossoms, lying in a bag together; and perceiving at the same time that there was no show of blossoms putting forth at the lower joints, he concluded that the crops of pease would miscarry that year; that they would not only have some top-kid, and that it would be vain to expect any on the lower joints, because they are always forwarder in blossoming and kidding than the upper joints, and had not then the least appearance of doing either. This afforded him some amusements in reasoning: but,

not being satisfied, in a day or two after looked again into these upper pods or bags of these blossoms, and upon dissecting a number of them, found sometimes in a single one, near thirty buds of blossoms, two or three of which seemed usually to have got the start of the rest, and to be bigger in bulk, and taller; most of the rest seemed to lie in a huddle without making any gradations; but as he had never seen, excepting the crown pea (which carries all its blossoms in a tuft at top, like a nosegay), other pease put forth above two blossoms and kids at top, which seldom come to any good, he suspected that the many blossoms in this pod must form the successive gradations of blossoming joints, arising from that stock as from a common root, and that every blossom shot forth in order as it grew forwarder than the rest, while the main stem, advancing higher and higher, left behind the subaltern blossom of a lower joint. To be clear in this, he tied scarlet threads just under several of these pods, that he might know them again, and, as he expected, found in four or five days time a gradation of blossoms arising from joints with lobous leaves above his scarlet threads, and the pod of blossoms still advanced on to the end, leaving behind farther joints of blossoms, till the whole stock was spent.

From this observation Mr. Lisle infers, 1. That by looking into this pod, or purse of buds, while it is yet so much in its infancy as only to be viewed by a magnifying glass, we may judge what hopes there are of a future crop, provided the succeeding months prove favourable: and, 2. That we may learn from hence what sort of pease to adopt to every sort of ground: "but, continues he, before I enter on this part and use of the above-mentioned observation, I must, for the better understanding thereof, premise, that the farmers vary in their judgment in no one point so much as in the nature of the pea. Several sorts of pease are commonly sown within the limits of the same parish, and each of the persons who sow them generally has a great prejudice to any other sort than that which he sows, having perhaps been disappointed of his expected return from other pease, when he has sowed them, and being, for the same reason, equally disposed as readily to alter his opinion for his last favourite kind; for the produce of a crop of pease is always very uncertain. But if the farmer would consider, from the foregoing observation, how early or rath-ripe a pea is, or how late in ripening, in its nature; and that (as all its stock or power to put forth blossoms lies within the foliage of one pod) the art must result from thence, so to sow the pease, in such ground, and at such time, that each sort of pea, according to its nature, may, before autumn and cold weather come to check them, send forth all its gradations of joints or blossoms, so that none may become abortive for want of summer enough to enable nature to bring her embryos to maturity, and carry the bud-blossoms into kids; then it is apparent (as all large pease ripen late, and run to great haulm or stalks, and small pease have less haulm and ripen earlier) that the great or late ripe pease should be sowed as early as the climate will permit; for thereby such pea will get so forward as to have time to put forth all its gradations of blossoms and kids, and to perfect them before a rainy autumn comes, and puts a stop to farther vegetation. Again, great pease ought to be sowed on a white, or some mixed land, not too gross of juice; but not on a cold clay: for the moisture of this last will keep feeding the haulm, and be inconsistent with the main design of sowing them early, which is, that they may bring all their fruit to maturity in due time. The white or mixed mould must be in good heart; for otherwise it cannot maintain a great pea. On the other hand, it is evident from hence that a pea which ripens early should be sowed in a strong feeding land, because such land will nourish it more vigorously, without danger of too great an increase of its haulm, which is naturally short; and notwithstanding the coldness of the soil, there need be no doubt but that all the kids will ripen.

Moderate rains are of singular service to pease while they grow, and particularly at their time of blossoming and filling up their pods; but a continuance of cold rain for many days, is perhaps as prejudicial as too much heat or drought. The bluish bloom upon their leaves, and their expanding backward the two outermost and largest leaves of their blossoms, are undoubted signs of great health and vigour. Mr. Lisle is of opinion, that they neither ripen nor harden so well upon high grounds, as in the vallies, and consequently that the former are not so fit for keeping as the latter.

Among the very few experiments on the culture of pease in field, the following, which M. Duhamel has given, afford a pretty strong conviction of the benefits which arise from horse-hoeing between their rows.

In April 1753, M. de Villiers, one of that ingenious gentleman's correspondents, sowed a small field in Champagne, with pease in double rows. Not being provided with a proper instrument to hoe the intermediate spaces, he made use of a narrow angular kind of share, which stirred only three or four inches on the outside of the rows. Almost all the pease in his neighbourhood were destroyed that year by a kind of vermin called vine-fretters. His were hurt the least of any; which was probably owing to the greater vigour of the plants, or the insects being killed by the stirring of the ground. By a comparison which he made of the produce of this spot, he found that it yielded six times as much as the same extent of the best land in the same country. "In a good year, says M. Duhamel, the difference would not have been so great; but still this experiment shews, that plants cultivated in the new or horse-hoeing way, are better able to resist the inclemencies of the seasons, and other accidents, than those which are cultivated according to the old method."

The next year, M. de Villiers, being provided with M. Duhamel's drill and horse-hoe, sowed pease again in rows, in some places two feet, and in others two feet and a half asunder. But this distance was so narrow, that it rendered the horse-hoeing very difficult in many places, and quite impracticable in others. He was therefore obliged to contrive other means of stirring the ground, in which, notwithstanding this, his pease flourished extremely, and yielded more than any others on the very best land in the same district.

The same gentleman drilled pease again, in 1755, in a strong heavy soil, in which no one had ever ventured to sow any in the common husbandry. They grew as high as if the ground had been ever so fit for them, and yielded half as much again as any sown in the common way, besides the saving in the seed, which in pease thus drilled is about one half. They were sown in double rows, with a space about two feet and a half wide between the outmost rows of one range and the next outmost row of another, and this space was stirred with the horse-hoe.

When any particular sorts of pease are intended for feed, they should be carefully looked over whilst in flower, in order to draw out all such plants as are not of the right sort; for there will always be, in every sort, some rogues plants, as the gardeners term them, which, if left to mix, will degenerate the kind. As many rows as may be thought sufficient to furnish the desired quantity of seed should then be marked out, and left till their pods turn brown, and begin to split, when they should immediately be gathered up, with the haulm; and if the husbandman has not room to stack them till winter, they may be threshed out as soon as they are dry, and put up in sacks for use: but particular care should be taken not to let these remain too long abroad after they are ripe; because wet would rot them; and heat, after a shower of rain, would make their pods burst in such a manner that the greater part of their seeds would be lost.

When the pease are reaped, or hacked, as they call it in some parts of England, they are laid up in small wads, and left in the field till the haulm and pods are dry: but during this time they should be frequently turned, and raised as much as possible from the earth, that they may lie hollow for the wind to dry them, especially when any rain happens to wet and beat them down. In Leicestershire they set all their pease abroad in stacks, being persuaded that they thence acquire a much better colour than when housed in a barn.

An ingenious farmer has obliged the public with the following method of preparing pease for hog-meat; and which we shall here give in his own words:

"A few years ago, says he, I had a plentiful crop of pease on a ten acre piece, which lies near my house: when they were full podded and nearly ripe, I had them hooked in the usual manner; but before I could get them in, there came a heavy shower of rain, which wetted them through and through; and the dull heavy weather, with frequent showers which followed, prevented their drying for a considerable time.

"I caused the wads to be from time to time turned, to prevent the haulm from rotting; and at length a few days

sunshine dried them enough to be inned; for as they lay hollow, the wind was greatly assistant to the operation.

"Before I got them in, on examining some of the pods, I found that the pease were all sprouted to a considerable length: this was what I had expected, as I gave my crop over for lost, till after a little recollection, as the weather still continued fine, I determined to thresh them in the field.

"This was accordingly done; and the crop, after it was cast and riddled, to separate it from the rubbish, was dried on my malt-kiln.

"When this operation was over, I began to reflect in what manner I should dispose of my pease, being sensible that they could not be proper for seed, and standing no chance of disposing of them to any advantage in the market.

"At length, as it was then a time of war, and of course there was a great demand for pork for the use of the navy, I determined to buy a considerable number of lean hogs, that I might by their means consume this crop on my own premises, and in that manner make the most of it.

"My expectations were more than answered; for I found, by repeated experience, that three bushels of the pease I have mentioned went nearly as far in fattening the hogs I bought, as four bushels got in dry and hard in the manner usually practised.

"This discovery I made several years ago, and it has turned out to my advantage; for since that time I have been quite indifferent as to the weather in which my pease are hooked, being rather better pleased, as far as relates to them, with wet, than dry weather: but if the weather happens to be dry at the time they are ripe. I always use as many as I want for feeding my hogs, which are not a few in a year, to be regularly malted in the same manner, nearly as my barley: this management has of late succeeded very well with me, and I therefore intend to continue it.

"Besides feeding my hogs with these malted pease, I have besides often given them to my horses, with which they agree very well, and are heartening food.

"Turkeys will fatten apace on them also, and be fine meat.

"I have applied my malted pease to many other uses, which I have not, at present, time to enumerate: but were they only used for feeding hogs and horses, it is still worth while to prepare some in this manner every year. Pease should be never ground when given to fatten hogs."

Museum Rusticum, vol. I. page 109.

PEASE-BOLT, pease-haulm.

PEAT, a species of earth used in many countries for firing.

Under the article ASHES we have given some account of the uses of those made from peat; and shall here add the observations of a very intelligent husbandman, with regard to the value of those ashes, and the several crops to which they may be profitably employed as a manure.

"The more general, says he, a manure is in its uses, of so much the more value is it to the farmer; and, of all sorts of manures, perhaps ashes agree with the greatest variety of soils and crops: ashes, therefore, should, one would imagine, be had in universal request, for the purpose of dressing land; but the misfortune is, no great plenty can be procured, and the few that are to be got fetch a large price: this deters the farmer from making use of them often as manure.

"I must, however, except one sort of ashes which are on all accounts valuable; I mean peat, or turf-ashes: these are in most places easy to be procured, cost no great matter, and have a wonderful effect on almost every soil and crop. You may believe what I say, as I have had many years experience of their good qualities.

"The sulphureous and saline particles with which these ashes abound, have a most happy effect in promoting vegetation; and if used with discretion, the increase procured by them is truly wonderful.

"I suppose few of your readers will be at a loss to know what peat or turf is, most people having seen a kind of it burnt as fuel.

"The ordinary peat is dug from wet bogs and morasses; but that which is of much superior quality and virtue in its ashes, is dug from moory wetish lands, which will bear cattle: as to the peat that is pared from the surface of heaths and commons, for firing for the poor cottagers, the

ashes

ashes of it are of very little value, when compared with those above-mentioned.

"Peat is found in most low grounds that lie betwixt hills, especially if timber has formerly stood upon the spot. It lies in various depths, being often near the surface, and sometimes six, eight, or ten feet deep, having a stratum of black moory earth over it, such as the soil of many of our low meadows near the banks of rivers: it sometimes even lies under a bed of gravel.

"Peat may be burnt for the sake of procuring its ashes for manure, all the summer season: as soon as it is dug, some of it is mixed in a heap regularly disposed with faggot wood, or other ready burning fuel: after a layer or two of it is mixed in this manner, peat alone is piled up to complete the heap. A heap will consist of from four hundred to a thousand loads.

"After setting fire to it at a proper place, before on purpose prepared, it is watched in the burning, and the great art to is to keep in as much of the smoke as possible, provided that as much vent is left as will nourish and feed the fire.

"Whenever a crack appears, out of which the smoke escapes, the labourer in that place lays on more peat; and if the fire slackens too much within, which may easily be known by the heat on the outside, the workman must run a strong pole into the heap in as many places as is necessary to supply it with a quantity of fresh air. When managed in this manner, the work goes on as it should do. It is to be noticed, that when once the fire is well kindled, the heaviest rain does it no harm whilst it is burning.

"Having procured a sufficient quantity of ashes, the farmer's next care should be to apply them properly to use; and to do this, he must be well acquainted with the nature of the manure he is to lay on his land.

"All ashes are of a hot, fiery, caustic nature; they must therefore be used with caution. With respect to peat-ashes, almost the only danger proceeds from laying them on in too great quantities at improper seasons.

"Nothing can be better than peat-ashes for dressing low damp meadows, laying to the quantity of from fifteen to twenty Winchester bushels on an acre: it is best to sow them by hand, as they will then be more regularly spread.

"This work should be done in January or February at latest, that the ashes may be washed in towards the roots of the grass by the first rains that fall in the spring.

"If they were spread more forward in the year, and a speedy rain should not succeed, being hot in their nature, they would be apt to burn up the grass, instead of doing it any service.

"It is to be remembered, that the damper and stiffer the soil, the more peat-ashes should be laid on it; but in grass lands the quantity should never exceed thirty Winchester bushels, and on light warm lands less than half that quantity is fully sufficient.

"On wheat crops these ashes are of the greatest service, but they must be laid on with the utmost discretion. Were they to be spread in any quantity before the winter, after the sowing the corn, they would make the wheat too rank, and do more harm than good: was the spreading this manure, on the contrary, deferred till the spring, the corn could not possibly during the winter season be benefited by it. After due reflection and repeated experience, my method of management in this case is as follows:

"About the beginning of November, before the hard frosts set in, I sow on every acre of my heavy clayey wheat land about eight Winchester bushels of these ashes; on my lighter warmer lands in wheat, I sow only four bushels at this season.

"The winter dressing is, I imagine, of great service: trifling as the quantity may seem, it warms the roots of the plants, brings it moderately forward, preserves its verdure, and disposes it to get into a growing state the first fine weather after Christmas.

"About the latter end of February, or the beginning of March, on the above-mentioned heavy lands in wheat, I bestow another dressing of ashes, by sowing of them on every acre eight bushels more; on light lands, in this second dressing, I allow only six bushels.

"These ashes laid on in the spring are of the greatest service, without any probability of danger; if rain falls within a few days after the dressing is laid on, it is washed

in, and has a happy effect on the succeeding crop, co-operating with the manure that was laid on in November; if, on the contrary, dry weather for a long continuance succeeds, the first winter-dressing has its full effect, and the quantity laid on in the spring is in fact so small, that there is very little probability of its burning or hurting the crop.

"This method has succeeded very well with me, and I have no reason to think it can fail with any one else.

"This excellent manure is, I find, of great use in the turnep-husbandry on many accounts, particularly as it much contributes to preserve the young crop from being devoured by the fly.

"When I sow my turneps, before I harrow in the seed, I have eight bushels of these ashes strewed by hand on every acre; and when the plants shew their first leaves above ground, I sow on every acre four bushels more: by this management my crops seldom fail, when at the same time some of my neighbours sow their turnep-land three or four times over.

"But one of the principal advantages derived from these ashes I have not yet mentioned, which is the very great service they are of to every kind of artificial pasture.

"Saintfoine receives great benefit from this manure, and so does clover, ray-grass, and trefoil, provided it is laid on with discretion: the proper season is about the month of February: the quantity must be regulated by the nature of the crop and soil; but in my opinion, it ought scarcely in any instance to exceed thirty Winchester bushels. Clover, with the help of this manure, grows with great luxuriance, inasmuch that I have often had two large crops of hay from the same field in a year, and good autumn feed afterwards.

"But the effect of it is most seen in tares or vetches, and on them it is I bestow most of this manure, as they will bear it, being a very succulent plant. I had last summer a crop of tare-hay that was astonishing, by the help of these ashes, being above three large loads on an acre. The field contained six acres; it was a dryish loam, and not very rich. In the beginning of February I caused ten bushels, Winchester measure, to be strewed on each acre: immediately after the first rains had washed them in, the same quantity was in like manner spread, and about the middle of March I bestowed on each acre six bushels more for the last dressing. I am fond of dividing my entire quantities, thinking my crops are thereby less exposed to the danger of being burned, and the manure is besides more gradual and lasting in its effects.

"My tares came on amazingly; but they ran chiefly to haulm, which was what I wished, not having any desire of saving the seed, but intending to make the crop in hay: my only fear was, that it would rot on the ground before it was in a proper condition to cut; but this I luckily escaped, by the soil being tolerably dry, and by the fineness of the weather. It was so heavy in the swarth, that I was obliged to pay an extraordinary price for mowing it.

"I have observed above, that I was fearful my tares would have rotted on the ground before they were fit to cut; this was owing entirely to the invigorating quality of the ashes, which by their salts, &c. promoted the growth of the plants even to luxuriance.

"Before I well knew the great fertilizing quality of these ashes, I lost, by improper management, a fine three acre piece of hog-pease. I laid on this field, soon after the pease came up, threescore Winchester bushels of these ashes at one dressing: this brought them forward a great pace, but at harvest I found, to my grief, I had scarcely any corn, for I had overdone it in laying on so much, and the pease were run all to haulm.

"Ever since this accident I have declined using them as a common dressing for my pease; and this I have been the more induced to do, as, in several little experiments I have since made, I have found it extremely difficult to appportion the several quantities which ought to be laid on various soils when sown with pease; for the quantity that has one year succeeded very well with me, has, the next, owing to the difference of seasons, on the same soil, in another part of the same field, totally disappointed me; so that, for pease, I esteem it a very critical manure, therefore very cautiously to be used.

"The effects of this manure will be visible at least three

three years, and it does not, like some others, leave the land in an impoverished state, when its virtues are exhausted and spent.

"Peat-ashes are not so certain a manure for barley and oats as for the winter corn: for as these are quick growers, and occupy the land but a few months, this warm manure is often apt to push them forward too fast, and make them run too much to coarse straw, yielding only a lean immature grain. Oats, however, are not so apt to be damaged by it as barley.

"To get a good crop of barley, I often sow it after turneps, which have two light dressings of ashes, in the manner above described.

"When the turneps are fed off, or drawn, I give the field, if the season permits, a good ploughing; if they were fed off, the land will want no more ashes; but if they were drawn, and either carried into another ground to feed sheep, or given to my stall-fed oxen, I strew on each acre, after this ploughing, five Winchester bushels of ashes, leaving them to be washed in by the first rain. In this manner I let the land lie till I give it the second and last ploughing before it is sown. The manure has by this management the desired effect, and the barley generally produces full and heavy ears.

"When I sow my barley after turneps, I give the land only two ploughings, because the soil was before much loosened by the hoeings bestowed on the turneps; but in other cases I am fond of allowing three, and sometimes four ploughings, to my lands destined for barley; and I generally find it answer very well; for many years experience has convinced me, that upon a fine tilth barley always thrives best, and yields most: in fact, the crop is almost always governed by the condition of the land, and a well-tilled soil is less exposed to danger in an untoward season.

"Peat-ashes approach, in their effects on the several crops on which they are laid, to coal-foot; but two-thirds of the quantity that is used of foot, will be sufficient of the ashes, as they are, in a much stronger degree, impregnated with a vegetative power; and they are, besides, in most places easier procured in quantities, and at a cheaper rate.

"It may possibly be objected, that this manure requires great nicety in the application. I allow it does; yet every intelligent farmer, who knows the nature and qualities of the soils of his several fields, will soon be able, with great precision, to judge how much he ought to lay on each acre: his chief care at first should be not to overdo it; for therein consists the principal danger; though, after all, these ashes will, at the worst, unless laid on in very great excess indeed, only occasion the inexperienced farmer the perhaps partial loss of a single crop; for the succeeding year they will, in all probability, have a very salutary effect on the land, and sometimes even repay the preceding loss.

"When the error is in the excess, it is very easy for a farmer to avoid falling into it: for, independent of every other consideration, the sole view of lessening his expences will, it is imagined, sufficiently induce him to be attentive to this particular.

"When peat is burnt for the sake of its ashes in summer time, it is necessary that some care should be taken to defend them from the too powerful influence of the sun, air, dews, rains, &c. or great part of their virtue would be exhaled and exhausted. If the quantity of ashes procured is not very great, they may be easily put under cover in a barn, cart-lodge, or hovel; but large quantities must necessarily, to avoid expence, be kept abroad; and when this is the case, they should be ordered as follows:

"A dry spot of ground must be chosen; and on this the ashes are to be laid in a large heap, as near as possible in the form of a cone standing on its base, the top as sharp pointed as possible: when this is done, let the whole be covered thinly over with a coat of soil, to defend the heap from the weather: the circumjacent earth, provided it is not too light and crumbly, will always serve for this purpose.

"When thus guarded, the heap may very safely be left till January or February, when it is in general the season for spreading it: but, before it is used, it is always best to sift the ashes, that the cinders, stones, and half-burnt turf, may be separated from them.

"This may, perchance, by many be esteemed an un-

necessary trouble; but experience, which is the best guide, has convinced me, that by this means I can better ascertain the quantity that ought to be sown on the several sorts of land; for the small powdered ashes, being equal in quality, are of course equal in its effect: whereas, when there has been any other mixture with them, the effect has often been greater or less than I could have wished. Thus, when I mention the number of bushels I strew on an acre, it is always to be understood of sifted ashes: should any farmer be inclined to try them rough as they are first produced after burning, the quantity to be allowed for an acre must be more in proportion to the mixture of other matter that is in them.

"These peat-ashes are almost, as I have already observed, a general manure suited to every soil. On cold clay they warm the too compact particles, dispose it to ferment, crumble, and of course fertilize; and, in fine not only assist it in disclosing and dispensing its great vegetative powers, but also bring to its aid a considerable proportion of ready prepared aliment for plants.

"On light lands these ashes have a different effect: here the pores are too large to be affected, or farther separated by the salts or sulphur contained in them; but, being closely attached to the surfaces of the large particles, of which this earth is generally composed, this manure disposes them, by means of its salts, to attract the moisture contained in the air: by this operation, the plants which grow on these porous soils, are prevented from being scorched up and burnt; and if they want, which they generally do, more nourishment than the land is of itself capable of affording, this is readily and abundantly supplied by this useful manure.

"In large farms it is very usual to see all the home-fields rich and well mended by the yard-dung, &c. whereas the more distant lands are generally poor, impoverished, and out of heart, for want of proper manure being applied in time.

"Whilst the farmers depend almost entirely on their yard-dung, this cannot fail being the case; for dung is of very heavy carriage: they are willing, therefore, to drop it as near home as possible, being in this way able to do a great deal more work in the same space of time: but would they once try the virtue of peat-ashes, all their lands might be alike improved, though at a very considerable distance from the home-stall; for so few of them are required, and they are so light of carriage, that a single tumbrel will hold as many as ought, in most cases, to be laid on two acres of land; by which means, when these ashes are used as a dressing for the distant fields, it costs the farmer less in carriage than does that of the stable-dung for the home-fields." *Museum Rusticum*, vol. I. p. 222.

PENNY-earth, a term used by the farmers for a hard, loamy, or sandy earth, with a very large quantity of sea shells intermixed in it; some of which being round and flat, and in some measure resembling pieces of money, have occasioned the earth's being called by this name. It is an earth not easily dug, but is usually undermined with pick-axes, and then falls in large lumps; which, with the frosts, break to pieces, and leaves the shells loose. It is prepared by breaking and mixing well with water, and then makes very desirable floors. The Jersey combers comb-pots, are also made of it, and the sides and roofs of ovens are plastered with it; and being rightly managed, it combines into a floor almost as strong as plaster of Paris. *Moreton's Northamptonshire*

PEKRY, the name of a very pleasant and wholesome liquor extracted from pears, in the same manner as cyder is from apples. See the articles **CYDER**, **APPLE**, **PEAR**, and **ORCHARD**.

The best pears for perry, or at least the sorts which have been hitherto deemed the fittest for making this liquor, are so excessively tart and harsh, that no mortal can think of eating them as fruit: for even hungry swine will not eat them; nay, hardly so much as smell to them. Of these the Bosbury pear, the Bateland pear, and the horse pear, are the most esteemed for perry in Worcestershire, and the squash pear, as it is called, in Gloucestershire; in both which counties, as well as in some of the adjacent parts, they are planted in the hedge-rows and most common fields.

There is this advantage attending pear-trees, that they will thrive on land where apples will not so much as live, and that some of them grow to such a size, that a single pear-tree, particularly of the Bosbury and the squash kind, has frequently been known to yield, in one season, from one

to four hogheads of perry. The Bosbury pear is thought to yield the most lasting and most vinous liquor. The John pear, the Harpary pear, the Drake pear, the Mary pear, the Lullum pear, and several others of the hardest kinds, are esteemed the best for perry, but the redder or more tawney they are, the more they are preferred. Pears as well as apples, should be full ripe before they are ground.

Dr. Beale, in his general advertisements concerning cyder, subjoined to Mr. Evelyn's Pomona, disapproves of Palladius's saying, that perry will keep during the winter, but that it turns sour as soon as the weather begins to be warm; and gives, as his reasons for being of a contrary opinion, that he had himself tasted, at the end of summer, a very brisk, lively, and vinous liquor, made of horse-pears; that he had often tried the juice of the Bosbury pear, and found it both pleasanter and richer the second year, and still more so the third, though kept only in common hogheads, and in but indifferent cellars, without being bottled; and that a very honest, worthy, and ingenious gentleman in his neighbourhood assured him, as of his own experience, that it will keep a great while, and grow much the stronger for keeping, if put into a good cellar, and managed with due care. He imputes Palladius's error to his possibly speaking of common eatable pears, and to the perry's having been made in a very hot country: but he would have ascribed it to a more real cause, perhaps, had he pointed out the want of a thorough regular fermentation, to which it appears plainly that the ancients were entire strangers; for all their vinous liquors were medicated by boiling, before they were laid up in order to be kept. See the article CYDER.

PHEASANT, a bird so nearly allied to our common poultry, that it would naturally appear a very easy thing to breed them up from young; but the proper food of them is not sufficiently enquired into. Though they eat corn when full grown and in health, yet they have recourse in their young state, and when sick, to another sort of food, preying on several insects, and that in a very voracious manner.

The young pheasants and partridges prey upon ants; and they will never succeed with us, if they have not a proper quantity of ants to have recourse to, as soon as they leave their roost in a morning. When musty corn, or want of due care in cleaning their houses, has made them sick, a repast of ants will often recover them. When that fails, they may be offered millepedes or earwigs, or both together, which will always do much better than either singly. To this medicine must be added a proper care that their common food of corn be very sweet, their habitation kept nicely clean, and their water shifted twice a day. They must not be let out of the house in a morning till the dew is off the ground; and after the sun-set they must be immediately taken in again: in the heat of the day they must be allowed to bask in the sun in a dry sandy place. With these regulations the birds of this kind will succeed much better than they usually do. The pheasant is a bird of a fullen disposition, and, when the coupling time is over, there are seldom found more than one in a place. *Philos. Trans.* No 23.

PHYSIC for Horses. For a purging ball: Take Barbadoes aloes ten drachms and a half; diagyridium and ginger (in powder), each a drachm; jalap and Castile soap, of each a drachm and a half; syrup of blackthorn, sufficient to make a ball. These balls may be encreased or decreased in their purgative qualities, so as to be selected by the judgment of the reader. The ball being given early in the morning, let it be washed down with a quart of water slightly warm; give him a little sweet hay, and about three hours after give a warm mash of scalded bran, containing one fourth of oats, and let it be repeated twice in the course of the day, and on the following morning, about which time the physic may be expected to begin its operation. So soon as the physic begins to operate, assist the work by frequent applications of warm water, and do not omit letting him be walked out about half an hour at least (well clothed). Frequent supplies of warm water must be given, and two other mashes at their proper times, by no means omitting to take him out, and walk him gently twice or thrice in the course of the day.

Bartlet recommends a cooling purging drink, which is cooling, easy, and quick in its operation, and greatly preferable, in all inflammatory cases, to any other purge, as it passes into the blood, and operates also by urine.

"Take fenna, two ounces; infuse in a pint of boiling

water, two hours, with three drachms of salt of tartar; pour off and dissolve in it four ounces of Glauber salts, and two or three drachms of cream of tartar."

In inflammatory cases, or when the horse causes the ball to regurgitate, and it cannot be easily or properly passed, this drink may be admitted with propriety.

PIGEON. A domestic bird, very well known: I shall chiefly mention those that are bred in pigeon or dove-houses; some there are, for want of the conveniency of such houses, that are bred in coops and dove-cotes; in general we reckon but two sorts of pigeons, the wild and the tame; the tame rough-footed ones differ not much from the wild, only they are somewhat bigger, and more familiar: the wild usually perch upon trees, being seldom seen on the ground, and are very good food.

By wild pigeons, are meant those that breed in woods, sea-rocks, &c. and by the tame, such as are bred in dove-houses.

There are indeed many sorts of pigeons, such as carriers, croppers, powters, horsemen, runts, jacobins, turbits, helmets, nuns, tumblers, barbs, petits, owls, spots, trumpeters, shakers, turners, finikins, &c. from which proceed, when they are contrarily matched together, bastard-bred pigeons, such as are called from the cropper or powder, and the carrier, powting horsemen; from the tumbler and the horseman, dragoons: of the generality of these I shall say but little, they being only kept for fancy, and not for the profit of the table, though the same method is to be used in breeding them.

There are different sorts of runts, one called Spanish runts, generally of a blood-red or mottled colour: they are very loose feathered, and large bodied, but breed not so often as the smaller sorts.

Horsemen are excellent breeders, and are not easily took; the common English runt is a good sized pigeon, and breeds well.

The pigeon called the Leghorn, is a sort of runt, only distinguished by a little wattle over his nostril: he is a full bodied pigeon, whose feathers lie close to his body, and is an excellent breeder, and generally of a grizzled colour, ermined round the neck.

To those who keep pigeons for the sake of good breeding, I would recommend bastard-bred pigeons, such as powting-horsemen, powting dragoons, from a powder or cropper, and a Leghorn; the reason is, such pigeons will breed nine or ten pair of young ones in a year; for the little puff of wind thrown in from the powder, gives them a heat and mirth; they will continually be playing or courting, and when they have young ones, will feed them well, which a cropper, by reason of the bigness of his crop, seldom doth.

Carriers breed but slowly; three or four pair a year for them is much, by reason of their cold nature: they are constant lovers, and very rarely tread any but their own mate, and therefore hard to match when separate; they will often take three months time.

On the contrary, a powder will tread any hen that will let him, at any time; and take him from his own mate, and he will match to another in a day or two; for that reason bastard-bred pigeons are most serviceable for those who breed them to supply the table.

Great care must be taken to make convenient places to breed in; each pair of pigeons must be sure to have two nests, with baskets in them is best, for before one pair can go out of the nest, or feed themselves, the old ones will lay, and be sitting: nay, I have often seen a second pair. Be sure when you take the young ones, clean out the nest, or put in a clean basket, for cleanliness is a great help.

Never let them want meat; for if you do, they cannot be provided with soft meat in their crop when the young hatch, which if wanting, the young ones certainly die: or if you feed the old ones by hand, they will go feed their young immediately with what they get, which they not being able to digest, kills them; so that the best way is to let them have meat always by them in a box, with a hopper in it made for that purpose.

Breed young ones for stock in the spring, those bred in the winter being generally crampy, and never prove good breeders.

The reason why I recommend baskets to breed in, is, tame pigeons seldom build their nests, the want of which a basket supplies. Be sure take care no vermin come among them.

Of those bred in pigeon-houses, the grey pigeon, inclining to ash colour and black, is best; and she generally shows her fruitfulness by the redness of her eyes and feet, and by the ring of gold colour which is about her neck.

There are two seasons in the year wherein you may stock your pigeon-house; the first is May; for as these pigeons having much strengthened themselves during the winter, they are in a condition soon to yield profit to the buyer. Secondly, in August there are a great number of young pigeons that have been well fed with the corn which their dams, both cocks and hens, have plentifully supplied them with, from the harvest in that season.

You must take care to furnish your pigeon-house according to the bigness of it; if you put but a few in it, it will be a great while before you will have the pleasure of eating young pigeons, for you must take none out of the pigeon-house before it is well stocked.

Be sure to feed them in hard weather, and in bending time, which is when the corn is in the ear, and keep out the vermin, and you will never want stock.

It is good to give them loam, mixed with salt and cummin-seed, mixed well, made up in lumps and dried; it provokes lust, and helps them in breeding.

Be sure never to let them want fresh water. The mornings and evenings are proper times to give them their meat, and never at noon, for fear of breaking their rest, which they usually take at that hour, which roost is very necessary to make them thrive with the food which they eat.

To hinder pigeons from quitting the pigeon-house, take the head and feet of a goat, and boil them together till the flesh separates from the bone: take this flesh and boil it again in the same liquor, till the whole is consumed; bruise into this decoction, which is very thick, some potter's earth, (out of which you are to take all the stones,) vetch, dung, hemp, food, and corn; the whole must be kneaded together and reduced to a paste, or dough, which form into small loaves about the thickness of two fists, and dry them in the sun or oven, and take care it do not burn; when they are baked, lay them in several parts of the pigeon-house, and as soon as they are set there, the pigeons will amuse themselves with pecking them and finding some taste there which pleases them; they will keep so close to it that they will not afterwards leave it but with regret. Others take a handful of salt, which they candy, and afterwards put into the pigeon-house. Some take a goat's head and boil it in water with salt, cummin, hemp, and urine, and then expose it in the pigeon-house, with which they amuse the pigeons. Lastly, there are those who fry millet in honey, adding a little water to prevent it's burning; this preparation is a repast to them, and will cause them to have such an affection for their ordinary habitation, that so far from abandoning it themselves, they will draw strange pigeons to it.

Pigeons will live eight years, but they are only prolific for the first four years; afterwards they are worth nothing, for when they are once past that age, all they do is, to deprive you of the profit you might reap by others that are younger. It is something difficult to know how to distinguish their age.

If you would furnish your table with young ones in the winter, and feed daintily, you must not tarry for them till they can fly, but take them when they are grown pretty strong; pluck the largest quills out of their wings, which will confine them to their nests; others tie their feet, or else break the bones of their legs, by which means they will be fat in a very short time, because the substance of the nourishment they receive being then not so much dispersed, turns into fat.

There are several species of tame pigeons; viz.

Runts, the largest kind of pigeons, called by the Italians, *troufo*; but these may again be distinguished into greater or smaller: those which are commonly called the Spanish runts are much esteemed, being the largest sort of pigeon, but are sluggish, and more slow of flight than the smaller sort of runts: but the smaller runts are better breeders, and quicker of flight, for which they are esteemed. As for the colours of their feathers, they are uncertain, so that a judgment cannot be made of the sort by them.

The next which makes the largest figure, but is not in reality the largest bird, is the cropper, so called, because they usually do, by attracting the air, blow up their crops to an extraordinary bigness, even so as to be sometimes as large as their bodies. This sort is the most valued, according as it can swell up its crop to the larger size.

The bodies of this sort are about the bigness of the smaller runt, but are somewhat more slender; this sort also is of various colours in the feathers.

The shakers; these are of two sorts, viz. the broad-tailed shaker, and the narrow-tailed shaker: these are so called, because they are almost constantly wagging their heads and necks up and down; the broad are distinguished from the narrow in that the broad-tailed sort abounds with tail feathers about twenty-six in number; but the narrow-tailed shakers have not so many.

These, when they walk, carry their tail-feathers and crest spread abroad like a turkey-cock: they have likewise a diversity of feathers.

The jacobines, or cappers, which are so called on account of certain feathers which turn up about the back part of the head: some of this sort are rough footed; they are short billed, the iris of their eye of a pearl colour, and the head is commonly white.

The turbit, which some suppose to be a corruption of the word *corbeck*, or *curtbeke*, as they are called by the Dutch, which seems to be derived of the French, *court-beck*, and signifies a short bill, for which this pigeon is remarkable; for the head is flat, and the feathers on the breast spread both ways; these are much of the same size with the jacobines.

The carriers are pigeons so called from the use which is sometimes made of them in carrying of letters to and fro: certain it is that they are very nimble messengers, for some authors affirm that it has been found by experience, that one of these pigeons will fly three miles a minute, or from St. Alban's to London in seven minutes; this has been tried by experiments.

We have an account of their passing and repassing with advices between Hirtius and Brutus, at the siege of Modena, who had, by laying meat for them in some high places, used their pigeons to fly from place to place for their meat, they having before kept them hungry, and in a dark place.

These pigeons are about the size of common pigeons, and of a dark blue, or blackish colour, which is one way of distinguishing them from other sorts: they are also remarkable for having their eyes compassed about with a broad circle of naked spongy skin, and for having the upper chap of their beak covered more than half from the head, with a double crust of the like naked fungous body. The bill or beak is moderately long, and black.

These birds have this quality, that if they are carried many miles from the place where they are bred and brought up, or have themselves hatched or bred up any young ones, they will immediately return home as soon as they are let to fly.

When persons would use them for carriers, they must order them in the following manner:

Two friends must agree to keep them, the one at London, and the other at Windsor, or any other place; he that liveth at Windsor must take two or three cocks or hens which were bred at his friend's at London, and the other two or three that were bred at Windsor: when the person at London has occasion to send any advice to his friend at Windsor, he must roll up a piece of paper, and tie it gently, with a small string passed through it, about the pigeon's neck.

But here you must remember, that the pigeons you design to send with a letter, must be kept pretty much in the dark, and without meat for eight or ten hours before they are turned out, and then they will rise and turn round till they have found their way, and continue their flight till they have got home.

With two or three of these pigeons on each side, a correspondence might be carried on in a very expeditious manner, especially in matters of curiosity, &c.

The Barbary pigeon, or barb, is another sort, whose bill is like that of the turbit, short and thick, having a broad and naked circle of a spongy white substance round about the eye, like that of the carrier pigeon; the iris of the eye is white, if the feathers of the pinion are inclinable to a darker colour, but is red if the feathers are white, as is observed in other birds.

Smiters are supposed to be the same that the Dutch call *dragers*; this sort shake their wings as they fly, and rise commonly in a circular manner in their flight, the males, for the most part, rising higher than the females, and frequently falling and flapping with their wings, which makes a noise that may be heard a great way off, which often

is the cause of their breaking or shattering their quill-feathers.

These very much resemble the tumbler pigeon; the difference chiefly is, that the tumbler is somewhat smaller, and in its flight will tumble itself backward over its head; the diversity of colours in the feathers makes no difference.

The Helmet pigeon is distinguished from the others, because it has the head, the quill-feathers, and the tail-feathers, always of one colour, sometimes black, sometimes white, or red, or blue, or yellow; but the other feathers of the body are of a different colour.

The light horseman; this is supposed to be a cross strain, between a cock cropper and a hen of the carrier breed, because they seem to partake of both, as appears from the excrescence of flesh upon their bills, and the swellings of their crops; these are not inclined to leave the place of their birth, or the house that they have been used to.

The bastard-bill pigeon is something bigger than the Barbary pigeon; they have short bills, and are generally said to have red eyes, though probably those coloured eyes belong only to those that have white feathers.

There is a pigeon called the turner, which is said to have a tuft of feathers hanging backwards on the head, which parts like a horse's mane.

There is also a pigeon of the smaller sort, called the finikin, but in other respects like the former.

There is another pigeon called the spot, supposed (and with judgment), to take its name from a spot on the forehead, just above the bill, and the feather of its tail always of the same colour with the spots, and all the other feathers are white.

The Mahomet, or mawmet pigeon, supposed to be brought from Turkey, which is singular for its large black eyes, but the other parts are like those of the Barbary pigeon.

To distinguish which are the males and females among pigeons, it is chiefly known by the voice and cooing; the females having a small weak voice, and the male a loud and deep voice.

The food which is generally given to pigeons is tares, but if spurry seeds were mixed with them, or buck-wheat, those grains would forward their breeding; however, with only tares, they may be expected to breed eight or nine times a year; but perhaps they seldom hatch above one at a time, though, if they be in full vigour, they will breed a pair at one sitting.

In the feeding of pigeons, it is advisable not to let them have more meat at one time than they can eat, because they are apt to toss it about and lose a great deal of it; so that the contrivance of filling a stone bottle with their meat, and placing the mouth downwards, so that it may come within an inch of a plane or table, will give a supply as they feed.

And something of the same method should be used about their water, by the bottle being reversed with the mouth into a narrow shallow cistern; but they must by no means be without water, they being of themselves a dry bird, and subject to contract dirt and fleas.

To take Pigeons, upon new-ploughed or sown Ground.

Take a good number of small twigs, of strong wheaten straw, of a good length, bird-line them well, lay them on the ground where pigeons, &c. frequent, and they will soon be entangled with them; and in order to allure to your twigs or straws, you may tie two or three pigeons to the ground, among the twigs.

Another Way.

Cut some sheets of thick brown paper, each into about eight parts, making them up in the shape of a sugar-loaf, and line the inside of them three or four days before you intend to use them; put into each paper, near the bottom, three or four grains of corn, and lay these papers up and down the ground, as much as you can, under clods of earth, early in the morning, before the pigeons, &c. come to feed. The more papers you lay, the greater you may expect your sport. When the pigeons come to feed they will see the corn, and by thrusting in their heads to reach it, will get hood-winked by the paper sticking to their heads, which will occasion them to take wing, and fly bolt upright till they have spent themselves, when they will come tumbling down and may be easily taken.

PIGEON-HOUSE, a house erected full of holes within, for the keeping, breeding, &c. of pigeons, otherwise called a dove-cote.

Any lord of a manor may build a pigeon-house on his land, but a tenant cannot do it without the lord's licence. When persons shoot at or kill pigeons within a certain distance of the pigeon-house, they are liable to pay a forfeiture.

In order to erect a pigeon-house to advantage, it will be necessary, in the first place, to pitch upon a convenient situation, of which none is more proper than the middle of a spacious court-yard, because pigeons are naturally of a timorous disposition, and the least noise they hear frightens them. With regard to the size of the pigeon-house, it must depend entirely upon the number of birds intended to be kept; but it is better to have too large than too little: and as to its form, the round should be preferred to the square ones; because rats cannot so easily come at them in the former as in the latter. It is also much more commodious; because you may, by means of a ladder turning upon an axis, easily visit all the nests in the house, without the least difficulty: which cannot so easily be done in a square house.

In order to hinder rats from climbing up the outside of the pigeon-house, the wall should be covered with tin plates to a certain height, about a foot and a half will be sufficient; but they should project out three or four inches at the top, to prevent their clambering any higher.

The pigeon-house should be placed at no great distance from water, that the pigeons may carry it to their young ones; and their carrying it in their bill will warm it, and render it more wholesome in cold weather.

The boards that cover the pigeon-house should be well joined together, so that no rain may penetrate through it. And the whole building should be covered with hard plaister; and white-washed within and without, white being the most pleasing colour to pigeons. There must be no window, or other opening, in the pigeon house, to the eastward; these should always face the south; for pigeons are very fond of the sun, especially in winter.

The nests or covers in a pigeon-house, should consist of square holes made in the walls of a size sufficient to admit the cock and hen to stand in them. The first range of these nests should not be less than four feet from the ground, that the wall underneath being smooth, the rats may not be able to reach them. These nests should be placed in quincunx order, and not directly over one another. Nor must they be continued any higher than within three feet of the top of the wall: and the upper row should be covered with a board projecting a considerable distance from the wall, for fear the rats should find means to climb the outside of the house.

M. Duhamel thinks that pigeons neither feed upon the green corn, nor have bills strong enough to search for its seeds in the earth; but only pick up the grains that are not covered, which would infallibly become the prey of other animals, or be dried up by the sun. "From the time of the sprouting of the corn, says he, pigeons live chiefly upon the seeds of wild uncultivated plants, and therefore lessen considerably the quantity of weeds that would otherwise spring up; as will appear from a just estimate of the quantity of grain necessary to feed all the pigeons of a well-stocked dove-house." But Mr. Worlidge and Mr. Lill alledge facts in support of the contrary opinion. The latter relates, that a farmer in his neighbourhood assured him he had known an acre sowed with pease, and rain coming on so that they could not be harrowed in, every pea was fetched away in half a day's time by pigeons: and the former says, "It is to be observed, that where the flight of pigeons falls, there they fill themselves and away, and return again where they first rose, and so proceed over a whole piece of ground, if they like it. Although you cannot perceive any grain above the ground, they know how to find it. I have seen them lie so much upon a piece of about two or three acres sown with peas, that they devoured at least three parts in four, of the seed, which, I am sure, could not be all above the surface of the ground. That their smelling is their principal director, I have observed; having sown a small plat of peas in my garden, near a pigeon-house, and covered them so well that not a pea appeared above ground. In a few days, a parcel of pigeons were hard at work in discovering this hidden treasure; and in a few days more, I had not above two or three peas left out of about two quarts that were planted; for what they could not find before, they found when the birds

buds appeared, notwithstanding they were hoed in, and well covered. Their smelling alone directed them, as I supposed, because they followed the ranges exactly. The injury they do at harvest on the peas, vetches, &c. is such that we may rank them among the greatest enemies the poor husbandman meets withal; and the greater, because he may not erect a pigeon-house, whereby to have a share of his own spoils; none but the rich being allowed this privilege; and so severe a law being also made to protect these winged thieves, that a man cannot encounter them, even in defence of his own property. You have therefore no remedy against them, but to affright them away by noises, or such like. You may, indeed, shoot at them; but you must not kill them; or you may, if you can, take them in a net, cut off their tails, and let them go, by which means you will impound them: for when they are in their houses, they cannot bolt or fly out of the tops of them, but by the strength of their tails: after they are thus weakened they remain prisoners at home."

Mr. Worlidge's impounding the pigeons reminds me of a humorous story of a gentleman, who, upon a neighbouring farmer's complaining to him, that his pigeons were a great nuisance to his land, and did sad mischief to his corn, replied jokingly, Pound them, if you catch them trespassing. The farmer, improving the hint, steeped a parcel of peas in an infusion of *coccus Indicus*, or some other intoxicating drug, and strewed them upon his grounds. The pigeons swallowed them, and soon remained motionless on the field: upon which the farmer threw a net over them, inclosed them in it, and carried them to an empty barn, from whence he sent the gentleman word that he had followed his directions with regard to the pounding of his pigeons, and desired him to come and release them.

PIGGIN, a little pail or tub, with an erect handle.

PIKE, a name given in some counties to what is generally called a fork, used for carrying straw, &c. from the barn, cocking of barley, &c.

PINE, the name of a forest tree, of which there are various species, but two only that deserve cultivating; namely, the Scotch-pine, and the white pine, commonly called in England lord Weymouth's, or New England pine.

The Scotch pine, so called from its growing naturally on the mountains of Scotland, is the tree that affords the red or yellow deal, which is the most durable of any of the kind yet known. The leaves of this tree are pretty broad and short, of a greyish colour, growing two out of each sheath; the cones are small, pyramidal, and end in narrow points; they are of a light colour, and the seeds are small.

This sort grows well upon almost every soil; I have planted numbers of the trees upon peat-bogs, where they have made great progress. I have also planted them in clay, where they have succeeded far beyond expectation; and upon sand, gravel, and chalk, they likewise thrive as well; but as they do not grow near so fast upon gravel and sand, as upon moist ground, so the wood is much preferable; for those trees which have been cut down upon moist soils, where they have made the greatest progress, when they have been sawn out into boards, have not been valuable; the wood has been white, and of a loose texture; whereas, those which have grown upon dry gravelly ground, have proved nearly equal to the best foreign deals; and I doubt not but those plantations, which of late years have been made of these trees, will in the next age, not only turn greatly to the advantage of their possessors, but also become a national benefit.

The white pine is one of the tallest trees of all the species, often growing a hundred feet high, as I have been credibly informed. The bark of this tree is very smooth and delicate, especially when young; the leaves are long and slender five growing out of each sheath; the branches are pretty close, garnished with them, so make a fine appearance; the cones are long, slender, and very loose, opening with the first warmth of the spring: so that if they are not gathered in winter, the scales open and let out the seeds. The wood of this sort is esteemed for making of masts for ships; it is in England called lord Weymouth's, or New England pine, as hath been already observed. As the wood of this tree was generally thought of great service to the navy, there was a law made in the ninth year of queen Anne, for the preservation of the trees, and to encourage their growth in America: and it is within forty years past these trees began to be propagated in England in any

plenty, though there were some large trees of this sort growing in two or three places long before, particularly at the marquis's of Bath at Longleet; and Sir Wyndham Knatchbull's, in Kent; and it hath been chiefly from the seeds of the latter that the much greater number of these trees now in England have been raised; for although there has annually been some of the seeds brought from America, yet those have been few in comparison to the produce of the trees in Kent: many of the trees, which have been raised from the seeds of those trees, now produce plenty of the seeds, particularly those in the gardens of the late duke of Argyle, at Whitton, which annually produce large quantities of cones, which his grace, when living, most generously distributed to all the curious.

All the sorts of pines are propagated by seeds, which are produced in hard woody cones; the way to get the seeds out of these cones, which are close, is to lay them before a gentle fire, which will cause the cells to open, and then the seeds may be easily taken out. If the cones are kept entire, the seeds will remain good some years, so that the surest way to preserve them, is to let them remain in the cones, until the time for sowing the seeds: if the cones are kept in a warm place in summer, they will open, and emit the seeds; but if they are not exposed too much to heat, many of the sorts will remain entire some years, especially those which are close and compact; and the seeds, which have been taken out of cones of seven years old, have grown very well, so that these may be transported to any distance, provided the cones are well ripened, and properly put up.

The best time for sowing the seeds of pines, is about the end of March; when the seeds are sown, the place should be covered with nets to keep off birds; otherwise, when the plants begin to appear with the husk of the seed on their tops, the birds will pick off the heads of the plants and destroy them.

Where the quantity of seeds to be sown is not great, it will be a good way to sow them either in boxes or pots, filled with light loamy earth, which may be removed from one situation to another, according to the season of the year; but if there is a large quantity of the seeds, so as to require a good space to receive them, they should be sown on an east or north-east border, where they may be screened from the sun, whose heat is very injurious to these plants at their first appearance above ground. Those seeds which are sown in pots or boxes, should also be placed in a shady situation, but not under trees: and if they are screened from the sun with mats, at the time when the plants first come up, it will be a good method to preserve them.

When the plants appear, they must be constantly kept clean from weeds, and, in very dry seasons, if they are now and then gently refreshed with water, it will forward their growth; but this must be done with great care and caution, for if they are hastily watered it will wash the tender plants out of the ground, or lay them down flat, which often rots their shanks: and when this is too often repeated, it will have the same effect; so that unless it is judiciously performed, it will be the best way to give them none, but only screen them from the sun.

If the plants come up too close, it will be a good method to thin them gently about the beginning of July. The plants, which are drawn up, may then be planted on other beds, which should be prepared ready to receive them, for they should be immediately planted as they are drawn up, because their tender roots are soon dried and spoiled at this season of the year. This work should be done, if possible, in cloudy or rainy weather, and then the plants will draw out with better roots, and will soon put out new fibres again; but if the weather should prove clean and dry, the plants should be shaded every day from the sun with mats and now and then gently refreshed with water. In drawing up of the plants, there should be great care taken not to disturb the roots of the plants left remaining in the seed-beds, &c. so that if the ground be hard, the beds should be well watered some time before the plants are thinned, to soften and loosen the earth; and if, after the plants are drawn out, the beds are again gently watered to settle the earth to the roots of the remaining plants, it will be of great service to them; but it must be done with great care, so as not to wash out their roots, or lay down the plants. The distance which should be allowed these plants, is four or five inches row from row, and three inches in the row.

In these beds the plants may remain till the spring twelve-months after, by which time they will be fit to transplant, where

where they are to remain for good; for the younger plants are, when planted out, the better they will succeed; for although some sorts will bear transplanting at a much greater age, yet young plants planted at the same time will in a few years overtake the large ones, and soon outstrip them in their growth; and there is an advantage in planting young, by saving the expence of staking, and much watering, which large plants require. I have several times seen plantations of several sorts of pines, which were made of plants six or seven feet high, and at the same time others of one foot high planted between them, which in ten years were better trees than the old ones, and much more vigorous in their growth; but if the ground, where they are designed to remain, cannot be prepared by the time before mentioned, the plants should be planted out of the beds into a nursery, where they may remain two years, but not longer; for it will be very hazardous in removing these trees at a greater age.

The best season to transplant these pines, is about the latter end of March, or the beginning of April, just before they begin to shoot; for although the Scotch pine, and some of the most hardy sorts may be transplanted in winter, especially when they are growing in strong land, where they may be taken up with balls of earth to their roots; yet this is what I would not advise for common practice, having frequently seen it attended with bad consequences; but those which are removed in the spring rarely fail.

Where these trees are planted in exposed situations, they should be put pretty close together, that they may shelter each other, and, when they have grown a few years, part of the plants may be cut down to give room for the others to grow; but this must be gradually performed, lest by too much opening the plantation at once, the air should be let in among the remaining trees with too great violence, which will stop their growth.

Wherever large plantations are designed to be made, the best method will be to raise the plants either upon a part of the same land, or as near to the place as possible, and also upon the same sort of soil; a small piece of ground will be sufficient to raise plants enough for many acres; but, as the plants require some care in their first raising, if the neighbouring cottagers, who have many of them small inclosures adjoining to their cottages; or, where this is wanting, a small inclosure should be made them for the purpose of raising the plants, and they be furnished with the seeds, and directions for sowing them, and managing the young plants till they are fit for transplanting, the women and children may be usefully employed in this work, and the proprietors of land agreeing with them to take their plants, when raised at a certain price, it would be a great benefit to the poor, and hereby they would be engaged to have a regard for the plantations when made, and prevent their being destroyed.

The Scotch pines, as was before observed, being the hardiest of all the kinds, and the wood of it the most useful, is the sort which best deserves care. These will thrive upon the most barren sands, where scarce any thing else except heath and furze will grow; so that there are many thousand acres of such land lying convenient for water carriage, which at present is of little benefit to any body, that might, by plantations of these trees, become good estates to their proprietors, and also a national benefit; and as the legislators have taken this into their consideration, and already passed some laws for the encouraging these plantations, as also for their preservation and security, so it may be hoped that this will be undertaken by the gentlemen who are possessed of such land in all the different parts of the kingdom, with proper spirit; for although they may not expect to receive much profit from these plantations in their own time, yet their successors may, with large interest, and the pleasure which these growing trees will afford them, by beautifying the present dreary parts of the country, will in some measure recompense them for their trouble and expence, and by creating employment for the poor, lessen those rates which are now, in many parts of England, very heavy.

The expence of making these plantations is what most people are afraid of, so would not engage in it; but the greatest of the expence is that of fencing them from the cattle, &c. for the other is trifling, as there will be no necessity of preparing the ground to receive the plants and the charge of planting an acre of land with these plants, will not be more than thirty shillings where labour is dear,

exclusive of the plants, which may be valued at forty shillings more. I have planted many acres of land with these trees, which were covered with heath and furze, and have only dug holes between to put in the plants, and afterwards laid the heath or furze, which was cut upon the surface of the ground about their roots, to prevent the ground drying, and few of the plants have failed. These plants were most of them four years old from seed, nor was there any care taken to clear the ground afterwards, but the whole left to shift, and in five or six years the pines have grown so well as to overpower the heath and furze, and destroy it.

The distance which I have generally planted these plants in all large open situations, was about four feet, but always regular, avoiding planting in rows as much as possible; and in the planting great care is, not to take up the plants faster than they can be planted, so that some men have been employed in digging up the plants, while others were planting. Those who take up the plants must be looked after to see they do not tear off their roots, or wound their bark; and as fast as they are taken up, their roots should be covered to prevent their drying, and put into their new quarters as soon as possible. In planting them, care should be had to make the holes large enough for their roots, as also to loosen and break the clods of earth, and put the finest immediately about their roots, then to settle the earth gently with the foot to the roots of the plant. If these things are duly observed, and a proper season chosen for performing it, there will be very little hazard of their succeeding; but I have seen some plantations made with plants, which were brought from a great distance, and had been so closely packed up, as to cause a heat, whereby most of the plants within had their leaves changed yellow, and few of them have grown, which has discouraged others from planting, not knowing the true cause of their failure.

After the plantations are made, the only care they require for five or six years, will be to secure the plants from cattle, hares, and rabbits; for if these are admitted to them, they will make great destruction in a short time; for if the branches are gnawed by hares or rabbits, it will greatly retard the growth of the plants, if not destroy them.

In about five or six years after planting, the branches of the young trees will have met, and begin to interfere with each other, therefore they will require a little pruning; but this must be done with great caution. The lower tier of branches only should be cut off; this should be performed in September, at which time there will be no danger of the wounds bleeding too much, and the turpentine will harden over the wounds as the season grows cold, so will prevent the wet from penetrating of them. These branches should be cut off close to the stem of the plants, and care should be taken in the doing of this, not to break any of the remaining branches of the young trees. This work should be repeated every other year, at each time taking off only the lower tier of branches: for if the plants are much trimmed, it will greatly retard their growth, as it does in general that of all trees; but as these trees never put out any shoots where they are pruned, so they suffer more from amputation than those which do.

In about twelve or fourteen years these will require no more pruning, for their upper branches will kill those below, where they have not air; but soon after this, if the plants have made good progress, it may be necessary to thin them; but this should be gradually performed, beginning in the middle of the plantation first, leaving the outside close to screen those within from the cold, so by degrees coming to them at last, whereby those, which were first thinned, will have had time to get strength, so will not be in danger of suffering from the admission of cold air. When these plantations are thinned, the trees should not be dug up; but their stems cut off close to the ground, for their roots never shoot again, but decay in the earth, so there can no harm arise by leaving them, and hereby the roots of the remaining plants are not injured. The trees which are now cut, will be fit for many purposes; those which are straight, will make good putlocks for the bricklayers, and serve for scaffolding poles, so that there may be as much made by the sale of these as will defray the whole expence of the planting, and probably interest for the money into the bargain.

As the upright growth of these trees renders their wood the more valuable, they should be left pretty close together, whereby they will draw each other up, and grow very tall.

I have seen some of these trees growing, whose naked stems have been more than seventy feet high, and as straight as a walking-cane, and from one of these trees there was as many boards sawed, as laid the floor of a room near twenty feet square. If these trees are left eight feet asunder each way, it will be sufficient room for their growth; therefore, if at first thinning a fourth part of the trees are taken away, the others may stand twelve or fourteen years longer, by which time they will be of a size for making ladders, and standards for scaffolding, and many other purposes: so that from this sale, as much may be made, as to not only pay the remaining part of the expence of planting, if any should be wanting in the first, but rent for the land with interest, and the standing trees for fortunes of younger children. This may be demonstrated by figures, and there has been several examples of late years, where the profits have greatly exceeded what is here mentioned. *Miller's Gard. Dict.*

Pitch, tar, rosin, and turpentine, are all made from these trees by a very familiar process. In the spring time, when the sap is most free in running, they pare off the bark of the pine-tree, to make the sap run down into a hole which they cut at the bottom to receive it: in the way, as it runs down, it leaves a white matter like cream, but a little thicker: this is very different from all the kinds of resin and turpentine in use, and it is generally said to be used in the making of flambeaux, instead of white bees wax. The matter that is received in the hole at the bottom, is taken up with ladles, and put in a large basket; a great part of this immediately runs through, and this is the common turpentine. This is received into stone or earthen pots, and ready for sale. The thicker matter, which remains in the basket, they put into a common alembic, adding a large quantity of water; they distil this as long as any oil is seen swimming upon the water; this oil they separate from the surface in large quantities, and this is the common oil or spirit of turpentine; the remaining matter at the bottom of the still, is common yellow resin. When they have thus obtained all that they can from the sap of the tree, they cut it down, and, hewing the wood into billets, they fill a pit dug in the earth with these billets, and, setting them on fire, there runs from them, while they are burning, a black thick matter; this naturally falls to the bottom of the pit, and this is the tar. The top of the pit is covered with tiles, to keep in the heat; and there is at the bottom a little hole, at which the tar runs like oil; if this hole be made too large, it sets the whole quantity of the tar on fire; but, if small enough, runs quietly out.

The tar being thus made, is put up in barrels, and, if it be to be made into pitch, they put it into large boiling vessels, without adding any thing to it: it is then suffered to boil a while, and, being then let out, is found, when cold, to be what we call pitch. *Phil. Transf. Numb. 243.*

PIP, or PER, a disease among poultry, consisting of a white thin skin, or film, which growing under the tip of the tongue, hinders their feeding. It usually arises from their drinking puddle-water, or eating filthy meat; and is cured by pulling off the film with the fingers and rubbing the tongue with salt.

PIPE-DRAINS. See DRAINING and UNDER-DRAINING.

PISMIRE, or ANTS, are destroyed by laying human ordure on their hills, as that will drive them away or kill them if done in frosty weather. Some destroy them by firing their nests. Another manner of driving them away is by the root of wild cucumber, muske-shells burnt with storax, and beat to powder strewed over the gardens where they are, will compel them to quit their holes and prove their destruction.

Origanum, powdered, and spread among them, kills them; or cirenicum, melted in oil, will answer the same purpose: or, make a roll of wool, newly plucked from the sheep's belly, and encompass your flower-stem, five fingers in breadth.

Smear the bottom of the trees all round with tar, which will prevent their climbing; or put human ordure round the root or stem of the tree.

Mix some powder of arsenic with honey; put it into a box made of cards or pasteboards, pricked full of holes with a bodkin. Hang these boxes on the trees, and it will kill the vermin. Be careful not to make the holes too large, lest bees should likewise get in, and be poisoned.

Some persons hang a glass bottle on the tree, with a

little honey, or other sweet liquor in it, and it will draw the ants into it. If you do this you must often wash the bottle and place it there again; they are also killed by frequent watering the walks or paths.

In winter the ant-hills should be dug up, and the core taken out, that when you lay your turf down, it may lie lower than the ground. This prevents ants returning, and the rain and frost will destroy those that remain.

The dregs of oil, mixed with lupins, and rubbed over the bottom of your plants, will preserve them from pismires. To keep your sugar or spice-box from these insects you must cover it with white wool. Brimstone powdered, and steeped in water, till the water is become coloured, will drive them away.

PISSING of Blood [in horses] may proceed from divers causes, sometimes by being ridden over-hard, or laboured beyond his strength, and by carrying too heavy burdens on his body; at other times it may be by some vein broken in his body, on which blood will frequently issue out of his body; or it may proceed from some stone fretting upon his kidneys, and from several other causes.

For the cure:

Take knot-grass, shepherd's purse, bloodwort of the hedge, polypody of the wall, comfrey, and garden bloodwort, of each an handful, shred them small, and boil them in a quart of beer, to which add a little salt-leaven and foot, and give the horse.

PLANET-STRUCK, or SHREW-RUNNING, as it is called by some, is a distemper in horses, being a deprivation of feeling or motion, not stirring any of the members, but that they remain in the same form as when the beast was first seized with it.

It proceeds sometimes from choler and phlegm, superabundantly mixed together: sometimes from melancholy, blood, being a cold and dry humour which affects the hinder part of the brain; sometimes from extreme heat and cold, or raw digestion, striking into the veins suddenly; or lastly, from extreme hunger, occasioned by long fasting.

If the disease proceed from heat, it may be known by the hotness of the horse's breath, and the free fetching of his wind; but if from cold, by a stuffing and poze in his head. For the cure,

Some prescribe to hang a flint-stone over his head, or some cold iron, as an old scythe, &c. others, to give him fifteen seeds of single piony; others prescribe exercise before and after water, to mix hemp-seed in his provender, and to cause him to sweat, by giving him mistletoe of the oak, mustard-seed, seed of black poplar, cinquefoil, germander, hyssop, and St. John's wort.

PLANTATION. Mr. Marshall, in his Rural Economy of Gloucester, says, "that the plantations of the Vale consist wholly of fruit-trees. Forest-trees may be said to be here in total neglect; excepting some few ash coppices for cyder-cask hoops; a species of plantation common on the Herefordshire side of the county.

"If, however, we may judge from the coppice which has been spoken of above, and the hedge noticed aforegoing, it is highly probable, that many of the cold swells, which occur in different parts of the Vale, might be planted with great profit.

"The timber-oak is, at present, almost entirely banished from this side of the Severn; and although the opposite banks are yet sufficiently wooded, the present woods will, in all probability, be fallen, long before such as may be now raised from the acorn, will be ready for the axe.

"Unfortunately for the Cotswold hills, a spirit of planting has never been generally diffused among them. Something has been done about Guiting and Dowdeswell; and an ancestor of the marquis of Lansdown laid out and planted a new park, near his residence at Sherborne. And lord Bathurst's grounds near Cirencester are well known. But these have all been done with a view to ornament, merely. The propagation of wood for the use of estates appears not to have taken place; excepting some small ash coppices, which have been made, and still I see continue to be made, in the vallies, for hurdle stuff. Farms, in general, may be said to be totally destitute of wood. Coals are fetched 20 to 30 miles by land carriage; and faggot wood perhaps eight or ten

ten miles. Not a pole upon the farm to assist in making a handful of brushwood to kindle the fire. Straw, I am afraid, is here considered as an article of fuel: a circumstance which reflects no credit on the owners of landed estates.

"It strikes me forcibly that the corners and asperities of every estate ought to be cut off, and the angles filled up with coppice-wood: and that the more central farms ought each of them to have its skreen coppices, sufficiently extensive to admit of a plot being filled every year, for the use of the farm, and the cottagers of the township it lies in.

"In winter, the poor, on these shelterless hills, must be in a wretched state as to fuel. There are few hill countries which do not afford either wood, coals, peat, or at least turf; but here straw may be said to be the only fuel the country at present produces. Fortunately for the farmers stone walls will not readily burn.

"Few countries are so well adapted to the propagation of woodland as this. Wall is of all other the best plantation-fence; and here it is raised at an easy expence. Mark out the intended site; cleanse it by a turnep or a whole summer fallow; wall it round; dibble in acorns, beech masts, ash keys, hazlenuts, or other seeds of wood best adapted to the purpose intended; cleanse during the first three of four years, and fell at the age best suited to the ware required." See OAK, NURSERY, and ORCHARD.

PLAT-VEIN in a horse, is a vein on the inside of each fore-thigh, a little below the elbow, so called among common farriers; some call it the basilic vein.

PLEURISY, an inflammation of the lungs, &c. are disorders in horses, though they have scarce been mentioned by any writer in farriery before Mr. Gibson; who, by frequently examining the carcases of dead horses, has found them subject to the different kinds of inflammations here described.

He has often discovered matter on the pleura (or membrane which lines the chest internally) making its way into the chest; he has found in some horses the whole substance of the lungs black, and full of gangrened water; and in others abscesses of various sizes; and, in short, inflammations in every bowel. He has frequently seen the blood vessels so overloaded, that the blood has burst out of the smaller vessels, and run over their carcases in many places, while the collar-maker was fleaing off their hides, and on cutting open the larger vessels, the blood has gushed out as from a fountain, filling all the cavity of the body; an evident proof, that plentiful evacuations had been neglected. In order to distinguish these disorders from others, we shall describe the symptoms, in Mr. Gibson's own words.

"A pleurisy then, which is an inflammation of the pleura, and a peripneumony, which is an inflammation of the lungs, have symptoms very much alike; with this difference only, that in a pleurisy a horse shews great uneasiness, and shifts about from place to place; the fever, which at first is moderate, rises suddenly very high; in the beginning he often strives to lie down, but starts up again immediately, and frequently turns his head towards the affected side, which has caused many to mistake a pleuritic disorder for the gripes, this sign being common to both, though with this difference:

"In the gripes a horse frequently lies down, and rolls, and when they are violent, he will also have convulsive twitches, his eyes being turned up, and his limbs stretched out, as if he was dying; his ears and feet sometimes occasionally hot, and sometimes as cold as ice; he falls into profuse sweats, and then into cold damps, strives often to stale and dung, but with great pain and difficulty: which symptoms generally continue, till he has some relief: but in a pleurisy, a horse's ears and feet are always burning-hot, his mouth parched and dry, his pulse hard and quick; even sometimes when he is nigh dying, his fever is continued and increasing, and though in the beginning he makes many motions to lie down, yet afterwards he reins back as far as his collar will permit, and makes not the least offer to change his posture, but stands panting with short stops, and a disposition to cough, till he has relief, or drops down.

"In an inflammation of the lungs, several of the symptoms are the same, only in the beginning he is less active, and never offers to lie down during the whole time of his sickness; his fever is strong, breathing difficult, and attended with a short cough; and whereas in a pleurisy, a horse's mouth is generally parched and dry, in an inflammation of the lungs, when a horse's

mouth is open, a roapy slime will run out in abundance; he gleans also at the nose a reddish or yellowish water; which sticks like glue to the inside of his nostrils.

"In a pleurisy, a horse heaves and works violently at his flanks, with great restlessness, and for the most part his belly tucked up; but in an inflammation of the lungs, he always shews fullness, and the working of his flanks is regular, except after drinking and shifting his posture; and his ears and feet are for the most part cold, and often in damp sweats.

"The cure of both these disorders is the same. In the beginning a strong horse may lose three quarts of blood; the next day two quarts more; and if symptoms do not abate, the bleedings must be repeated, a quart at a time: for it is speedy, large, and quick repeated bleedings that are in these cases chiefly to be depended on. But if a horse has had any previous weakness, or is old, you must bleed him in less quantities, and oftener. Mr. Gibson recommends rowels, on each side the breast, and one on the belly; and a blistering ointment to be rubbed all over his brisket upon the foremost ribs.

"The diet and medicines should be both cooling, attenuating, relaxing, and diluting; and the horse should have warm mashes, and plenty of water or gruel. The following balls may be given thrice a day:

"Take of spermaceti and nitre, of each one ounce: oil of aniseed thirty drops: honey enough to make a ball.

"A pint of barley-water, in which figs and liquorice-root have been boiled, should be given after each ball; to which the juice of lemons may be added; and if the lungs are greatly oppressed with a dry short cough, two or three horns full of the decoction may be given three or four times a day, with four spoonfuls of honey and linseed oil. A strong decoction of the rattle-snake root is also much recommended in pleuritic disorders, and may be given to the quantity of two quarts a day, sweetened with honey. It remarkably attenuates the blood, and disperses the inflammation, and in some parts is deemed a specific for this complaint.

"An emollient clyster should be injected once a day, to which may be added two ounces of nitre, or cream of tartar.

"In two or three days he will probably run at the nose, and begin to feed; but should he not, and continue hot and short breathed, you must bleed him again, and give the following clyster:

"Take fenna and marshmallows, of each two ounces: fennel and bay-berries, each one ounce: boil them in five pints of water to two quarts, pour off the clear, and add four ounces of purging salts, two or three of syrup of buckthorn, and half a pint of linseed, or any common oil.

"If by these means he grows cooler, and his pain moderates, repeat the clyster the next day, unless it worked too much; then intermit a day; and when he comes to eat scalded bran and picked hay, leave off the balls, and continue only the decoction, with now and then a clyster.

"But let it be observed, that a horse seldom gets the better of these disorders, unless he has relief in a few days; for if the inflammation is not checked in that time, it usually terminates in a gangrene, or collection of matter, which for want of expectoration, soon suffocates him.

"But as pleuritic disorders are apt to leave a taint on the lungs, great care should be taken of the horse's exercise and feeding, which should be light and open for two or three weeks. Thus a quartern of bran scalded, with a spoonful of honey and flour of brimstone, may be given every day, with two or three small seeds of oats, sprinkled with chamberlye. Instead of the bran, for a change, give about a quart of barley scalded in a double infusion of hot water, that it may be softened, and the water given to drink. His exercise should be gradual, in an open air and fair weather: and when his strength is recovered, a gentle purge or two should be given; that of rhubarb, when it can be afforded, is best, or the purging drink already recommended for this purpose.

"There is also an external pleurisy, or inflammation of the

the muscles between the ribs, which when not properly treated, proves the foundation of that disorder, called the chest-founder; for if the inflammation is not dispersed in time, and the viscid blood and juices so attenuated by internal medicines, that a free circulation is obtained; such a stiffness and inactivity will remain on these parts, as will not easily be removed, and which is generally known by the name of chest-founder.

"The signs of this inflammation, or external pleurisy, are a stiffness of the body, shoulders, and fore-legs; attended sometimes with a short dry cough, and a shrinking when handled in those parts.

"Bleeding, soft pectorals, attenuants, and gentle purges, are the best internal remedies; and externally, the parts affected may be bathed with equal parts of spirit of sal ammoniac, and ointment of marshmallows, or oil of chamomile.

"These outward inflammations frequently fall into the inside of the fore-leg, and sometimes near the shoulder; forming abscesses, which terminate the disorder.

"The membrane which separates the lungs, and more particularly the diaphragm, or midriff, is often also inflamed; which is scarce to be distinguished from the pleurisy, only in this, that when the midriff is greatly inflamed, the horse will sometimes be jaw-set, and his mouth so much closed, that nothing can be got in: but the method of cure is the same." *Bartlett's Farriery* p. 51.

PLOUGH, a well-known machine for breaking up the ground.

The advantage of digging with the spade, or such other instrument, very naturally led men to the invention of the plough, a much more expeditious way of doing the same thing; that is, cutting and breaking the earth into small pieces; but in this the spade has the advantage of the common plough, as it goes deeper, and divides the earth more minutely; but the improvement of the common plough into the four-coultered one, shews that it is easy to make the plough perform this office as much better, as it usually does it worse than the spade.

The plough described by Virgil had no coulter; and at this time, the ploughs of Italy and the south of France, have none; and the ploughs in Greece, and in the eastern nations in general, are of the same kind. Neither is it indeed possible to use a coulter in such a plough; because the share does not cut the bottom of the furrow horizontally, but obliquely: in going one way it turns off the furrow to the right-hand, but in coming back it turns it off to the left; therefore if it had a coulter, it must be on the wrong side every other furrow.

It is a great mistake in those who say that Virgil's plough had two earth-boards, for it really had none at all; but the share itself always going obliquely, served instead of an earth-board; and two ears, which were the corners of a piece of wood lying under the shares, did the office of ground-wrists. This fashion of the plough continues to this day in those countries; and in Languedoc this sort of plough performs tolerably well when the ground is fine, and makes a shift to break up light land. This is the sort of land that is common in the East, and the arable land, about Rome, being never suffered to be fallow so long as to come to turf: this plough succeeds very well in such places, but it would be wholly impossible to turn up what in England we call strong land, with it.

The English ploughs are therefore different from these, as the soil is different. Our ploughs, where well made, cut off the furrow at the bottom horizontally; and therefore, it being as thick on the land side as on the furrow side, the ploughs cannot break it off, from the whole land at such a thickness, being six times greater than what the eastern ploughs have to break off, and for this purpose it must have, of necessity, a coulter to cut it off: by this means the furrow is turned perfectly whole, and no part of the turf of it is broken; and if it lie long without new turning, the grass from the edges will spread, and form a new turf on the other side, which was the bottom of the furrow before the turning, but is now become the surface of the earth, and will soon become greener with grass than it was before ploughing.

Mr. Marshall says, that the Yorkshire, the Rotherham, and the Whip-rein ploughs are totally unfit for a stiff soil:

in loose mould they make very good work; but thinks them too short and stubbed for any soil. Their shortness makes them unsteady, as they are one moment buried, and the next above ground.

If whole, strong, turfy furrows are ploughed cross ways, as is too commonly practised, the coulter cannot easily cut them; because, being loose underneath, they do not make a proper resistance or pressure against its edge, but are apt to be drawn on heaps, and turned in all directions, but without cutting.

Some of our heavy drags have long iron tines in them; and though these broken pieces of furrows, being now looser than before, require keener edges to cut them, these tines have no edges at all. Thus the clods of earth are tossed into heaps again, and the surface left bare between them, and great labour and expence is used to very little purpose: all this is owing to the one coulter.

If the soil be shallow, it may be broken up with a narrow furrow, which will the sooner be brought into tilth; but if it be a deep soil, the furrows must be proportionally enlarged, or else a great part of the good mould will be left unmoved, and so be lost. The deeper the land is, the worse it is broke by one coulter; that is, it is broke into larger furrows, and it requires such repeated labour to conquer this, that often the best land will scarcely pay the tillage.

This gives an opportunity to servants to cheat their masters. They plough such deep land with a small furrow, and shallow, to the end, that the turf and furrows may be broken the sooner, and the superficial part made fine. They pretend the plough will go deeper the next time; but this is never the case.

This sort of land must not be ploughed the second time in wet weather; for this will cause the weeds to multiply, and the earth will be formed into thick and heavy clods where trodden: and in dry weather, the resistance of the untouched earth below, and the slight pressure of the plough above, will always be reasons why the plough will enter no deeper the second time than it did the first.

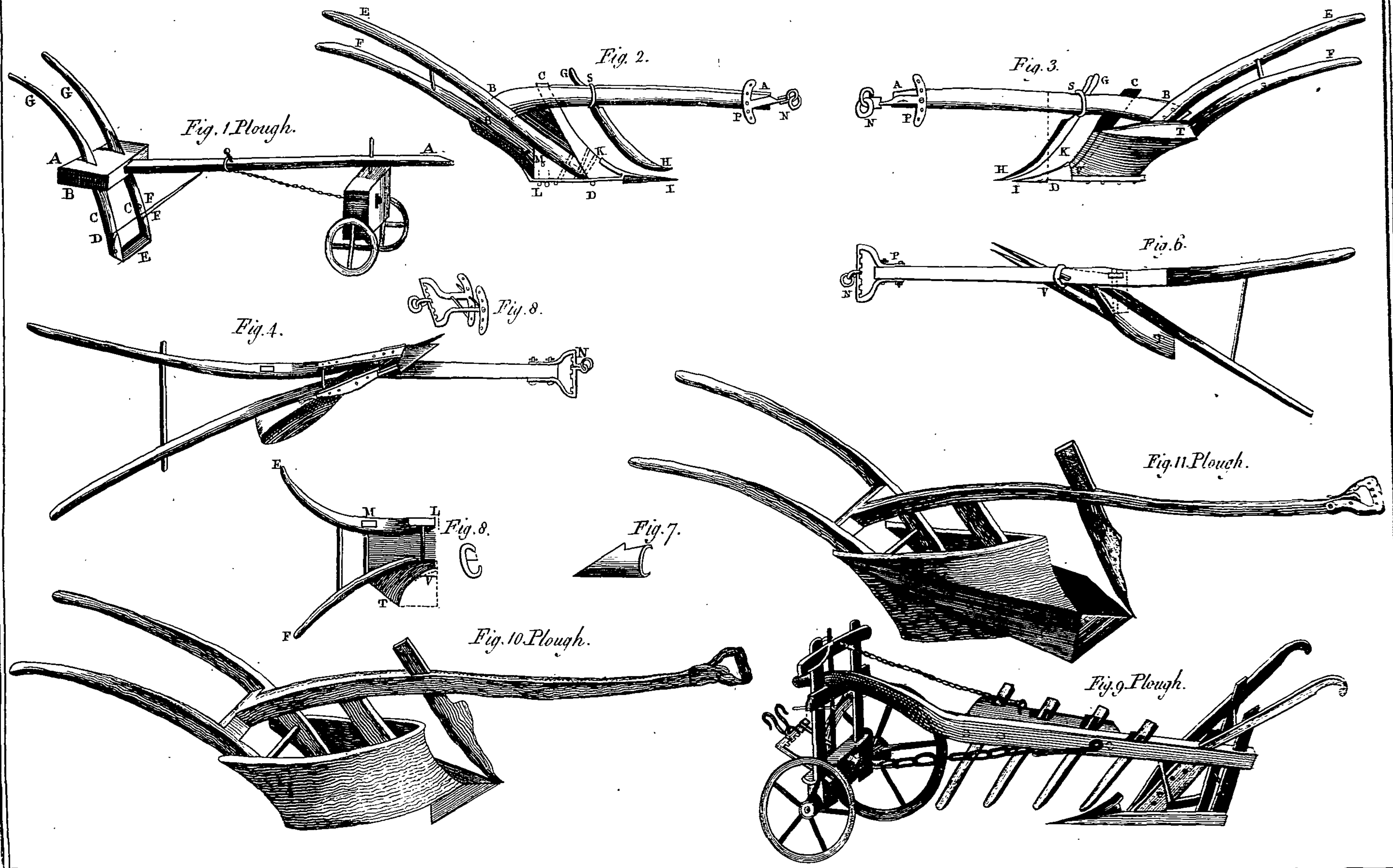
Another way to conquer strong turf, is to plough it up first with a breast-plough, very thin: and when the sward is rotten, then it is to be ploughed to the proper depth; but this method is liable to great objections; it is very troublesome and expensive, and if the turf be pared off in the winter, or early in the spring, it is a chance but the rains come on, and set it to growing faster than before: if, on the other hand, it be pared later in the year, though the turf be thoroughly killed by the succeeding dry weather, yet the time is lost, and the farmer loses the sowing season for wheat, which is the proper corn for such strong land.

Mr. Marshall, in his Minutes of Agriculture, says, that "he observed, after the fall of a great quantity of rain, that though the roads were sheets of puddle, yet in riding over some fallow grounds, which is as flat as a bowling-green, he found them still firm; which on examination he found had been plowed remarkably deep, and their firmness was owing entirely to the quantity of cultivated mould, by the deep ploughing. For had it been but half the depth of porous soil, its absorption would have been satiated, and the mould reduced to mud. This he imputes as a strong evidence in favour of deep plowing of neat soils. For though the roots of corn may strike two or three feet deep, this is no reason why six inches is insufficient to bring even wheat to perfection. He concludes with recommending deep-ploughing as universal good management."

In his Rural Economy of Yorkshire he, says, "the plough at present in universal estimation in the Vale is of the little, short, winding, mouldboard sort, which in different parts of the kingdom goes under the name of the Dutch plough, or the Yorkshire plough.

"On the construction of a ship volumes have been written, without any universally received principles being yet established. The Bermudians, who build by the eye alone, without either drawing or gauge to assist them, excel all other nations in the construction of small vessels (the almost only produce of their islands); which are remarkable as fast sailers, and notorious for lying nearer the wind than any other vessels.

"Different as the ship and the plough may be in magnitude and general appearance, there is some similarity in the principles of their construction; and the difficulty of fixing those



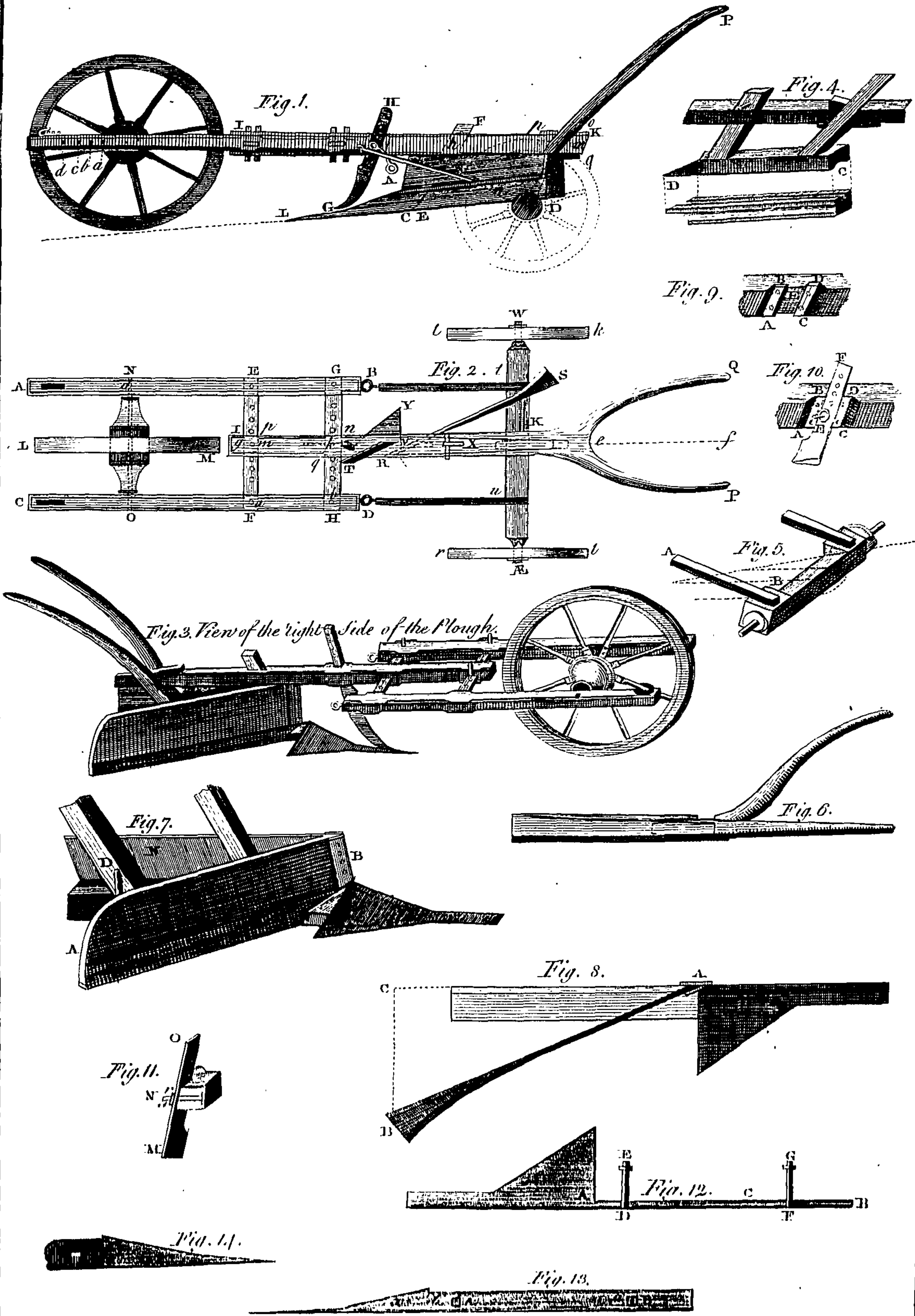


Fig. 3. View of the right Side of the Plough.

Fig. 11.

Fig. 8.

Fig. 14.

Fig. 12.

Fig. 13.

Scale of Feet for Fig. 13.

Scale of Feet for Fig. 8, 12, 13, & 14.

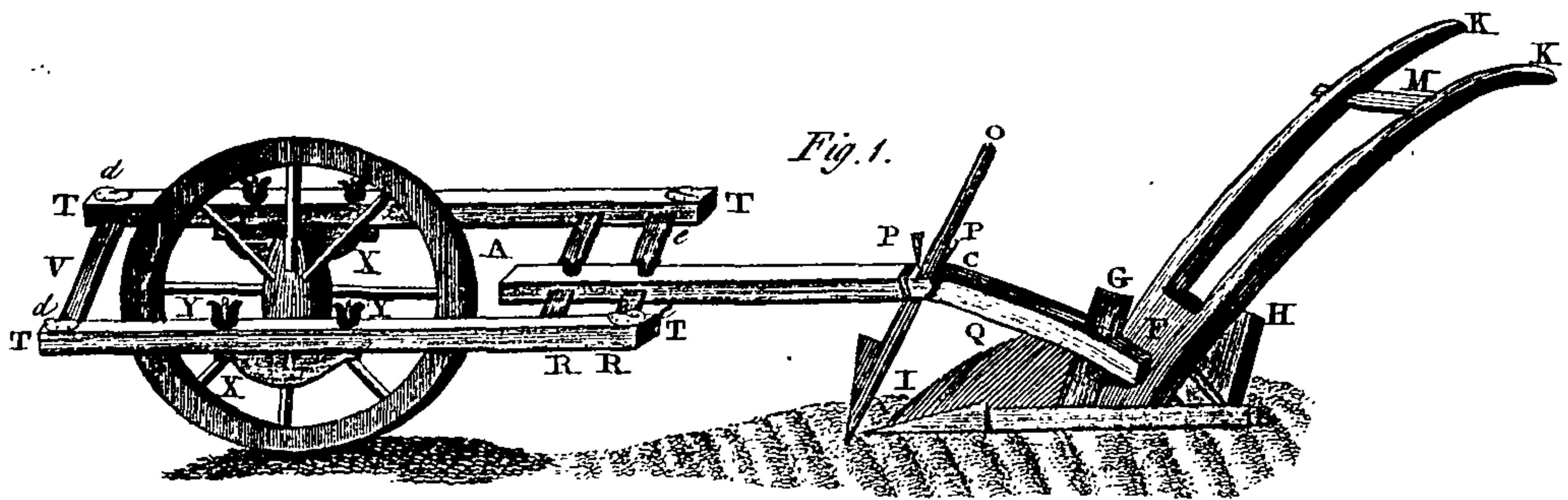


Fig. 1.



Fig. 3.

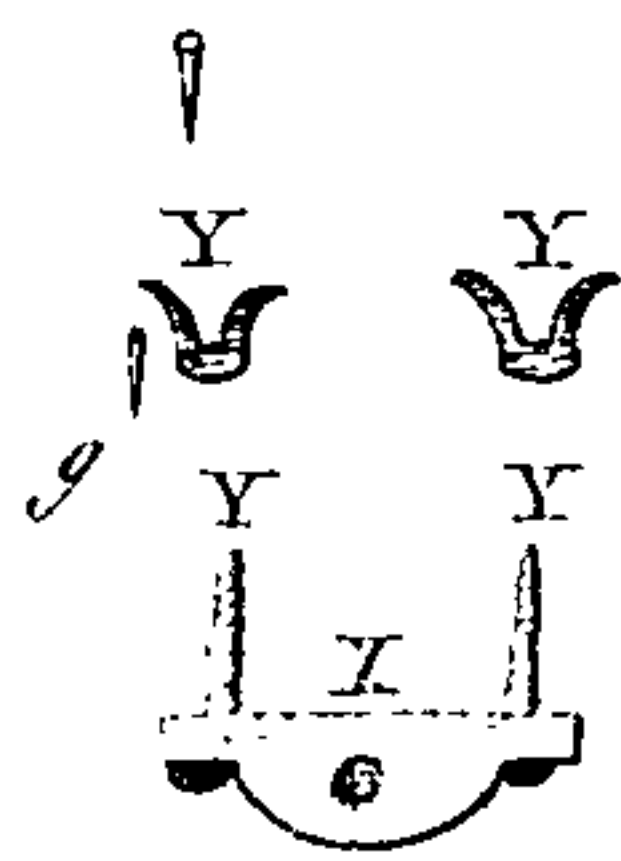


Fig. 4.

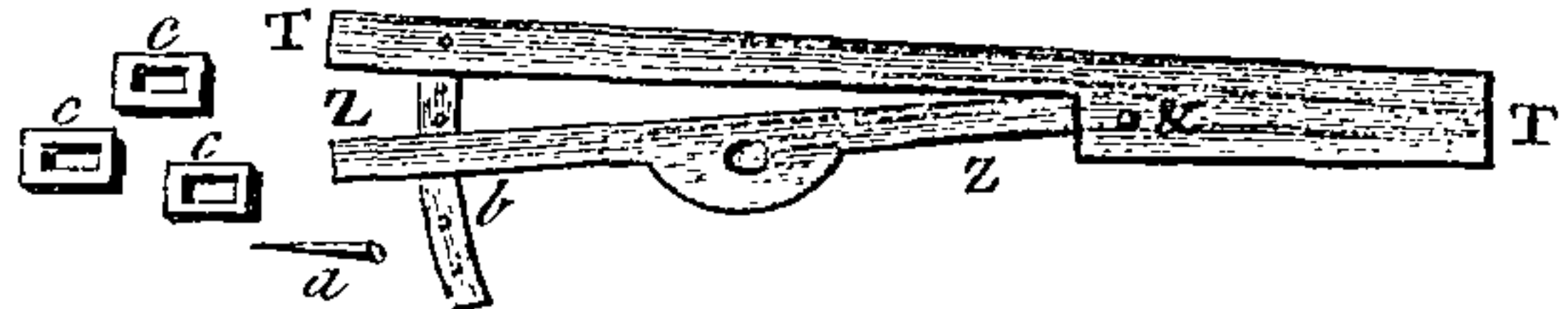


Fig. 5.

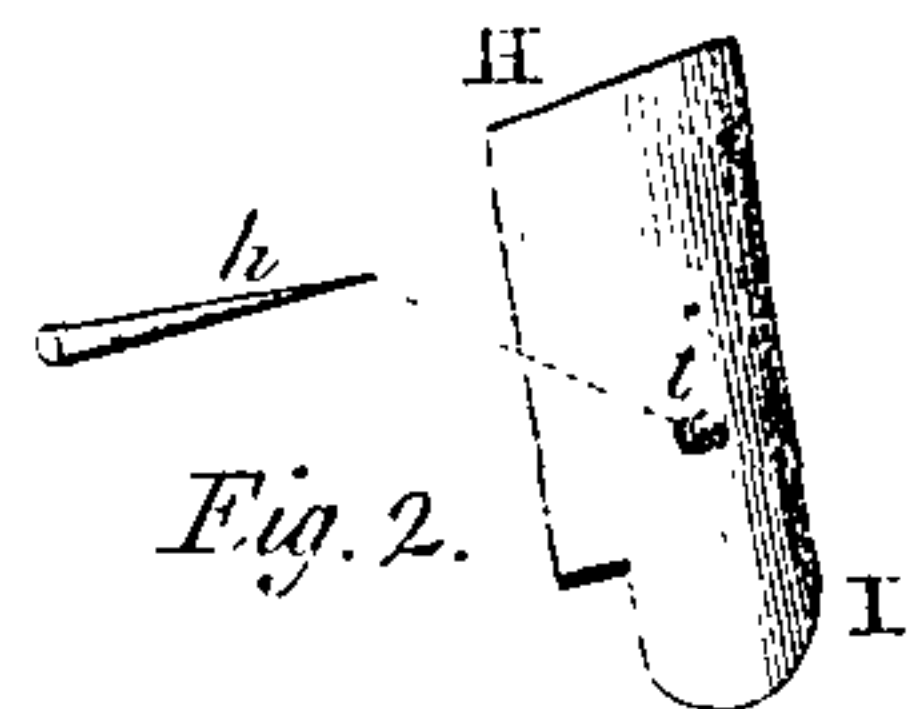
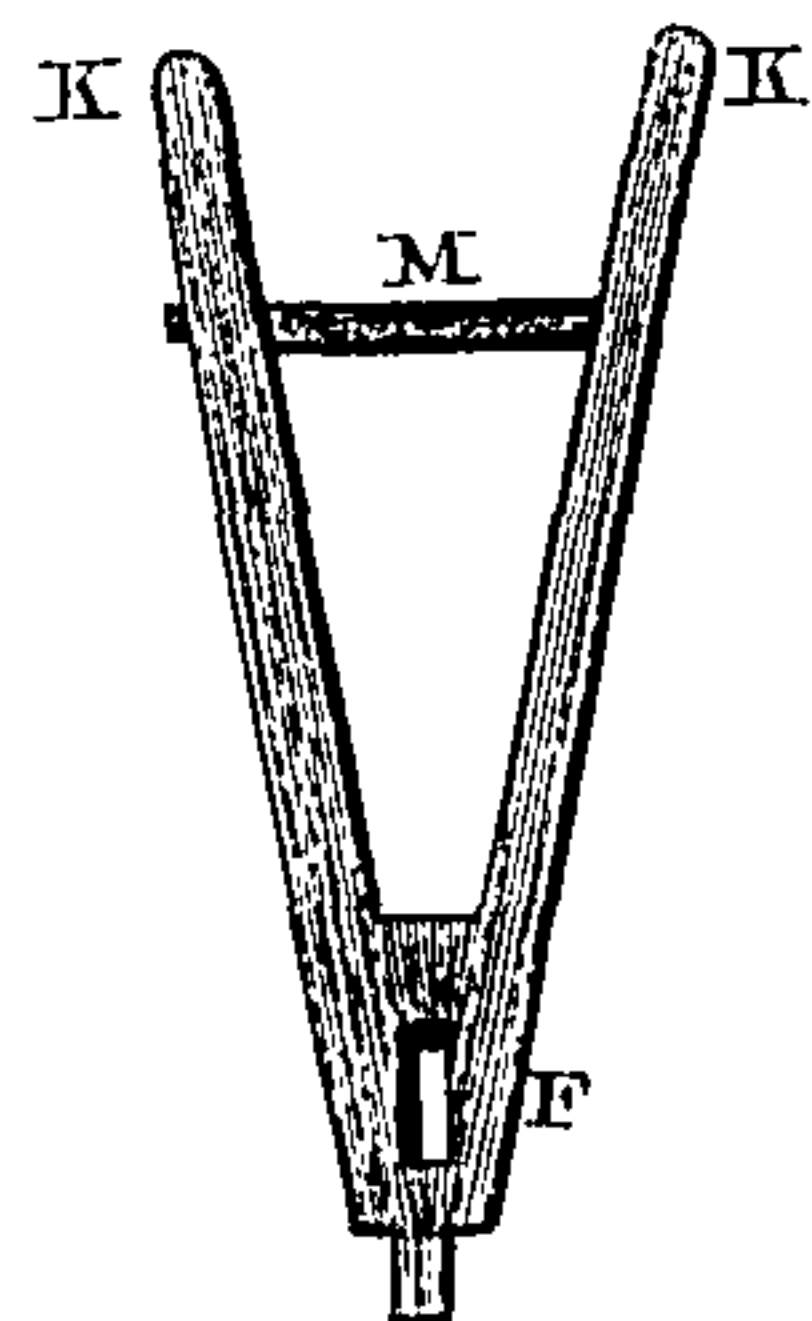
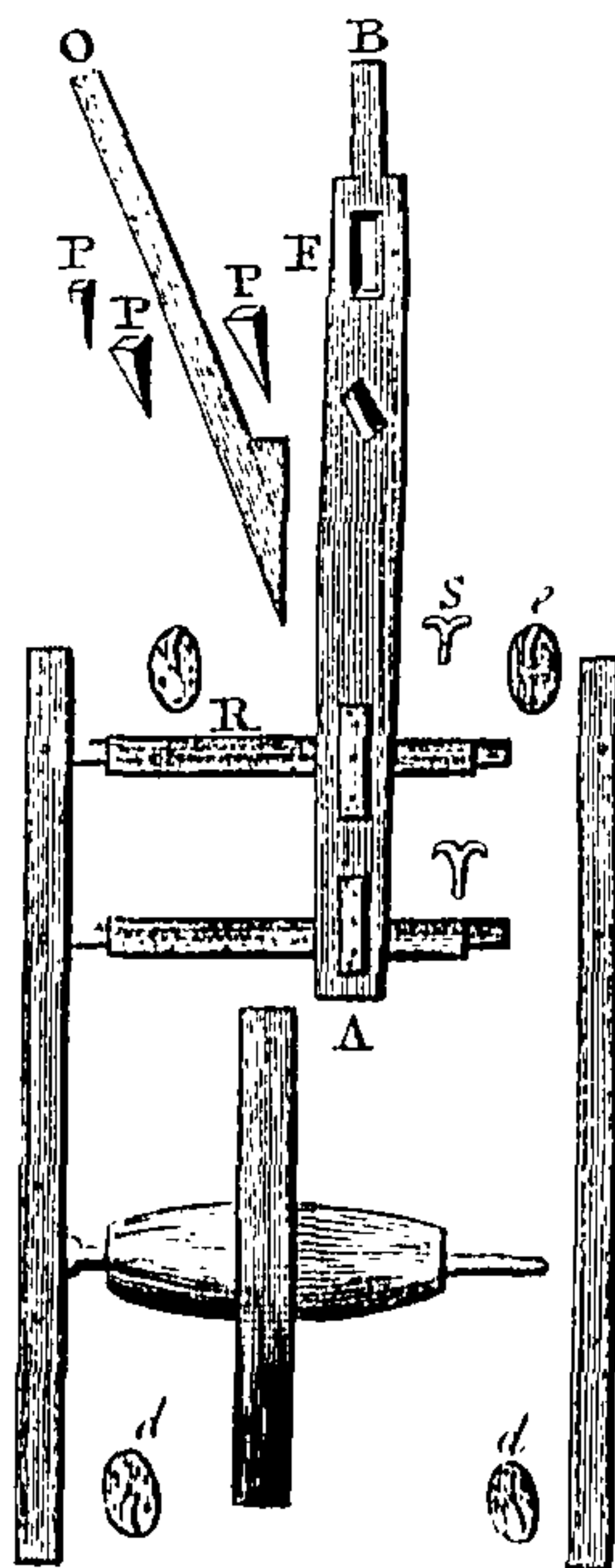
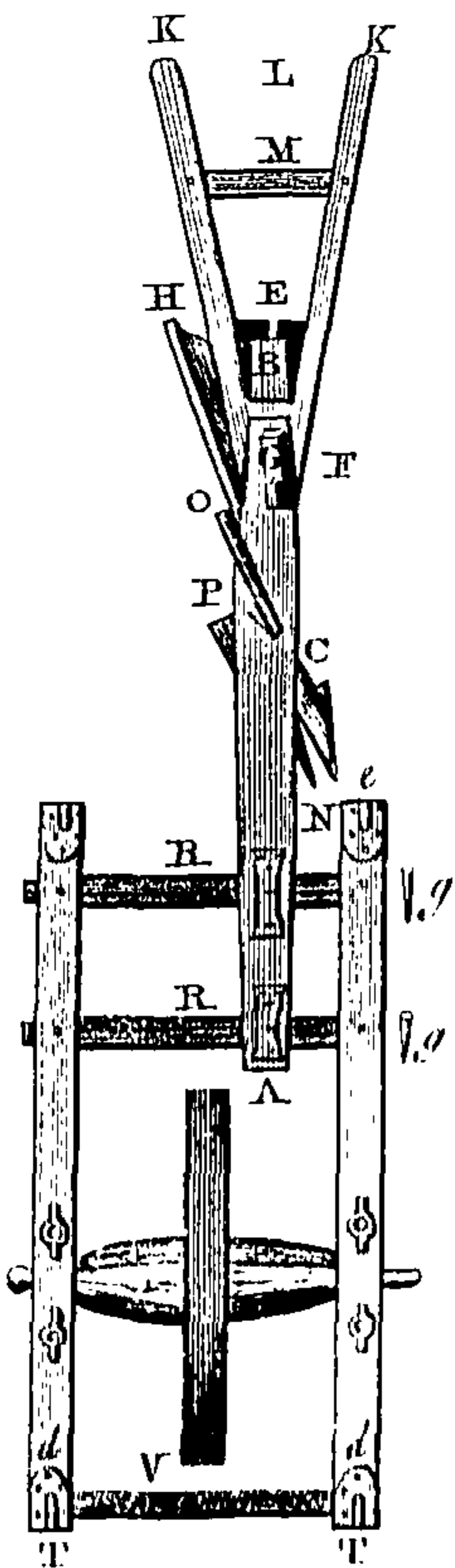


Fig. 2.



Scale of 6 Feet.



those principles, and of reducing them to a regular theory, is nearly the same in both. The art of construction in either case is principally attained by practice.

"In this district, the species of plough under notice is in general constructed better than it is perhaps in any other; yet even here, the ploughs of different makers pass through the soil with various degrees of facility and execution: nevertheless, though I have paid some attention to the different makes, I find myself entirely incapable of laying down such particular rules of construction as would do my country any service, or my work any credit. Even the general principles of construction I must mention with diffidence.

"The great difficulty, in the construction of a plough, is that of adapting it to all soils, in all seasons, and to all depths.

"If the soil break up in whole furrow, every inch of depth requires, in strictness, a separate plough, or a separate regulation. Here rests the main objection to the winding mouldboard, which admits of no regulation in respect of depth.

"If the semi-arch or hollow of the hindpart of the mouldboard be raised sufficiently high to turn a thick furrow completely, it is of no use in turning a thin one. On the contrary, if it be brought down sufficiently low to turn a shallow furrow properly, it is impossible to turn a deep one with it in a workman-like manner. There is not room for it within the hollow or semi-archway of the mouldboard. The inevitable effect of this is, either the furrow is forced away wholly by the upper edge of the mouldboard and set on edge; or the mouldboard rides upon the furrow, raising the heel of the plough from the ground; the evil effects of which need not be explained.

"An upright stern, with a moveable heelplate to turn the furrow at any given depth, is in this point of view much preferable to a hollow mouldboard; and if its use in raising a crest of mould for the purpose of covering the seed be added, its preference is still more conspicuous; and I see no reason why the Yorkshire plough should not receive so valuable an improvement.

"The foreparts of a Yorkshire plough of the best construction are admirably adapted to insinuate themselves beneath the soil and raise the furrow: a better form, perhaps cannot be conceived.

"The form of the Yorkshire plough is not its only excellency; the ordinary price of the woodwork complete, is not more than seven shillings and sixpence; the iron work about twenty shillings, including plates for the landside and mouldboard. Cast iron plates, somewhat resembling those of the Norfolk plough, are now coming into use instead of wooden mouldboards. These will reduce the general price still lower."

In his discourse about implements, he says as follows:

"The common sledge. This petty implement will be considered as unworthy of notice by those who are unacquainted with the uses of it. Nevertheless, here, where it is in common use, it is in universal estimation.

"For carrying harrows and other implements, thorns and other rough wood, turneps when the ground is tender, &c. &c. a sledge is frequently much preferable to a cart or a waggon. Some are made small and light for one horse; others strong and large, to be drawn by a team of oxen or horses.

"The principal singularity of construction consists in a valuable addition to the common harrow-sledge of other countries. This addition is made with two cross-pieces (like the cross-pieces of a cart or waggon), one fixed upon each end of the body of the sledge, projecting without the side-pieces about ten or twelve inches at each end. Upon the extremities of these cross-pieces are fixed two rails, provincially, stelvings, one on each side; thus increasing the width and hollowness of the bed of the sledge, and thereby rendering it capable of carrying a larger load with greater steadiness.

"The moulding sledge. This implement, I apprehend, is peculiar to Yorkshire.

"Its use is that of smoothing the surface of meadows; at the same time spreading the dung and molehills.

"The construction is that of the body of the common sledge, without its side-rails and cross-pieces; the upper edge of the side-pieces (of the body of the sledge) being for this purpose made perfectly straight.

"In use, it is drawn with the face downward, and the side foremost, across the ridges.

"Its effect is different from that of the landplane described in his Minutes of Agriculture, which having a middle bar, levels the surface; whereas this, having no middle bar, only smooths it.

"The front bar (namely, the side which is drawn foremost) forces off worm-casts, the rudiments of anthills, and other loose incumbrances which lie in its way.

"This collection of materials being driven before the implement, grind each other down fine enough to lodge in the dimples and fissures of the sward, thus smoothing the surface in a two-fold way; at the same time mixing, reducing, and distributing the meliorating ingredients in the most effectual manner.

"The front bar is sometimes shod with iron, projecting with a hoe-like edge before the woodwork. But this is unnecessary; and is frequently injurious in defacing the sward. The woodwork itself, while the acting angle in front remains sharp, is perhaps the best: but the angle soon wears off; by which means the implement loses its effect in removing the more stubborn protuberances. An iron bar fixed, not beneath, but in the front of the woodwork, the lower edge being set flush with the face of the implement, acts in a similar way to the wood itself, without being so liable to be worn away."

Paring PLOUGH, an instrument used in several parts of England, for paring off the surface of the ground, in order to its being burnt. See the article BURN-BAKING.

One of the best and simplest instruments of this kind is that which Mr. Bradley gives, with the following description.

From A to A, fig. 1. Plate XXI. is the plough-beam, about seven feet long, mortised and pinioned into the block B; which is of clean timber, without knots. C C are the sheaths or standards, made flat on the inside, to close equally with the paring-plate, and be fastened to it with a bolt and key on each side, as is marked at D.

E is the paring plate of iron laid with steel, about four inches wide, and from twelve to eighteen inches long, as the business may require. This plate must be made to cut on the sides, which are bolted to the standards, as well as at the bottom part.

FF are two iron braces, to keep the standards from giving way. These standards must be mortised near their out-sides, and through the block,

GG are the plough handles, which must be fixed slope-wise between the beam and the standards.

The pin-holes in the beam, the use of which is to make this plough cut more or less deep, by fixing the wheels nearer to or farther from the paring plate, should not be above two inches asunder.

Rotheram, or *Patent* PLOUGH, the name of a plough very simple in its construction, easily worked, and therefore deserves the husbandman's particular attention.

Fig. 2. Plate XXI. represents the left or land side of this plough, of which A B is the beam, CD the sheath, EBD the main handle, FR the smaller handle, GH the coulter, KI the sock or share, NP the bridle, S the flyband, ML a piece of wood in place of a head. The forms of all these different parts, as they appear on this side of the plough, are here represented, and their sizes and distances may be measured by the annexed scale of feet and inches.

Fig. 3. represents the right hand side of this plough, with all the parts that can be seen on that side, in which TV is the mould-board, &c.

Fig. 4. shews the under part of this plough turned up, in which may be seen the shape and size of the share, and the manner in which it is fixed on the sheath, mould-board, and ground-rest, with the angle which they make.

Fig. 5. represents the hind-part of the plough, in which are seen the two handles EF, with the hinder-part of the mould-board, VT, and a piece of wood in the place of the head LM, in their proper shapes and sizes by the scale.

Fig. 6. represents an upper view of this plough, as it appears while it works, with the bridle NP extended, the mould-board TV, fixed in its proper position, and all the other parts as they appear in this situation, and in their several shapes and sizes according to the scale.

Fig. 7. is the upper part of the sock or share.

Fig. 8. shews the opening of the share, as it is fixed on the end of the sheath and mould-board.

Fig. 9. is a perspective view of the bridle.

The whole of this plough should be made of ash or elm;

the irons should be steeled and well tempered; and that part of the plough which is under ground in tilling, should be covered with plates of iron.

The difference betwixt this and the common ploughs, seems to consist in the bridle at the end of the beam, by which the ploughman can give the plough more or less land by the notches at N in fig. 4, and 6, or make it cut deeper or shallower by the holes at P, in fig. 2, and 3, in the coulter and share, which are made and set so as to cut off the new furrow without tearing; and in the mould-board, which is so shaped at first to raise a little, and then gradually turn over the new cut furrow with very little resistance. But the greatest advantage of all is, it being so easy of draught, that it will do double the work of any common plough, as experience has proved; and, with only one man and two horses, will perform, even in stiff land, as much as two men and six horses can do in a moderately light soil with any of the wheeled ploughs generally used, or indeed known in this country, where their great defect is, that they are too complex, and weigh too much upon the fore-carriage, so that the friction of their wheels becomes a considerable addition to the draught: for the best plough certainly is that which is the most simple in its make and tackle; which requires the least strength to draw it, in proportion to the stiffness of the soil; which can be made always to cut to a proper depth; and which, by the shape of its mould-board, is best adapted to turn the furrow upside down. The principle of the Kentish plough, with the shifting mould-board, is very good, where the land is dry, and will admit of it.

Messieurs de Chateauxvieux and Duhamel, ever studious to promote the welfare of mankind, have endeavoured to remedy these inconveniencies in wheeled ploughs, by the following improvements, which, with their usual spirit of universal benevolence, they have most obligingly communicated to the world. We shall begin with the invention of the former of these gentlemen, because it was rather prior, in point of time, to that of M. Duhamel.

The fore-part of M. de Chateauxvieux's plough is composed of a wheel thirty-two inches, in diameter, which may be extended to thirty-four inches, or reduced to thirty: but to fall short of, or to exceed these measures, would be attended with inconveniences. This wheel may be made very light, especially if it be encircled with a thin hoop of iron. The plough itself is represented in Plate XXII. fig. 1, 2, and 3, where fig. 2. is the plan, and fig. 1. the profile.

The frame in which the wheel is placed, is formed by two shafts AB CD, fig. 2. distant from each other eighteen inches, from inside to inside; which fixes the length of the nave of the wheel. These shafts are four feet eight inches long, and may be reduced to four feet four inches, by shortening them at the ends C and A. They are about two inches and a quarter square: but the edges should be rounded off. These two pieces are fastened together by the two cross staves EF, GH, which are two inches and a half wide, and about an inch thick. They are riveted to one of the shafts, at E and G, where they are not to be loosened at all; and at their other ends F and H, the shaft must be moveable, so as to be taken off, to let the two cross staves through two mortises in the beam IK of the plough after which the shaft CD is put in its place, and fixed with two iron pins, *a*, *b*. Between the two shafts is placed the wheel LM, the nave of which is pierced through its center, with a hole proportioned to the thickness of the iron pin or spindle NO, which serves for an axle-tree, and is represented by the two pricked lines. This spindle, or axle-tree, the diameter of which is about three quarters of an inch, ought not to project beyond the outside of the shafts, lest it should lay hold of or hurt the stalks of the corn, when this plough is used for stirring the earth between the rows in the New Husbandry, as will hereafter be more particularly mentioned. To fix it at N, that end is flattened, and bent over the shaft to the middle of its upper side, where it is fastened at *d*, by a small pin driven through it and the shaft.

On the upper surface of each of the shafts, at the ends A and C, are the hooks A C, to which the harness is fastened: and at the other ends B and D, are two rings, the use of which will be explained hereafter.

The shafts AB, CD, should be pierced with four or five holes, to set the wheel more or less forward or backward, in order to make the plough strike more or less deep into the earth, as may be seen in fig. 1. at *a*, *b*, *c*, and *d*. The same holes are indicated by the pricked lines on the two shafts of fig. 2. from A to N, and from C to O.

The hind part of of this plough consists of the beam IK, fig. 1, and 2. the ground-rest CD, fig. 1. which is covered by the share LD; the handles KP, KQ, fig. 2. and KP, fig. 1. the sheat EF, fig. 1. of which part is pricked in fig. 1. and the end appears at X in fig. 2. the mould-board RS, fig. 2. part of which is seen at N in fig. 1, the coulter GH, fig. 1. and TV, fig. 2. and the share LD, fig. 1. part of which is seen at Y, in fig. 2.

The beam is four feet eight inches long, exclusive of the tenon which traverses the handles. Three inches and a quarter square are very sufficient in its thickest part, which is from X to V, fig. 2. The mortises in the beam, which are under *g*, *h*, and through which the two cross-staves EF, GH, are slipt, should be so fitted, that the cross-staves may not shake or be loose in them, at the same time that the beam should, by their help, slip with ease over the cross-staves, either to the right towards EG, or to the left towards FH, according as the intended ploughing may require. The beam should be fastened, either by two nuts screwed on at *m*, *n*, which will fix it tight to the cross-staves EF, GH; or by two iron pins stuck through the holes P and Q, in the cross-staves, one to the right in the cross-staff EF, and the other to the left in the cross staff GH. These pins will keep the beam steady in its place.

The lower part of the ground-rest should be somewhat concave, as is represented at CD, fig. 4. in order to lessen its friction against the earth.

The beam IK, fig. 1. and the ground-rest CD, are fastened together by the sheat FE, and the handles PK, both of which last are riveted to the ground-rest by two strong iron pins, the heads of which are seen at *g* and *h*; and to the beam, as also to the tenon of the beam which traverses the handles at *m*, *n*; and by the two wedges, *p*, *q*, and *r*, another use of which will be explained hereafter.

Wood naturally crooked is best to make the handles of, that they may be all of one piece, which should be so disposed, that one third of the space between the two handles, should be left on the left side, and the two other thirds on the right side, in order to facilitate the ploughman's walking in the furrow. This disposition is shewed in fig. 2. in which a line *e f*, drawn from the middle of the beam, between the two handles, gives to the left side a third P *f*, of the distance PQ between the two handles, and the two other thirds *f*Q to the other side.

For want of wood naturally bent to a proper shape, these handles may be made of two pieces firmly riveted and fastened together; and if it should be more convenient to the ploughman, the whole space between the handles may be on the right-side, as in fig. 6.

The sheat EF, fig. 1. should be very strongly and closely fastened by its tenon to the ground-rest at *g*. An intelligent workman will easily make it of a proper size, which is about two inches and a half wide, and a full inch thick. The inclining of this piece with the ground-rest gives it greater strength to resist, than if it was fastened to its right angles.

The mould-board, represented by RS, fig. 2. and AB, fig. 7, is from thirty to thirty-one inches long, and ten inches high or deep. It ought to be placed as in fig. 8, where its end A forms an acute angle, terminating at the junction of the fin of the share: its other end B extends beyond the length of the ground-rest, against which it should incline; in such a manner that, supposing the ground-rest to be lengthened out as far as C, the line CB would be twelve or thirteen inches long, reckoning from the farthest lateral surface of the ground-rest to the farthest lateral surface of the mould-board, which, being thus placed, will form the width of a furrow.

The lower part of this mould-board is sloped a little inward, as is expressed by the shade in fig. 7: and the part *b*, fig. 7, should jut out at least two inches beyond the part *a*. To this end, the mould-board should be made of a plank about three inches thick, which will bear being scooped on one side and rounded off on the other, in order to give it the concavity without, and the convexity within, represented in fig. 3, and 7.

The mould-board should be well fastened, to prevent its being displaced by the resistance of the earth. The upright piece CD fig. 7, which joins to the handles at its end D, and to the mould-board at its other end C, supports it strongly. It is highly necessary to cover the part of the mould-board which bears upon the earth, with a thin plate of iron, in order to preserve it; for otherwise it would soon be worn out.

The

The coulter GH, fig. 1. should be made of good iron well steeled. A notch is cut in the beam to receive it, as in fig. 9 and 10; and as the corners of the notch, C and B, against which the coulter bears hardest when the plough works, would soon be worn away if the wood was left bare, it is proper to secure them with two small pieces of iron AB, CD, about the sixth part of an inch in thickness, screwed on with flat-headed screws. These pieces of iron will keep the coulter steady in its place.

The coulter should be pierced with several holes from E to F, fig. 10, to take it higher up, or let it lower down, as occasion may require. It is fastened to the beam, which is pierced at E, fig. 9, by a strong iron pin with a square flat head, which is let into the beam and lies even with it, as in fig. 10. The other end of this pin, E, fig. 10, is a screw, fitted with its nut, by which the coulter is fastened tight to the beam. Upon this screw, hangs the handle A, fig. 1. which serves to turn it, and at the end of which is the key that fastens on the nuts of the iron pins which secure the share. By this means, the key to turn the screws is always carried with the plough.

M. de Chateaufieux's coulters weigh but five or six pounds a-piece at most, and frequently not more than three pounds.

He places his coulter so that its point G, fig. 1, projects about an inch beyond the outside of the share L C.

Fig. 12 represents the shape of the share, with its dimensions, as do also fig. 13 and 14. The point of this should be made of good steel, and the rest of good iron, neither too soft, nor too high tempered, that it may not be subject to break or bend. The tail of the share, AB, fig. 12, should be thickest from A to C, because that is the part which bears the greatest stress. Its thickness diminishes gradually to B, where the share is fastened to the ground-rest. This tail is pierced with two round holes at A and B, fig. 13, through which are put the iron pins DE, FG, fig. 12, which have square flat heads, lying even with the tail of the share. These pins pass through the ground-rest, where they are fastened on the other side by the nuts EG. A third round hole may be added at x, fig. 13, in order to fasten the share still more firmly to the ground-rest, with a short flat headed screw.

M. de Chateaufieux has likewise made some ploughs with the round holes *a b*, fig. 13, near A and B; that the iron pins DE, FG, fig. 12, might not traverse the tenons of the sheat and handles; and instead of those iron pins, he has riveted them with wooden pins, and found them keep the whole tighter than the iron ones.

To the left of the plough should be fastened the thin board N, fig. 1 and 7, the use of which is to prevent the earth from tumbling over between the share and the mould-board. As ploughing wears the point of the share, though it will not hurt this so much as it does that of the common plough, it must be new pointed from time to time, always observing to make the point incline a little towards the earth, as is represented by the pricked line DL, fig. 1, that the share may scarcely touch the ground at any other part than D and L, in order to lessen the friction.

The hind part of the plough, thus formed, is joined to the fore carriage, by running the cross staves EF, GH, fig. 2, through the mortises of the beams, *g h*; and is fixed there, either by the screws *m n*, or the pins *p, q*. The traces of the first and second horse are fastened to the hooks AC: and if a third horse be used, the traces of that third horse are fastened to those of the second. Horses will do better for this plough than oxen, unless these last have been used to be harnessed one before the other.

The plough thus equipped, may easily be carried to the field, if its hind part is laid upon the little carriage AEW, fig. 2, consisting of an iron axle-tree AEW, two small wheels *h i*, *h'*, and the two pieces B₁, D₁, at the end of which are the hooks B and D. These wheels are about twenty-one inches, or two feet in diameter; and three feet six inches, or even four feet asunder. They are very light, having but a small weight to bear. The hooks of these two pieces B₁, D₁, are inserted in the rings B and D at the end of the shafts; and by this means the plough will be carried upon three wheels, of which fig. 1 and 2 shew sufficiently the arrangement and use. Fig. 5. shews the slope that should be given to the upper surface of the middle of the axle-tree of this small carriage, on which the rest of the plough is to be loaded in order to remove it from one place to another, that the ground-rest and other pieces may lie flat and steady upon it.

To open the first furrow with this plough, the wheel must be placed at the last hole, towards the extremity of the shafts. This makes the share incline the more and consequently cut the deeper. But as it would be somewhat troublesome to change the position of the wheel, at every first cut of the plough, a very little attention will remedy that inconvenience. It is only inclining the handles of the plough to the right or left, instead of holding them even. The whole plough will incline with the handles, and the share will then enter into the ground with ease, and open the first furrow. The other furrows are ploughed without any sort of difficulty; and for them the plough is to be held even, or inclined but very little, either to the right-hand or the left, as the situation of the land may require.

M. de Chateaufieux generally rests the beam on the left-hand side of the fore-carriage. It is easy to place it so as to leave whatever distance is thought proper between the outmost row of corn and the furrow that is actually ploughing.

The forwarder the wheel is set, the deeper the plough cuts; and so on the contrary. But if one would have it cut still deeper, or shallower, than it can be made to do by altering the position of the wheel, that too may easily be effected. By loosening a little the wedge above the beam *p, o*, fig. 1, and driving farther in the wedge *q*, the plough will cut less deep: as, on the other hand, the share will be more inclined, and therefore cut deeper, if the wedge *q* under the beam is loosened, and the wedge *p, o*, over it is driven in tighter.

The chief differences between M. de Chateaufieux's plough, and that of M. Duhamel, are as follow.

1. The beam of this last, ABC, fig. 1. Plate XXIII, bends from C to B; whereas that of M. de Chateaufieux's is nearly straight all along.

2. In consequence of this bending, the hindermost extremity of M. Duhamel's beam is joined at B to the hindermost part of the ground-rest E, after passing through a mortise F, in the lower part of the handles; so that this beam is joined to the ground-rest by its extremity B, the bottoms of the handles F, and the sheat G; whilst that of M. de Chateaufieux's plough is joined to the ground-rest by this sheat, another which this plough has not, and the lower part of the handles: for the beam does not answer to the ground rest.

3. The mould board HI, fig. 2, of this plough, is lighter than that of M. de Chateaufieux's, and differently shaped.

4. The two handles KK, are at equal distances from the beam, and are joined together by a cross staff M.

5. The share N, fig. 3. is pretty much like that of M. de Chateaufieux's plough, but shorter and narrower; so that it cuts less wide furrows; which M. Duhamel rightly thinks the best way of ploughing.

6. The coulter O of this plough passes through a mortise in the beam, which is there strengthened by hoops of iron, to prevent the beam's being split by driving in of the wedges PP, which fix the coulter.

M. Duhamel thinks this hind part of his plough preferable to that of M. de Chateaufieux's, for light lands: but it would not do so well in stiff soils, because the earth would be apt to clog about the sheat at Q; whereas it is thrown off by M. de Chateaufieux's plough. M. Duhamel likewise approves of making the beam straight as M. de Chateaufieux's, instead of giving it the bending from C to B, especially for stiff lands.

7. The beam CA, is fixed to the cross staves RR of the fore-carriage of this plough, by the screws and nuts SS.

8. The shafts TT, are fastened before by a cross-staff V, which gives great solidity to the fore-carriage, and cannot be added to M. de Chateaufieux's plough; not only because the wheel is too large, but likewise because it must be set forwarder or backwarder, in order to make the share cut more or less.

The wheel of this plough is not so large as that of M. de Chateaufieux's, because the axle-tree, instead of being inserted in the shafts 'T T', is let into the side pieces X, fig. 4, which are fastened to the shafts by the screws and nuts Y Y.

The advantages of having the wheel smaller, are, 1. That the plough is less apt to lean too much on its side, and is more easily held upright; 2. That the cross-staff V may be added to the fore-carriage, by which it is rendered

ed more solid ; and 3. That the fore-carriage may be made shorter than it otherwise could be.

The bare inspection of the draught of this plough shews that it is made to cut more or less deep, by screwing the nuts Y more or less tight, and putting a thicker or thinner wedge between the side piece X and the shaft, which is an easier and quicker way, than changing the situation of the wheel. But still, a readier method is, to have under the shafts T T, a false shaft ZZ, fig. 5, fixed with hinges, &c. for then, by only sticking the peg a, into one of the holes b, the beam is raised or lowered, in a moment, to whatever degree is thought proper, without altering the position of the wheel.

It is likewise evident, that in order to give the share a greater or less degree of entrance into the earth, nothing more is requisite than to place the beam nearer to, or farther from, the right-hand shaft : for the horses, which are harnessed one before another, go, as does also the wheel, in the last made furrow, and the ploughman goes in the furrow actually making.

dd. Are hooks to fasten on the harness of the horses.

ee. Cramps to fasten the fore-carriage.

ff. Pins to fix the beams to the sheat.

gg. Pegs to fasten the cross staves.

h. A strong pin which goes through the hole i, to keep the mould-board steady.

Four-coultered PLOUGH, an instrument invented by Mr. Tull, being an improvement on the common plough, that makes it cut the pieces of earth into four ; that is, it thus divides the earth, four times as small as the common plough.

The common two-wheeled plough has of late years become universally used in many countries, and is found greatly preferable to the ploughs they used before ; there is an objection to it, indeed, in regard to some stiff and miry lands, in which the wheels become clogged up, and cannot turn. This, however, is easily remedied by twisting thumb ropes of straw about the iron circle and spokes of the wheels ; these spreading as they turn, and, as the circle twist bears upon the ground, throw off the dirt, and never clog. The two principal parts of this plough are the head and the tail : the plough-head contains the two wheels, and their axis, or spindle, passing through a box, and turning round both in it and in the wheels.

There are fixed perpendicularly in this box two crow-staves, as they are called, which are flat and narrow boards, each having on it two rows of holes, whereby to raise or sink the beam of the plough, by pinning up or down the pillow, to increase and diminish the depth of the furrow. Behind are a pair of gallows, through which the crow-staves pass at the top by mortises, into which they are pinned ; and to these are fastened what are called the wilds, which are rings and crooks of iron, by which the whole plough is drawn in the working. From the box to the center of the beam there is carried an iron chain, consisting of four, five, or more long links, and called the tow-chain : this fastens the plough-tail to the plough-head. It is fixed to an iron collar, fastened in the beam at one end, and at the other passes through a hole in the middle of the box, and is pinned in with a wooden pin.

From the same iron collar to which the tow-chain is fixed, there is also another chain fastened, called the bridle-chain : this runs above the beam, as the tow-chain does below it, and is composed of smaller and more numerous links. At the upper end, as the tow-chain enters to the box of the plough, this bridle-chain is fixed to the top of what is called the stake of the plough : this is a perpendicular stick, carried up parallel with the left crow-staff, and pretty near it, and fastened to it by a wyth or rope, or by the end of the bridle-chain itself, when that is long enough. This stake is also fastened in its lower part, under the gallows, to the same crow-staff, by another wyth or piece of rope.

These are the parts of which the head-part of the plough is composed. The plough tail consists of the beam carried from the head to the very extremity, and serving as the support and base of all the rest. A little below the collar to which the tow-chain and bridle-chain are fastened, this beam is pierced with a large hole, which lets through the coulter : this is a long narrow piece, terminating in an edge, and reaching just to the share ; and it is fixed immovably in its place by means of a wedge which is driven into the whole of the beam with it : the office of this coulter is to cut the earth as it is thrown up by the share. Behind these, the same beam is pierced with two more

holes, one very near its end : these give passage to two oblong pieces, called the fore-sheat and hinder-sheat, by which the plough-share is supported in its place. To the top of the hinder-sheat there is fastened a short handle by a wooden pin. Parallel to the hinder-sheat there runs up a piece of wood of much the same form, called the drock ; and to this is fastened another horizontal piece, called the ground-wrist ; these are all on the right-hand side of the plough, and parallel with the fore-sheat. There runs another piece of much the same form with it, on the right hand : and the bottom of this is the earth-board. The long handle of this, which reaches as far as that of the sheat, is fastened to the drock by a pin, the other end of which goes into the beam. Near the lower end of the fore-sheat, there are two flat pieces of iron, which pass from the two sides of it up to the beam ; and being let through it, are fastened to the upper part by screws and pins. These keep the sheat in its place.

The structure of the four-coultered plough is different, in some respects, from this, though in general founded on it. Its beam is ten feet long, whereas that of the common plough is but eight. The beam is straight in the common plough, but in this it is arched in one fourth part of its length, near the plough-head. At the distance of three feet two inches from the end of the beam at the plough-tail, the first coulter, or that next the share, is let through ; and at thirteen inches from this, a second coulter is let through ; a third at the same distance from that ; and, finally, the fourth at the same distance from the third, that is, thirteen inches.

The crookedness of the upper part of the beam in this plough is contrived to avoid the too great length of the three foremost coulters, which would be too much, if the beam was straight all the way ; and they would be apt to bend and be displaced, unless they were vastly heavy and clumsy. Ash is the best wood to make the beam of, it being sufficiently strong, and yet light.

The sheat in this plough is to be seven inches broad. The fixing of the share in this, as well as in the common plough, is the nicest part, and requires the utmost art of the maker ; for the well-going of the plough wholly depends upon the placing of this. Supposing the axis of the beam, and the left side of the share, to be both horizontal, they must never be set parallel to each other ; for, if they are, the tail of the share, bearing against the trench as much as the point, would cause the point to incline to the right hand, and it would be carried out of the ground into the furrow. If the point of the share should be set so, that its side should make an angle on the right side of the axis of the beam, this inconvenience would be much greater ; and if its points should incline much to the left, and make too large an angle on that side with the axis of the beam, the plough would run quite to the left hand ; and, if the holder, to prevent its running quite out of the ground, turns the upper part of his plough toward the left hand, the pin of the share will rise up, and cut the furrow diagonally, leaving it half unploughed. To avoid this and several other inconveniences, the straight side of the share must make an angle upon the left side of the beam ; but that must be so very acute a one, that the tail of the share may only press less against the side of the trench than the point does.

The great thing to be taken care of, is the placing the four coulters ; for on this the success of the whole depends. These must be so set, that the four imaginary planes described by their four edges, as the plough moves forward, may be all parallel to each other, or very nearly so ; for if any one of them should be very much inclined to, or should recede much from either, of the other, then they would not enter the ground together. In order to the placing them thus, the beam must be carefully pierced in a proper manner. The second coulter-hole must be two inches and an half more on the right hand than the first : the third must be as much more to the right of the second, and the fourth the same measure to the right hand of the third : and these two inches and an half must be carefully measured from the center of one hole to the center of the other. Each of these holes is a mortise of an inch and a quarter wide, and is three inches and an half long at the top, and three inches at the bottom. The two opposite sides of this hole are parallel to the top and bottom, but the back is oblique, and determines the obliquity of the standing of the coulter, which is wedged tight

tight up to the poll. A perspective view of this curious plough the reader will find in Plate XXI. fig. 9.

The coulter is two feet eight inches long, before it is worn; the handle takes up sixteen inches of this length, and is hallowed thus long, that the coulter may be driven down as the point wears away. *Tull's Horse-hoeing Husbandry.*

The four-coultered plough being heavy, difficult to manage, and fit only to break up meadow ground, or ground where there are very few or no stones, is now in disuse. The scaricator may be substituted to break the turf, and the land ploughed deeper afterwards. But it is still a better way of breaking up land, to trench-plough it; first paring the surface with a paring-plough, about two inches deep, turning the grass side downwards, upon which, with a common plough immediately following, in the same furrow, turn a deeper furrow upon the turf, going in all as deep as the staple will admit. This should be done in autumn; and if it is good meadow land, wheat may be sown upon it; if not, let it remain a winter fallow, and sow oats upon it in the spring. In either case the turf will be rotten by the time the wheat or oats are cut and carried off, and the land will be ready for other crops to follow in the common course, if to be continued in tillage; but if intended to be laid down again to grass, a crop of turneps is a good preparative; and at any rate lay it down in good heart. The scaricator will answer the purpose cheaper, without breaking up the land. See the article MEADOW.

Double PLOUGH, an instrument invented by Mr. Randal, which, by putting the share point to the middle of the interval left by the horse-hoe, throws the mould on each side of it, at the same time, towards the rows, and earths them up to what degree the ploughman pleases, in order to nourish them on to perfection. If a common plough, instead of the single hoe, was used, the furrows would be turned into the middle of the interval, and appear in the form of a single ridge: and if the plough went twice in a place, to deepen the soil, the ridge in the middle would be proportionably higher, and the ground strangely improved by such operations, and the vegetables surprisingly promoted in their growth. In either of these cases, of the plough's going once or twice in a place, the double plough, by taking fast hold of the mould, throws all back again; and if the vegetables are not effectually earthed up, which may be the case after double spitting the intervals, then running the double plough over again, completes the business, and strangely tosses about and mellows the ground. This, in general, is the use of this plough in earthing up vegetables, that have three feet intervals.

These whose mould-boards move on hinges, and may be set wide or narrow at pleasure, are the most convenient.

But under the name of this double plough, we are to understand another of the same form, much narrower in the tail, to perform what they called ridge-work, which is either single or double: if single, this double plough works alone, throws up the ridges, and, at a proper time, splits them, and throws them back into the trenches; and this tosses the mould backwards and forwards, which, by these agitations, and other operations, is made ready for cropping, as is particularly mentioned in my Treatise. If these ridges are to be double, that is, if there is to be double spitting, then the double plough performs as before, and goes as deep as is consistent with the interest of the man's arms, and the horse's ease. Here the worthy ploughman is requested to keep his hands even, that the plough may run flat upon its sole, and clear the trench of mould, as far as necessary, which it is made to do in that posture: to make way for the lifting-plough, of the same breadth in the tail. See Plate XXI. fig. 10.

Double lifting PLOUGH. My earnest desire, says Mr. Randal, is to imitate gardeners, in preparing the soil, by their always going a good depth, and which to be sure is the true bias of nature, in regard that vegetables in general, require a looser habitation, beneath the soil, to greater depth than farmers will allow them: this desire produced the lifting-plough, to raise the generous mould that lies far beneath the reach of common ploughing, into general use. This I have practised to very great effect, and never failed doing it, in all the going ground of the tenures of near a thousand acres, where the stratum, below the usual soil, would give me this desirable and encouraging advantage. Hence it was, that I was always extremely fond of this lifting-plough, which never fails

of success in the hands of an honest, worthy ploughman; and, no doubt, there are many such to be found. I was very imprudent, in my first construction of this plough, in having it made too large, in order, through a covetous disposition, to have much work done in a day. The draught was so fatiguing to the horses and men, that the invention was under a good deal of disrepute, and I was in danger of having all the servants leave the service, and of killing the horses: for these reasons, I was obliged to sit down with that loss, great as it was, in the purchase of this plough, and contract all the proportions of it, to make the draught quite easy to the team and men; and then there was not the least complaint heard, but only a backwardness to proceed, which use effectually removed.

Here, then, this lifting plough is to go into all the trenches made by the double plough, as mentioned before; and as the ploughman deepens the trenches as far down as is consistent with his own and horses ease, the irons, running up on each side of the plough, will lift up the mould, which will be thrown, by the motion, upon the old ridges. The ground now lies in deep trenches, and high ridges; and this is what is called, in my Treatise, double ridges; and how the soil is to be afterwards reduced to a level, and receive farther management, is therein particularly mentioned. Now, from the construction of these two ploughs, the soil beneath will, if the ploughman keeps his hands even, be cut level, instead of leaving these hills and dales, but two often practised, to the discouragement of the growth of the vegetables. See Plate XXI. fig. 11. *Randal's Semi-Virgilian Husbandry.*

Mr. Marshall, in his Minutes of Agriculture, says, that in his opinion the *Swing-PLOUGH* is the only plough of general use, especially for stiff land; it will plough it round or flat, clean or balky; wet or dry; foul or clear.

PLOUGHING, the action of breaking up, and loosening the soil.

"The principle, says M. de Chateauvieux, of thoroughly dividing and loosening the soil, is so generally received, that there is not a farmer who does not know, that one ploughing more than ordinary is of as much service to the ground, as dunging it would be. Experience must have shewn them, that his crops are increased by this extraordinary ploughing: but he is not sufficiently sensible, that of all the ways of improving his land, no one is more effectual, or less expensive than this. Were its full value known, it would be more generally practised, and every husbandman would give all his lands at least one ploughing extraordinary.

"To satisfy myself of what might be done with the plough alone, I resolved to make a trial on a spot, of ground which I knew to be incapable of naturally producing any thing. Some years before, I had dug away the earth, three feet deep, from a space of sixty square perches. Nothing remained in it but a white clay, like that which potters use. This spot, thus circumstanced, seemed to me a proper one for my experiment. As the space was too small for a plough to work in, I had recourse to the spade and hoe. The ground was laid out in beds, which were afterwards sowed with wheat, and the spaces between them were frequently stirred. The first year my plants were very poor, and branched into only two, three, or four stalks apiece. In the second year, they did much better; and in the third, they were as large and fine as any my garden could have produced. This spot still continues to produce equally well; the soil is now like fine mould; and, which is very remarkable, it has lost its former white colour, and is become black. We have here a strong instance of what may be done by pulverizing the earth. Let us but do the same with any of our bad lands, and persevere in ploughing and stirring them a sufficient time; the success will not be doubtful.

"To be still farther convinced of the truth of this important maxim in husbandry, that the earth should be thoroughly loosened by deep and frequent ploughings, I examined very carefully, whether my lands which had been prepared by repeated ploughings only, without the assistance of any dung or manure, were much loosened and rendered lighter than those which were under the common management. All my observations proved that they were. The first glance of my eye shewed me, that their surface was smoother; on sounding the furrows, I found them deeper; and much less strength was required to plough them; two horses, or sometimes only one, or a

single ox, doing here with ease, what would otherwise have employed double that number of cattle: a manifest proof that my grounds were in excellent tilth: whereas the common fields offered nothing pleasing or satisfactory to the eye; the earth there was extremely hard, close, and compact, and its surface almost as firm as that of a beaten road. The ground which had been well and often ploughed remained so light and soft, after its crop of wheat was taken off, that I thrust a stick of green willow eight or ten inches deep into it without the least difficulty, though I could not by any means push it at all into the land cultivated in the common way."

Camillo Tarello, a native of Lonato, in the Venetian territories, concerned to see the neglected and dreadful mismanaged state of husbandry, in his country wrote his small but highly valuable Treatise of Agriculture, and presented it to the senate of Venice under the title of *Ricordo d'Agricoltura*. The senate, in justice to the excellency of this work, and the patriotic intentions of its author, granted him, on the 29th of September 1566, not only the sole right of vending his book, but also ordered at the same time that all such as have adopted his new method of husbandry, should pay to him, and afterwards to his descendants, four marchetti (about three half-pence of our money), for every acre of corn land, and two marchetti for every acre of other land, planted according to his direction. The Berne society have favoured the public with the first part of Tarello's excellent treatise; and we shall take from thence the following extract, as a farther proof of the necessity of thorough ploughing.

"When we consider, says that good patriot and intelligent husbandman, Camillo Tarello, that every ear of wheat yields fifty grains (we will suppose that to be the medium number), we may infer, that if all these were sowed and grew, we should reap fifty times as much as was sown: but our crops are far from being so abundant. This failure cannot proceed from any other cause than that all these grains do not rise and prosper; nor can any but one, or all, of the seven following reasons be assigned for it, if we except bad seasons and extraordinary accidents.

"The deficiency arises either 1. from the seed; or 2. from rain, when the corn is in bloom: 3. from winds, when its stalks are large; 4. from birds which eat up the grains that have been sown; 5. from worms and insects; 6. from the earth; or, 7. from the cultivator himself.

"The cause of this defect is not in the seed: for, either the seed is good, or it is not: if it be not good, the grains will not rise at all: but if it be good, as we suppose it to be, each grain may, and should produce at least one ear. Another proof is, that if a parcel of seeds are planted at a proper depth, one by one, in holes made on purpose for them, and an equal number of the same kind of seeds are sowed at random in the same sort of ground, all the former will rise, but not all the latter.

"Neither ought it to be ascribed either to rain or winds, at the time of the blossoming of the corn: because we do not reap fifty for one, even when the weather is very fine; and even when each ear bears fifty grains, we do not reap fifty times the seed.

"Nor ought we to accuse the birds of the air: it being well known that lupins, which they never touch on account of their bitterness, do not all rise; for if they did, the crop would still be more considerable, as each of these plants bears from fifty to sixty-seeds. Besides, what the birds eat is not considerable.

"Worms and insects are not the cause, for three reasons, first, our crops are very little better even when neither worms nor insects are to be seen; secondly, the case here is the same as that of the lupins; and, thirdly, the worms would ravage whole fields (as they sometimes do) in so visible a manner, that it would be easy to distinguish the cause of the mischief. However, this is an extraordinary and pretty rare event.

"The same may be said of fogs, cold, bad weather, reptiles, and other mischievous creatures. Though these enemies do not injure our fields every year, we nevertheless constantly reap less corn than they might be made to produce.

"Lastly, the earth is not in itself the cause of this scantiness of increase: for the Creator has endowed it with perpetual youth and fruitfulness, as Columella justly and prettily observes in the first chapters of his first and second books. The earth and nature are always the same.

"Now, if the usual cause why we do not reap fifty for one, cannot be imputed to either of the things above-mentioned, it must of necessity be sought for in the ignorance, negligence, and indolence of the husbandman: for our practice is diametrically contrary to that of the ancient Romans. They ploughed often, and sowed little: yet every family lived upon the produce of its small farm: but we who plough little and sow a great deal, are always disappointed."

The Romans were not only extremely attentive to the thorough culture of their land, but also, even in the latter time of the republic, laid it down as a maxim to be followed by all good husbandmen, "to sow but little and plough much." This is strictly enjoined by Virgil; and Pliny, who instances the husbandry of Ctesimus, as an example of the good effects of this practice, laments the deplorable condition of Italy, when rich men, with the help of their numerous slaves farmed large districts of land; because it diminished the number of Roman citizens, and rendered the country less fruitful: for, as both he and Columella observe, the Romans then became dependant on other nations for the means of subsistence.

May not this naturally lead us to cast an eye upon our own country, where, of late years, gentlemen throw their estates, as much as possible, into large farms, which, in the language of Mago the Carthaginian, must, in general, render the farm stronger than the farmer, whereby it necessarily become less fruitful; this practice is attended with another most fatal consequence to a manufacturing and trading people: it lessens the number of inhabitants in the country from whence only the supply of population arises; for cities and large towns are always an expence of men.

Whilst we bestow this due commendation on ploughing, we do not mean to recommend it on Mr. Tull's principles, "that dividing and pulverizing the earth is all in all." When the earth is in fine tilth, so that the roots of plants can easily extend themselves every way, an advantage arises, which is thus described by the ingenious M. J. J. Biberg, in his Economy of Nature.

"Plants, as well as living creatures, must submit to death. They spring up, they grow, they flourish, they ripen their fruit, they wither, and at last, having finished their course, they die, and return again to the dust, from whence they first took their rise. Thus the black mould which we see upon the surface of the earth, is chiefly owing to dead vegetables. For all roots descend into the earth by their branches, and after a plant has lost its stem, the root remains; but this too rots at last, and changes into mould. By this means, this kind of mould is mixed with the earth, by the contrivance of nature: nearly in the same way as dung thrown upon fields is wrought into the earth by the industry of the husbandman.

"The earth thus prepared offers again to plants from its bosom, what it had received from them. For when seeds are committed to the earth, they draw to themselves, accommodate to their nature, and turn into plants the more subtle parts of this mould, by the co-operation of the sun, air, and moisture; so that the tallest tree is, properly speaking, nothing but mould wonderfully compounded and modified by a virtue communicated to a small seed by the Creator. From these plants, when they die, just the same mould is formed, as gave birth to them originally; but in such a manner, that it is in greater quantity than before, if the earth be kept loose to admit of the free extension of the roots. Vegetables therefore increase the black mould; whence fertility remains continually uninterrupted: whereas the earth would not make good its annual consumption, if it were not constantly recruited by new supplies."

The illustrious M. Lullin de Chateaufieux, to whom the world in general is infinitely indebted for some of the most judicious and best executed experiments ever made in agriculture, as is his native country in particular for his excellent administration in the high office of chief magistrate of the republic of Geneva, is the first writer who has attended to the advantages of stubble as a manure.

Towards the latter end of the year 1753, walking over his grounds after harvest, he was struck with the difference which he found in the stubble of his own experiments, and that of the corn which had been raised in the common way. This last was so poor and weak, that it scarcely opposed the motion of his feet, while the other resisted greatly. "I often felt it break, says he, under my feet, and frequently

quently met with tufts of twenty, thirty, forty, and sometimes more stalks, which stooped me short, like so many little bushes. I am the more particular in my account of this stubble, because it shews the great strength of the plants, which they would not have had if the earth had not been well prepared. Besides, it has its real use: for thorough ploughing supplies the want of dung, not only by keeping the earth constantly in a loose state, but likewise by the quantity of strong stubble which it produces, and which affords a most excellent manure, attended with no expence. It lies ready upon the spot; the ploughing of the earth buries it; and as it is a long time in rotting, it helps to keep the soil loose and light, and is repeated every year. I have found stubble almost whole at a year's end, and have seen some not quite consumed at the end of two years. From what I have seen of its effects, I will venture to say, that it contributes greatly to increase the productions of the earth. I have very often plucked up plants remarkable for their beauty, and have frequently found their roots interwoven with tufts of stubble, which shewed me the cause of their extraordinary growth."

"It is often, says Mr. Duhamel, more advantageous to increase the fertility of land by ploughing, than by dung: 1. Because in general, only a certain quantity of dung can be had, the product of twenty acres being scarcely sufficient to produce enough for four or five; whereas, the particles of the earth may be divided and subdivided almost to infinity. The help derived from dung is therefore limited: whilst no bounds can be set to the benefits that may accrue from ploughing.

"2. Few plants raised in dung ever have the fine flavour of those which grow in a good soil moderately dunged. Our kitchen gardens, and our other grounds afford daily instances of this truth. Pulse, pot-herbs, and fruit, are seldom so good in the neighbourhood of great cities, where dung abounds, as in country gardens, where but little of it is used. The corn raised in those excessively dunged lands, yields a great deal of bran, and not much fine flour, and is difficult to keep. Nice horses will not eat oats of the growth of fields manured with human ordure. But nothing is so striking as the difference between the wine of an undunged vineyard, and that of vines which have been greatly dunged.

"3. Dung, which is supposed to act by fermentation, causes indeed an inward division of the particles of the earth, which must be very useful, as well as the food which it furnishes to plants: but the plough, besides dividing those particles, changes their situation and turns the ground upside down, so that the part which was exposed to the influences of the air and dews, takes the place of another which is brought from within the earth up to its surface. The consequence of this is, that well ploughed land is not exhausted by weeds, and that it admits the moisture of rains and dews, together with the rays of the sun, all of which contribute greatly to render it fertile, as has been proved by very many experiments.

"4. Dung attracts insects, and those insects gnaw plants. It is well known that the roots of trees planted in dunged ground, are very liable to be damaged by insects; and this is one of the chief reasons why florists banish dung from gardens. Worms, grubs, and other such like vermin, make dreadful havock in their beds of flowers; and I have seen meadows where the grass has been entirely destroyed, by their eating its roots.

"I must add, that most sorts of dung contain a great many seeds, which fill the land with weeds.

"5. It is true that dung is equally serviceable to light lands, and to strong; but the same may be said of ploughing.

"Land is too strong when its particles lie so close together, that the roots of plants cannot extend between them, without great difficulty, in quest of their necessary food, for want of which they will remain poor and sickly. But when the ground has been well loosened by repeated ploughings, and its particles are set at greater distances from each other, those roots will be able to spread freely on all sides, to pervade every minute chasm, and to collect such quantities of food as will make the plants grow strong and vigorous. The friendly influences of the atmosphere will then penetrate to them. What plainly proves the good effects of loosening such soils, is, that their fertility is sometimes increased by a mixture of sand, instead of dung. Now sand does not afford any nutritive substance; but only hinders the particles of the earth from re-uniting too closely.

"Ploughing is equally beneficial to light lands, for the very contrary reason; though these do not require so much of it as the other. There is no danger of their being exhausted by any exposure to the sun: but, on the contrary, they acquire an additional degree of fertility by the stirring and grinding of their particles, and are thereby the better fitted to receive the moisture of rains and dews, and the salutary influences of the air and sun; whilst their inward pores are at the same time better adapted to the proper extensions of the roots of plants, by their being lessened.

"But, let the benefits arising from dung be ever so great, let the means of obtaining enough of it ever so easy, and let even its defects be corrected as much as can be; still it will not be the less true, that frequent ploughing is of infinite service to land.

"For this reason it is, that land intended for wheat is ploughed three or four times before the grain is sowed. Some farmers, who could not dung all their lands, ploughed part of them double the usual number of times, and reaped greater crops from these, than from those which were dunged. The expence of three ploughings extraordinary will be much less than the price of the dung necessary for the land, if the farmer is obliged to purchase it.

"In 1759, M. Delu gave three ploughings to some of his fields intended for oats; and though that year was very dry and unfavourable to spring-corn, his oats kept up well till they were perfectly ripe, and yielded a full crop of excellent grain.

"He gave five ploughings to a piece of wheat-land, which had not been dunged, and, at harvest, had taller and finer corn there, than in the neighbouring grounds which had been dunged and cultivated in the usual way.

"In short, the advantage of thorough tillage, while the plants are growing, is so great, that in many places it has been found amply to repay even the expence of digging between the rows of corn."

PLOUGH-WRIGHT, a person whose business it is to make ploughs, and other implements of husbandry.

POA, meadow grass, or that common species of grass, that principally forms the green covering of our fields.

POCKET, a large sort of bag in which wool or hops is packed up, in order to be sent from one part of the kingdom to the other.

POD, a term used to express a pericarpium, consisting of two valves, which open from the base to the point, and are separated by a membranaceous partition, from which the seeds hang by a kind of minute stalk.

POKE, a sack, or bag.

Hop-POLES, the upright poles, or pieces of wood, round which they bind, twist, and support themselves. See the article **HOP**.

POLLARD, or **POLLANGER**, a tree that has been frequently polled or lopped, and its top taken off.

POLE-EVIL, an abscess near the poll of a horse, formed in the sinuses between the noll-bone, and the uppermost vertebrae of the neck.

If it proceeds from blows, bruises, or any external violence, at first bathe the swelling often with hot vinegar; and if the hair be fretted off with an oozing through the skin, make use of two parts of vinegar, and one of spirit of wine; but if there be an itching with heat and inflammation, the safest way is to bleed, and apply poultices with bread, milk, and elder-flowers: this method, with the assistance of physic, will frequently disperse the swelling, and prevent this evil.

But when the tumor is critical, and has all the signs of matter, the best method then is to forward it, by applying the ripening poultices already taken notice of, till it comes to maturity and bursts of itself; or, if opened with a knife, great care should be taken to avoid the tendinous ligament that runs along the neck under the mane: when matter is on both sides, the opening must be made on each side, and the ligament remain undivided.

If the matter flows in great quantities, resembles melted glue, and is of an oily consistence, it will require a second incision, especially if any cavities are discovered by the finger or probe; these should be opened by the knife, the orifices made depending, and the wound dressed with the common digestive of turpentine, honey, and tincture of myrrh, and after digestion with the precipitate ointment; or wash the sore with the following, made hot, and fill up the cavity with tow soaked in it:

Take vinegar or spirit of wine, half a pint ; white vitriol dissolved in spring water, half an ounce ; tincture of myrrh, four ounces.

This may be made sharper, by adding more vitriol ; but if the flesh is very luxuriant, it should be first pared down with a knife before the application. With this wash alone, Mr. Gibson has cured this disorder without any other formality of dressing, washing with it twice a day, and laying over the part a quantity of tow soaked in vinegar and the white of eggs beat together. This last application will serve instead of a bandage, as it will adhere close to the poll, and come off easily when there is occasion to dress. Some wash with the phagedenic water, and then fill up the abscess with loose dossils of tow soaked in *Ægyptiacum* and oil of turpentine made hot, and continue this method till the cure is effected.

But the most compendious method of cure, is found by observation to be by scalding, as the farriers term it, and is thus prosecuted when the sore is foul, of a bad disposition, and attended with a profusion of matter.

Take corrosive sublimate, verdegriſe in fine powder, and Roman vitriol, of each two drachms ; green copperas half an ounce ; honey or *Ægyptiacum* two ounces ; oil of turpentine and train oil, of each eight ounces ; rectified spirit of wine, four ounces : mix together in a bottle.

Some make their scalding mixture milder, using red precipitate instead of the sublimate ; and white vitriol instead of the blue ; the following has been successfully used for this purpose, viz. half an ounce of verdegriſe, half a pint of train-oil, four ounces of oil of turpentine, and two of oil of vitriol.

The manner of scalding is, first to clean the abscess well with a piece of sponge dipped in vinegar ; then put a sufficient quantity of the mixture in a ladle with a spout, and when it is made scalding hot, pour it into the abscess, and close the lips together with one or more stitches. This is to remain in several days ; and if good matter appears, and not in an over great quantity, it will do well without any other dressing, but bathing with spirit of wine ; if the matter flows in great abundance, and of a thin consistence, it must be scalded again, and repeated till the matter lessens and thickens.

These liquid corrosive dressings agree well with horses, whose fibres are stiff and rigid, and whose juices are oily and viscid ; in this case they contract the vessels of the tendons on the hind part of the head and upper part of the neck, which are continually spewing out a matter or ichor that can hardly be digested, or the profusion abated without such applications as these.

POND, a reservoir or receptacle for collecting and preserving water.

The necessity of water, in all pastures, is self-evident ; as cattle cannot live without it, and the driving of them far for it, is known to be prejudicial to their health, in hot weather, besides being attended with great trouble, and a considerable loss of time. This is so sensibly felt in many parts of England, that people are obliged to dig wells, even to such a depth as frequently to require the assistance of a horse to draw up the water. The means of rendering it easily come at, must therefore enhance the value of the land where it can be procured, and are of very essential consequence to the husbandman.

Where the surface of the ground is sand or gravel, there seldom is occasion to dig deep for water ; because such soils generally lie upon marl, or some other rich earth, through which the water cannot descend. Beds of clay are most commonly thicker than those of sand or gravel ; and chalk is, too often, the thickest of all. But wherever water is wanting, the farmer should bore through the incumbent earth, if he intends to fit his land for pasture ; and if he finds the expence of obtaining it too great, his best way will be to convert the ground so circumstanced into arable, or to plant it with timber-trees suited to the nature of the soil.

Wherever water stagnates in a sandy or gravelly soil, the husbandman sees at once at what depth is the surface of the earth which retains it. But in other soils, and when this does not happen, Palladius, and the authors of the *Maſon Ruſtique*, give the following directions how to seek for water, with the greatest probability of success.

Where rushes, reeds, flags, willows, and other aquatic

plants grow spontaneously, or where frogs are observed to lie squatted down close to the ground, in order to receive its moisture, there generally is water underneath. Persons who make it their business to find out springs for fountains, cascades, &c. look upon it as an infallible sign of subterranean water, when they see a vapour arise frequently from the same spot of ground. Others assure, that wherever swarms of little flies are seen constantly flying in the same place, and near to the ground, in the morning, after sun-rise, there certainly is water under that spot. Again, where water is wanted on land apparently dry, let a man before sun-rise, lie down flat upon his belly, resting his chin upon his fist, placed close to the ground, that his view may be directed quite horizontally, and not rise too high, and in that situation let him look steadfastly toward the east. If he then sees a tremulous vapour arise from any particular spot, let him mark the place, by noticing some neighbouring tree, shrub, or other indication, and he will find water underneath it. But this experiment is to be made only on ground whose surface is dry ; because other exhalations, from a damp surface, would be apt in this case, to mislead the inquirer.

Another way is this. Dig a hole three feet wide, and at least five feet deep, and place at the bottom of it, when the sun is about to set, a pan, or basin, rubbed with oil on the inside : let the bottom of this vessel be uppermost ; cover it with dry hay, fern, or rushes, and over that with earth, and if any drops of water are found standing on its inside the next day, a spring is probably not far off. Or, put a new, unbaked, but well dried, earthen vessel into such a hole, and cover it as before ; and if there be water in that place, this vessel will be found soft and wet the next day. Likewise if wool be left all night in a trench of this kind, and water can be squeezed out of it the next day, little doubt remains but that plenty of water may be met with there.

The month of August is generally looked upon as the most proper time to search for water ; because we apprehend, as the heat of the preceding summer will have warmed the earth to a considerable depth, any steam arising from water resting on an impervious soil underneath, and particularly in hollows on the surface of that impervious soil, will then be most exhaled by this warmth. Now it is this steam, or vapour, which produces the before-mentioned signs.

By whatever method water is found, the means of coming easily at it are the next consideration. If it be on a plain, there is no other way than digging a well. In doing this, the substance under the sand or light soil must be dug into, to form a reservoir of water for occasional wants ; and this reservoir should be made deep and large, in proportion to the quantity wanted. If there were no such reservoir, the water, after having risen a little above the impervious body underneath, would glide along its surface, as usual, and very little of it could then be obtained, either by pumps, buckets, or any other way employed to raise it. If the well is made in a sloping ground, and the declivity is sufficient to give it an horizontal vent, it will be worth the husbandman's while to dig such a passage, and by means of pipes, or any other conveyance, to carry the water across the light soil, through which it would otherwise sink. The greatest quantity of water will be obtained in this manner, because there will then be a continual stream.

If the soil is very deep, and its surface has inequalities in which rain water runs in any quantity ; this may be collected in ponds made in the lowest parts of such grounds.

If a body of clay is found near the surface, it is worth the farmer's while to bore, that he may know at what depth a bed of sand or gravel may be met with : for he will be sure to find plenty of water in this last. If this be in a declivity, he need only cut an horizontal passage, and the water will flow so freely, as even to double the value of his land.

Here again the farmer needs not ever to be at a loss, because it cannot be very difficult to make a pond in a clayey soil, which is, of itself, retentive of water. But it may, perhaps, be advisable, even in this, to cover the bottom of the pond with a coat of gravel, in order to prevent its being poached by cattle, whose feet would otherwise be apt to sink deep into the clay. Some farmers judiciously pave the declivity by which the cattle enter into the pond, and this renders it much more lasting than it would otherwise be, and preserves the water clean.

When ponds are made in a loose soil, much more care is necessary. The bottom and sides there must be covered with a thick coat of the toughest clay, from a foot to two feet thick, well rammed down. Some have added hair and

and loam to the outer part of this covering, with a view of rendering it less liable to chap: but a thick coat of gravel is more necessary here, that the feet of the cattle may not pierce through the clay. Perhaps the expence of paving the whole inside of a pond, might, in the end, be money well laid out.

The greatest difficulty of finding water is in chalky soils, because these are not, of themselves, very retentive of it, and generally lie in such thick beds, that it is expensive to dig through them. However, it should be tried; and if sand or gravel be found underneath, water may be depended on. Even here, ponds are easily made, by digging into the chalk, and lining them with a coat of clay, as before directed. If there is a supply of proper manure, such as clay, or marle, this situation is well adapted to grain, which loves to stand dry; and as this kind of ground produces more forward crops than clayey or strong soils, it may be sowed early with corn, which will not, in that case, be so apt to be parched up as grass is, by the summer's drought. If a good soil can be made here, a foot deep, it will yield plenty of various sorts of pasture, either roots or grasses, as the farmer shall judge most proper: or it may be planted with different kinds of timber-trees. For the method of making ponds in gardens, see the art *de* DRINKING-POOLS.

Mr. Young, in his *Annals of Agriculture*, vol. VI. inserts the following method of constructing ponds. See PLATE XXIII*.

"As you are not unacquainted with that part of the East-Riding of Yorkshire, called the Wolds, the value of any discovery, by which so dry a tract of country can, at all times, and in all situations, can be supplied with water sufficient in quantity for the numerous flocks of sheep, and other cattle, kept upon it, and sufficiently good in quality for domestic purposes, cannot be doubted by you; if therefore you think ponds of the kind I am about to describe, may be of use to countries in similar circumstances, (and such there are in various parts of England), or where the water is brackish or otherwise of an unwholesome quality, you are at liberty to insert this account of the method of making them in any future volume of your *Annals of Agriculture*.

"About twelve or fifteen years ago, a man, by profession a well-sinker, first discovered the method of making these ponds; within this period the number of them has been so increased, that scarce a sheep-walk, or even field is now without one; and the use of them is creeping into the neighbouring country, in situations where otherwise water could not be had; so sudden and general an adoption is sufficient proof of their utility; before this period many sheep-walks were entirely destitute of water; it is, however, worthy of remark, that most of those sheep which have now a constant supply of water, are by many intelligent persons, thought, from circumstance only, to be considerably improved; whether, however, this opinion is well founded, I cannot, from my own experience, assert, not having had opportunity to make the necessary observations; but it does not admit of a doubt, that in very dry weather, much fewer sheep die than formerly: this in several instances was fully proved during the uncommon drought of a late summer, where the loss among sheep which had not this resource, was very great, while that among others of the same kind, and in similar situations, which did not labour under that want, was very trifling; perhaps not greater than would have taken place in any other equal space of time.

"The line A marks a circular hole dry in the ground of the size required, upon which a layer of clay B, sufficiently moistened, is to be carefully beaten and trod down into a compact and solid body of about the thickness of a foot.

"Upon this C is a layer of quick lime finely and uniformly spread over the whole, of one inch or upwards in thickness.

"D is another layer of clay of about one foot in thickness, which is to be trod and rammed down as the former; upon this are spread stones or coarse gravel E of such thickness as may prevent the pond receiving any injury from the treading of cattle, who would otherwise break through the body of the clay and lime, and by so doing let out the water; after this, according to the section, the pond will remain five feet deep and 45 feet diameter; the size they are usually made, D being the line of the water and of the ground.

"Brick-clay is by no means required for the ponds; any earth sufficiently tenacious to bear beating into a solid compact body, though not approaching to a pure clay, will very well answer the purpose.

"It is usual, where there is an opportunity, to make the

pond in a little valley, or at the bottom of a declivity, or near an high road, in which situations a stream of water may be brought into it after sudden showers or thaws, the object being to get it filled as soon as possible after it is made, that the sun and winds may not crack the clay; if it is not likely to be filled soon, some straw or litter must be spread over it; but in general after it is once filled the rains that fall in the course of the year will keep it full, no water being lost otherwise than by evaporation and the consumption of cattle.

"A pond of this size is usually made for from 4l. to 6l. exclusive of the time, and expence of carriage of clay, when that is necessary; the first varies in price in different countries, the last will depend upon the distance.

"It is to be remembered that the whole excellence of the pond depends upon the lime; care must be taken to spread it regularly and uniformly over the surface of the lower bed of clay; it is well known that ponds made with clay alone, however good its quality, and whatever care may be exerted in the execution, will frequently not hold water; these with the above precautions rarely fail. Never having seen a pond dug up after it had been made some time, I cannot say by what means the lime prevents the loss of water; one of these two is probably the cause; either the lime sets like terrace into a body impervious to water; or what I should rather think, the causticity of the lime prevents the worms in dry weather from penetrating through the clay in search of the water; certain, however, it is, that with lime, thus applied, ponds may be made in sand, however porous, or on rocks however open, in neither of which situations are they to be depended upon, when made with clay alone."

POOL. See DRINKING POOL and RILLS artificial.

POPLAR, a genus of trees, of which botanists enumerate four species; viz. the common white poplar, with large leaves: the common white poplar with smaller leaves: the common black poplar, and the poplar with trembling leaves, called the aspen tree. The poplar, whether black or white, may be easily propagated, either by layers, cuttings, or suckers, of which the white kind always produces a great many from the roots. The best season for the transplanting these suckers is in October, when the leaves begin to decay; and they should be removed into a nursery for two or three years, at the end of which time they will have got strength enough to be transplanted into the places where they are to remain.

When they are to be propagated by cuttings, it is best to do that in February, cutting off large truncheons of eight or ten feet long; which, being thrust down a foot deep in the ground, will take roots very quickly, and, if the soil be moist, will grow to a considerable size in a few years.

The black poplar is not so easily raised from these large truncheons, but should be planted in cuttings, of about a foot and a half long, planting them a foot deep in the ground. This will grow on almost any soil, but does much better on a moist one than on any other. They are the fittest of all trees for raising a shade quickly, as they will grow fourteen feet in height sometimes in one season, and in four or five years will be large trees.

A considerable advantage may be obtained by planting these trees upon moist boggy soils, where few other trees will thrive: many such places there are in England, which do not, at present, bring in much money to their owners; whereas, if they were planted with these trees, they would, in a very few years, over-purchase the ground, clear of all expence: but there are many persons in England, who think nothing, except corn, worth cultivating: or, if they plant timber, it must be oak, ash, or elm; and, if their land be not proper for either of these, it is deemed little worth; whereas, if the nature of the soil was examined, and proper sorts of plants adapted to it, there might be a very great advantage made of several large tracts of lands, which at this time lie neglected.

The wood of these trees, especially of the white, is very good to lay for floors, where it will last many years; and, for its exceeding whiteness, is, by many persons, preferred to oak; but being of a soft texture, is very subject to take the impression of nails, &c. which renders it less proper for this purpose: it is also very proper for wainscoting of rooms, being less subject to swell or shrink than most other sorts of wood; but for turnery ware, there is no wood equal to this for its exceeding whiteness, so that trays, bowls, and many other utensils, are made of it; and the bellows-makers prefer it for their use; as do also the shoemakers, not only for heels, but also for the soles of shoes:

it is also very good to make light carts ; the poles are very proper to support vines, hops, &c. and the lopping will afford good fuel, which in many countries is much wanted.

Miller's Gard. Dict.

Red POPPY, or RED-WEED. The common wild red poppy is one of the most mischievous weeds the farmers are plagued with among their corn, and it is the most difficult to thoroughly destroy of almost any other. Its seed will lie a long time in land unploughed, without ever shooting ; but they will be sure to grow with every crop of corn. Mr. Tull gives an instance of the seeds of this plant being buried four and twenty years in a field of saintfoin, and at the end of that time, the land being ploughed for wheat, they all grew up among the corn, though they had lain dormant so long before. *Tull's Horse-hoeing Husbandry.*

POTATOE, or POTATO, the name of a well known plant, the roots of which make a very nourishing food.

Mr. Houghton describes the potatoes to be a bacciferous herb, with esculent roots, bearing winged leaves and a belled flower ; and says, that according to his information, which is allowed to be very right in this respect, it was first brought from Virginia, by Sir Walter Raleigh, who, stopping at Ireland, about the year 1623, gave away a number of these roots, which were planted there, and multiplied so exceedingly, that, in the wars which happened afterwards in that country, when all the corn above ground was destroyed, potatoes became the chief support of the people : for the soldiers, unless they had dug up all the ground where they grew, and almost sifted it, could not have extirpated them. The Philosophical Transactions observe likewise, that the Irish were relieved from their last severe famine, which lasted two years during which all their corn failed, merely by the help of this root. From Ireland it was brought to Lancashire, now famous for its potatoes : and the culture of this plant has, within these last thirty years, been extended to almost every part of England. The rich, who, at first, deemed them fit for none but the meaner sort of people, now esteem them so much, that Mr. Miller thinks the quantity of them which is cultivated around London only, exceeds that of any other parts of Europe.

The red-rooted potatoes have purplish flowers, and the white-rooted (for Mr. Miller distinguishes only these two general varieties) bear white flowers.

The potatoe seldom perfects its seeds in England ; and if it did, the raising of it from them would be much more tedious and uncertain than propagating it by its roots, as is the general and right method : for these multiply exceedingly, and may be made to yield vast crops, with little cost or labour.

“ The Irish husbandman, says Mr. Switzer, after blaming the English for planting this root uncut, because it often contains five or six eyes, or perhaps more, from which the produce of the ensuing year is to spring ; and also for not allowing that bulb, or rather the great number of shoots and bulbs that proceed from it, a space of earth sufficient for their nourishment, which is the reason why so many poor, stunted, unserviceable potatoes are dug up in the autumn, relates the practice of his country, which is to chuse middle sized roots, for the largest are generally eaten, to single out the eyes, that seem strongest and most vigorous, and to cut them out in squares of at least half an inch every way : so that one root will sometimes furnish three or four good pieces to set.

“ The ground, prepared for planting, is marked out for beds four or five feet wide, with intermediate alleys of two or three feet. It is then trenched, only a single spit deep, and the bottom of this trench, made as in common garden-trenching, is covered with dung, long and short, taken out of a wheel-barrow which stands at the labourer's elbow. The potatoe-eyes cut as before directed, are placed upon this dung, at about five or six inches asunder ; and this trench is filled up with the mould taken out of the next, which is marked by a line at the distance of two or three feet. This trench is again filled with the mould of the next, and so on to the last, which is filled from the alley.

“ The use of the dung thus laid at the bottom of the trenches, is not only to make the roots grow single, for not above one root, or at most two, will in this case be produced by each eye, and these will be large and well fed ; but it is attended with the farther advantage of making the potatoes run, and spread themselves to a certain determinate depth, which is no small help to their growing large.

“ The last thing to be done to them is, in April or May (for they are planted in February or March) as soon as they begin to rise, to dig the earth out of the alleys, as is done for asparagus, and to cover the potatoe bed with it,

about five or six inches thick. This will give new life and vigour to the roots, will keep the green from running too much to haulm, and will make the bulbs grow much the larger. By this means the crop of fine large potatoes will be almost the double of what is obtained when they are planted promiscuously in the common way : nor will any farther culture be requisite till they are fit to be dug up, except the pulling out some of the largest weeds.”

Mr. Miller's reasons for disapproving of the planting either of the small offsets entire, or the eyes cut out of larger roots, are, that though the former generally produce a greater number of roots, these roots are always small ; and that the cuttings of the larger roots are apt to rot, especially if wet weather happens soon after they are planted. He therefore recommends, to make choice of the fairest roots for setting, and to allow them a larger space of ground, both between the rows, and between the plants in the rows ; and he assures us that he has observed, when this method has been followed, that the roots in general have been large the following autumn. M. Duhamel, in his Elements of Agriculture, does not object at all to the planting of the cuttings.

The soil in which this plant thrives best, is a light sandy loam, neither too dry nor over moist, but brought to a fine tilth, and ploughed very deep : for the deeper the earth is loosened, the finer and larger the roots will grow. In the spring, just before the last ploughing (according to Mr. Miller's method) a good quantity of rotten dung should be spread on the ground, and this should be ploughed in early in March, if the season be mild : otherwise it had better be deferred until the middle or latter end of that month ; for if a hard frost should come on soon after the roots are planted, they may be greatly injured, if not destroyed, thereby ; but if they can be planted in the spring, without that danger, the better it will be.

The last ploughing should lay the ground even, and then furrows should be drawn three feet asunder, and seven or eight inches deep. The roots should be laid at the bottom of these furrows, about a foot and a half asunder, and they should then be covered in with earth.

After all the ground intended for potatoes is planted in this manner, it must remain in the same state till near the time when the shoots are expected to appear ; then it should be well harrowed both ways, as well to loosen the surface and render it smooth, as to tear up the young weeds which will have begun to grow by that time. If much wet has fallen after the planting, it may have caked the surface of the earth, so as to retard the sprouting of the plants ; and this harrowing will, in such case, almost answer the intent of a first hoeing.

I have placed the rows of potatoes at three feet distance, continues Mr. Miller, in order to introduce the hoe-plough between them ; because that will greatly improve their roots : for by twice stirring and breaking of the ground between these plants, not only weeds will be destroyed, but the soil will be so loosened, that every shower of rain will penetrate to the roots, and greatly quicken their growth. But these operations should be performed early in the season, before the stems or branches of the plants begin to fall and trial upon the ground : for after that, it cannot be done without injuring the shoots.

If these hoe-ploughings are carefully performed, they will prevent the growth of weeds, till the haulm of the plants cover the ground ; and after that there will be little danger of their growing so as to injure the crop ; for the haulm will keep them under : but as the horse-hoe can only go between the rows, it will be necessary to make use of a hand-hoe to stir the ground, and destroy the weeds in the rows, between the plants. If this is well done, in dry weather, immediately after each of the two horse-hoeings, it will be sufficient to keep the ground clean until the potatoes are fit to be taken up ; which will be, very soon after the first frost in the autumn has killed the haulm. They should not remain much longer in the earth, lest the roots themselves be frost-bitten, which spoils them. A four or five pronged fork is better to dig them up with, than a spade, because it is less apt to cut them : but a principal thing to be considered here, is the clearing of the ground thoroughly of them : for if any are left, they will shoot up among the next crop, whatever it be, and do considerable damage, especially if it be wheat, as is generally the case, sown in the common broad-cast way.

The best way of keeping these roots during the winter, is to lay them up in a dry place in very dry sand, or in fine and perfectly dry earth.

The method of laying dung only at the bottom of the furrows in which the roots are planted, "is a very poor one, says Mr. Miller; because, where the potatoes begin to push out their roots, they are soon extended beyond the width of these furrows, and the new roots are commonly formed at a distance from the old, so will be out of the reach of this dung, and consequently will receive little benefit from it." But rather the contrary would seem to be the case, according to the Irish husbandman, who seems to speak from experience, when he says, he had intended expressly to answer this very objection, that "the dung is placed at the bottom of the furrows on purpose to make the roots grow single; and that its being so placed is attended with the farther convenience of making the potatoes run and spread themselves at a certain determinate depth, which is no small help to their growing large." Facts must here determine which is right: as they also must in regard to some parts of what Mr. Miller adds in the following words. "As most farmers covet to have a crop of wheat after the potatoes are taken off the ground, so the land will not be so thoroughly dressed in every part, nor so proper for this crop, as when the dung is equally spread and ploughed in all over the land, nor will the crops of potatoes be so good. I have always observed, where this method of planting the potatoes has been practised, the land has produced a fine crop of wheat afterward, and there has scarce one shoot of the potatoe appeared among the wheat, which I attribute to the farmers planting only the largest roots: for when they have forked them out of the ground the following autumn, there have been six, eight, or ten large roots produced from each, and often many more, and scarce any very small roots; whereas in such places where the small roots have been planted, there has been a vast number of very small roots produced, many of which were so small, as not to be discovered when the roots were taken up; so have grown the following season, and have greatly injured whatever crop was on the ground."

Will not a thorough ploughing and good harrowing, after the crop of potatoes has been taken off the ground, intermix the dung laid in the furrows, and the contiguous earth most impregnated thereby, with the rest of the soil, perhaps almost as well as if the dung had been spread equally over the whole field, at the very first? If it will, the presumption seems strong in the favour of the Irish method. For certain it is, that the land ought to be well ploughed and harrowed after the potatoes are removed, before it is sown with any other crop; unless the seed for that crop, which generally is wheat, be sprinkled by hand between the rows, as they are dug up, and there covered with the earth then turned over. This is practised in some parts of France; but, as M. Duhamel observes, the grain is so apt to be distributed unequally in this method, that it is better to plough the ground, and sow it in the regular way.

If the farmer apprehends that his land has not been thoroughly cleared of the potatoes, and is therefore afraid of their damaging his ensuing crop, his best way will be to lay it up very rough against winter; because the frosts of that season are known to kill and rot all potatoes in the ground exposed to them, and it will at the same time be thereby finely prepared for spring corn; especially as it will have been well enriched by the haulm of the potatoes lying upon it.

Though potatoes delight most in a light sandy loam, neither too dry, nor over moist, as was observed before; yet Mr. Maxwell says he has seen them thrive well on ground that seemed to be very bad; even in deep moss, which could not bear horses to plow it, but which is considerably bettered by them; and on coarse heath, where they were succeeded by grain, without more dung than was laid on at first. Of so improving a nature are they, and so much is the land enriched by the rotting of their stalks among it, and the digging it gets in raising them.

Several experiments communicated to M. Duhamel concur to prove the extraordinary increase of potatoes cultivated with the horse-hoe; but as this will always be the consequence of the New Husbandry, whenever it is properly used, I shall only borrow from him, on this occasion, M. de Viller's account of his method of practice, because it is the clearest and most concise.

"There are, says he, several sorts of potatoes. That which I cultivate is the middle sized. It is planted about the end of April, or the beginning of May, and it ripens

in October. My beds are five feet wide. I give them two ploughings in the spring; at the second of which I half-fill the main furrow. Before I plant, I cut a small furrow with the single cultivator, which likewise loosens the earth; but if it be moist, I put a double spring-tree bar to the cultivator, to avoid the poaching of the horses. I then plant the potatoes a foot asunder in the row, choosing for this purpose such as are about the size of a walnut. They are thrust in by hand, two or three inches deep; and if the mould does not then cover them sufficiently of its own accord, a little more is pushed down upon them.

"A slight hand-hoeing can hardly be avoided afterwards, to destroy the weeds which spring up at the same time as the potatoes: but this hoeing need not extend farther than three or four inches on each side of the row, because the plow will do the rest.

"I give the first hoe-plowing in the spring, as for wheat; but earlier or later, according to the condition of the ground.

"My second hoe-plowing is given as soon as the plants are tall enough to be earthed up; that is to say, when they are eight or ten inches high. I then turn the earth up towards them as much as possible.

"As this plant spreads greatly, and shoots out very fast, it would be impossible to give more than two of these hoeings, if one should neglect to take advantage of the time when its leaves and branches do not entirely cover the bed.

"The roots are dug up in October, or perhaps somewhat earlier or later, according to the season, with a strong iron prong; shaking and clearing them well from the mould. They are then left to dry for some hours, and are afterwards laid up in a place where the frost cannot reach them.

"This fruit, which yields surprisingly, is of great service to feed and fatten cattle, especially when it has been boiled a little. They like it very well raw, after it has been kept a few months above ground: but it is best for them after it has been boiled."

The reader is obliged to the ingenious Mr. Irwin for the following account of cultivating potatoes in Ireland, and which we shall give in his own words:-

"The potatoe, says he, is become a root of such immense utility, especially to the poorer sort, within this century, that too much, methinks, cannot be said towards improving, and extending the culture of it.

"In Provence, Dauphiny, Switzerland, and several other parts of Europe, and even in America, it yields commodious, abundant relief to the more indigent, as being easily and plentifully propagated in almost every kind of soil.

"In Ireland particularly it is the principal food of the poor during the greater part of the year, without which, since the late unproportionable rise of land in that kingdom, to the trade of it, they could not well subsist. And, indeed, it seems a particular favour of Providence sent to them on this account.

"In times, not very remote, lands were cheap there, and the peasantry, consequently, then lived on nourishment somewhat more luxurious, diversified: their labour also was less burthensome. But now, being obliged to work hard at four-pence and sixpence a day, and their rents considerably augmented, it will not seem surprising that this root alone has become the staple of their support, and that they have been the first people in Europe, or, perhaps in the world, that have led the example in an extensive improvement of it. This may naturally be supposed to arise from close-pressing necessity, the most cogent and inspiring of all motives.

"In truth, with much reason; for a poor labourer, in that ill-fated country, is driven to seek his sole refuge for subsistence in this root, for the inexorable imposition of a hard-hearted landlord, (sorry I am to have it to say, too many of them grind the poor; but hope it will not be long the case) who thinks he cannot get too much for his land out of the persons, or purses, of his independants, and who hath so inverted the old customs, that a hewer of wood, and drawer of water, (and many of these perhaps descendants of former proprietors) can afford himself but a miserable scanty platter of potatoes, seasoned with a palatable grain of salt, and washed down with a draught from the next rivulet, to support the fatigue of thirteen hours (statute quantity) of unceasing labour, about his ancient mansion.

mansion-house, or in his elegant gardens, well-laid out closes, or refreshing bog-holes.

"The potatoe is a root, a little of which is very filling, quickly appeasing hunger; but by no means a lasting solid nourishment for a labourer, as evidently testify the squalid looks of numbers of the poorer Irish; though at the same time it is in general wholesome, agreeing with most stomachs, that can vary their food; but like other productions of the earth, forbid in many cases by the medicinal tribe.

"There are several ways of breeding potatoes in Ireland, which partly arises from the difference in soil, and kinds of seed. The different soils for this purpose in use in my neighbourhood, for about twenty years past, and which, I believe, are pretty general, are the following, wherein they are abundantly propagated, viz.

"First, On rich clay land without any manure, vulgarly called *grafs* potatoes.

"When a lease is near being expired, that is, during the last seven years of it, if there be no covenants grounded on the statute against waste, &c. the tenant, finding no hopes of a renewal, sets considerable tracts in this way, where the soil will admit of it.

"Secondly, On good ley land well gravelled, (otherwise sanded) which ought to be done a year before planting. But the poorer sort, who are the chief cultivators of this root, are obliged to sand and plant at the same time, or nearly thereabouts; which is very destructive to themselves, their potatoes not having the proper benefit of the manure; at least one part in three of the return are on this account exceeding small, and are from hence called *poreens* by them, being a diminutive expression. Whole fields are set in this way, commonly called *spaddane*, in which a considerable trade is driven; especially in the provinces of Munster and Connaught.

"Had it been properly and moderately done, it would be a fine preparation for the increase of corn, and the laying down and bringing in, or, in other terms, the reclaiming of land; but the poor do it so negligently, and mangle it so intolerably, having but a short temporary use it in, besides paying near double the worth of it, that this manufacture, which might otherwise be of considerable benefit to Ireland, is, as now carried on, rather the contrary.

"Thirdly, On ground previously gravelled (that is perhaps six months before) and dunged at setting-time. There is but little done in this way, except by the gentry and renters of land, for their own private use; it being as yet out of reach of the peasantry, unless in a few instances.

"Fourthly, On the ley with dung alone. Marle is not in use in my neighbourhood, though there is plenty of it in several parts of it; therefore cannot yet inform you how it would do for the potatoes in that district. As to potatoes set in the ley with dung alone, this manufacture also is done, as you may judge, mostly by the more opulent. I have, however, often seen large fields set in this way to the public: but it is not of late years so much the custom, this sort of land being commonly kept for grazing: this hurts the land; and any preparation out of the ley for potatoes will, if not previously gravelled.

"Fifthly, In arable or stubble land, vulgarly called *sticking* or *thrusting* of potatoes, because they are sown with a stick, pointed at the end, about an inch diameter, and two feet long, with the *loy* (otherwise the Irish *spade*). In this method dung is also used, which shall be noticed in loco.

"These are the most general methods that now occur to me, or I believe that are in use. There are, however, some others arising from the quality of the seed, practised only by the curious, in which the plants are put down at nine or twelve inches asunder every way, in little hillocks (like the hop plant), as practised in several counties in England; and, if you land them at certain proper stated times, while vegetation continues, you will have a handsome nest of large oblong potatoes at every landing.

"I made the experiment of one sort in my garden; and out of half a dozen potatoes cut into several pieces, each having an eye, I had, to the best of my remembrance, without exaggeration, a quantity nearly equal to twelve Winchester bushels.

"This kind of potatoe is introduced into Ireland but of late years: it is however well known there.

"A potatoe entirely black is also in use in Fingal, near Dublin, fructifies abundantly, and eats exceeding dry, which principally marks the goodness of this root in almost every instance.

"There are several kinds of potatoes. Mr. Maxwell, of Arkland in Scotland, a very judicious gentleman, has particularly noticed six sorts, viz. the long red, the round red, the long white, the round white, or Spanish potatoe; the blue, the leather-coat, and an early kind that comes in a month sooner than the common sort, though planted at the same time.

"This root being greatly manufactured in Ireland, they mix most of the better sorts promiscuously, both for use and seed.

"I remember, about twenty-five years ago, the large red potatoe, then called the *Castonian*, (perhaps from Castile) as also the oblong Spanish white potatoe, to be chiefly in use; but now a lesser sort, such as the Munster or kidney potatoe, of a whitish or lightish yellow colour, the leather-coat, or round red Cronian potatoe, with a rough thick skin, and particularly that styled the Spanish white potatoe, are mostly in use.

"All these sorts are cut for seed, according to the number of eyes on them, and thrive generally well with very little care; so that all sorts being now so plenty, and answering so well, there are (as we may easily judge) no over nice distinction made about them there. The poorer Irish, who affect not to plant this root in bottom lands, or wet swampy grounds, unless hard pressed for soil, are even in this case seldom attentive about the kind of potatoe they put down, the return being commonly wet, unfit for eating, and only proper for seed, which (from my little experience) I think, makes but indifferent, though sown in the best prepared upland; for too much moisture, as well as too much dung, makes a potatoe wet: and plant it when you will, I am apprehensive it never loses this quality, which is the worst it can have, except being rotten, or frost-bit; nor will any eat so well, raised from dung, as without.

"As the potatoe thrives in different soils, so there are different methods of cultivating it: I will therefore now proceed to that most generally in use in my neighbourhood, (and indeed all over the kingdom) called *grafs* potatoes or *spaddane*, and by some (improperly) *con-acres*, which seems to be the natural culture, but doubtless not so good to make the land stand long proof, (notwithstanding the gravelling) as if artificial manures were added, such as dung, compost, lime, &c. for marle, limestone, gravel, sea-sand, shells, &c. I consider in the class of natural manures, and the best; and Providence hath kindly given them in every spot, (even in the unpromising deserts of Zara, &c.) had we known how to come at them.

"Land in the ley, (as I said before) and that which requires no manure, the Irish seek most greedily after; some of which has not been ploughed perhaps within this century: so that you can only just distinguish that it has been tilled, and that the tilth is generally curved, the old people inclining the plough with the casual shape of the field, so as to let the water in the furrow have a drip or a fall.

"When a peasant has the good luck to get a bit of such choice ground, (for two or three of them will be concerned in an acre, and few take more than one) he follows the old ridge with his *loy*, or Irish *spade*, unless compelled by the possessor of the land to make his ridges straight, which he most unwillingly does, and at best but awkwardly, with a rope made of hay or straw, or some of his wife's worst tow; neither of which stretching right, and often breaking, seldom admit well-looking ridges: these he makes from one end of his ground to the other, the beds being about three, or at most four feet wide, and the furrows or trenches about two. When he deposits the seed on his bed, at about four or six inches at most asunder, he divides the turf of his furrow into two equal parts, which he turns alternately in sods on the edge or verge of each bed, the green side on the potatoes cutting the sods on three sides or angles, leaving that next the bed uncut. This laborious work the poor fellow does surprisingly quick: two more men follow him, one digging the under stratum, and throwing up on the middle of the bed as much of the earth as he conveniently can with his *loy*; the remainder the third man calls on with his

his shovel, settling the bed in the form or manner in which it is to remain.

"Some cover their potatoes at first (through want of time, with only the sod; and about four or five inches of earth, and finish them, perhaps, that is, cast the last covering on them, not for a month or six weeks after; which possibly may greatly check their growth. Many account this the best way, and it is become common; but I attribute the neglect of not finishing their potatoes, (as the term is) in due time, to no want of proper knowledge in the common Irish, but their inability to give the proper attention to their own little affairs, occasioned by the greedy severity of their masters, as before observed.

"Others there are (and many) who, making the furrows unproportionably narrow to the beds, throw up a third spit or stratum, and perhaps not until two months after the first setting.

"This pernicious method may possibly destroy, or check the weeds; but certain I am, it will not contribute to the increase or largeness of the root, in the unphysical or over heavy manner in which I have seen it done; because this lower stratum, which is mostly sand, remains on the top of the richest part of the soil, and being thus unmixed with it, prevents it from receiving the proper benefits of the air, &c; besides, too great a covering on the potatoe is highly prejudicial to it.

"In other cases, these stratums thrown up, and mixed into a good tilth, would answer wonderfully; mixing well, being the life of good tillage. I would therefore in this place recommend to our farmers (who are too penurious of their land) to make their potatoe trenches so wide, as not to require throwing up much of the third or sandy stratum on the last covering, or landing of their potatoes; and they will find a much greater return, and one half (or more) less of poreens, or small potatoes: which is an object highly worthy of their notice. The experiments I have made, I purpose repeating on my return to Ireland, and hope to prove this simple method to exceed that in the hillock, or in the drill way.

"In this manner all ley land is sown with potatoes by the common people, and most others, whether manured or not. If dunged, the dung is laid out as the ridges are to be, but the sand is spread all over the surface. Commonly little boys and girls precede the setters on the ridges, laying down the seedlings or potatoe eyes, which they do very quick and tolerably well, at the appointed distance. This seems a giddy part of their business, and well suited to their years; but custom makes them perfect in it.

"The next general method is planting potatoes in stubble ground, which is, in the common way above-mentioned, by dunging it well, and sometimes by ploughing it in, and then shovelling up the ridges, a man going before, lightly digging them, that there may be a sufficient quantity of mould to cover them; but this the poorer sort cannot well compass to do, and always avoid it when they can get a fresh or ley surface.

"Nor do they sow them to choose, the second year, in the same ground, without dung or some other artificial manure, (for the natural, such as sand, marle, &c. would not do) unless it be exceeding good.

"Lime, indeed, in this case, will very probably answer, but it is rarely tried.

"There is also a custom a good deal in use, which is by sticking or thrusting potatoes in stubble land fresh ploughed, which is done in this manner: a man (but seldom two) goes on the crown of a narrow ploughed set, and sticks his loy, or Irish spade, in it, every here and there, with his right foot, holding it in his left hand, and with it pushing the spade once, and sometimes twice from him, to make an opening, (which I have seen done with a great deal of dexterity) and with the right hand, that contains the seed, (a convenient quantity of which he carries in an apron, or cloth, tied round his middle, so as to let the contents be easily come at), he throws one, and sometimes two sets, or eyes, into the opening which the loy makes behind; and on his drawing it away, the loosened earth falls in and covers them. Soon after he dungs the ridges, and covers them up, as in the preceding method, with mould out of the furrows.

"Sometimes also they do this work with a stick about eighteen inches long, and an inch or so diameter, pointed at one end, and somewhat curved at the other. By this easy means, husband, wife, children, and servants, (if they

have any) and a friendly neighbour or two, (who may be helped in return) assist at it for greater expedition, especially when the season happens to be advanced.

"In Scotland they do this work somewhat differently.

"In Ireland also there are many, who sow potatoes after the plough; the ploughman letting the sets drop in as he goes along; and a harrow matched to the same plough, following him close behind, covers them in. There is no great difficulty in this, the land being in tilth. Over all they put dung; but they should mind to give it a light covering, that the substance of it might impregnate with the adjacent earth, which it would not do, but evaporate, by being left exposed to the air, &c. yet this precaution many are very negligent in.

"The other methods, as in the drill, or hillock, or horse-hoeing way, &c. are little used there, except among the more curious; but they being well known in England, it is needless to mention them in this place.

"The next thing requisite is the fencing, which should be done, at farthest, before the stalk begins to appear; for, if the cattle, that are in that season greedy for fresh vegetables, get at them, the roots of such as they nip will never come to the size they otherwise would.

"This is well known in Ireland; and yet the poor, chiefly I believe from inability, and partly from a sort of carelessness, or rather laziness, they still inherit (notwithstanding the mixture of English and Norman blood, &c.) from their Spanish ancestors, are very remiss in this respect; especially in the chiltern, or more fertile parts of the country; where, in most matters of husbandry, they leave too much to chance, relying on the bounty of the soil.

"About me, and in many other parts, they very commonly do not put on the first covering till about the middle of May; and the second, perhaps, not for a month after; so that it is often July before they fence them properly: and where many of them are concerned in a plantation (as is usually the way) it is troublesome and difficult to get each man to do his part of ditching, which commonly is but a sorry mound of sods, with some bushes sodded down on top, to keep out sheep, that smell this plant when it rises (as cattle do corn) and are very dexterous in getting at it.

"Some of these poor people are so heedless, they never can be brought to make their fences; and then the owner of the ground, in his own defence, is obliged to get it done at an advanced price, and they do pay for it, or their potatoes remain.

"Many of them, especially in cheap years, leave them on the landlord's hands; and, unless a farmer collects himself, or has a good servant to do it, the rent is not had without immense trouble, and some of it never. Notwithstanding these difficulties, many farmers have made easy fortunes in this way.

"Thus it happens, at the time they are often finishing the fencing, they ought to be weeding their potatoes. The weed that mostly annoys them is the Scotch thistle; this should be cut away in June, and if the soil should be so rich as to require a second weeding (which is very often the case) it should be done in August. There will be no other trouble with them till digging time.

"The best time for this work is the latter end of October, or beginning of November, to avoid the early frosts, which are mortal to them: but if, by bad husbandry, they have been planted late, they should be left longer in the ground, and covered with litter, or haulm, to prevent being lost in this way.

"About Michaelmas the cattle are let through them, the roots not being then effected by the nipping or beating down of the stalk; this the peasants know by the colour of it, which becomes a dark brown, losing its verdure; as also by the apple and pear.

"The more needy begin to dig them for use in August, though they are not then near so long in ground as they are in England; which demonstrates the excellence and strength of the Irish soil.

"When gentlemen farmers dig their potatoes, they set on a great number of hands at once, two to a ridge: boys and girls gather them promiscuously, big and little, into bags containing about two Winchester bushels; and thus they are carried to the farm-house, and thrown into a room in one heap, part of which is destroyed by the frost, a great part by the kitchen, also by the hogs, who destroy them much while in ground, there being hardly

any fencing against them; a great part are also stole by the followers or hangers-on; and the remainder rarely suffices for seed, of so little value is this estimable root considered in those parts: and yet I have often known them at a very high price, from ten to twenty shillings, and upwards, the big barrel, which is the usual measure in the western parts of Ireland; that is, above two barrels, or eight bushels Winchester measure.

"Had they such places as Covent-Garden near them, the case would be very different: but where there are no convenient and brisk markets, the waste in farms is always great.

"Though, as I remarked before, low or swampy grounds do not answer well for potatoes, yet they sometimes thrive, and are large, the meat being generally scabby, close, wet, and heavy, from the too great impregnation of the water, which renders them unpalatable, and not the best for seed; however, such are chiefly used in this way: yet I have seen them planted in red bogs, which are the wettest and worst; and the bog being previously sanded and dunged, the stalk looked green and healthy, and some of the roots might perchance have eat very dry; but those planted in black, or drier bogs, have been found to succeed well.

"There is no culture perhaps yet known, will better reclaim waste and unprofitable lands, than that of the potatoe. Ireland can well prove the truth of this assertion in a numberless variety of instances.

"I have seen several tracts of woodland stubbed up, and brought into fine tilth, by means of the potatoe husbandry. America, I believe, can say the same.

"Of late years the hard-hearted sky-farmers, that is, the inferior sort, and even some of our gentlemen farmers, drive the poor into the mountains, moory grounds, wooded and stony lands, and even into the bogs; and when, by the culture of the potatoe principally they have reclaimed them, so as to be fit to admit cattle they are turned out without ceremony. I have in such places seen as fine crops of potatoes, and afterwards flax, and different kinds of corn, as I ever met with any where.

"The mountain and other surfaces, except bog, seldom fail being blessed by nature with lime-stone, gravel, (which is the commonest) or some other manure adapted, to them; so that it is nothing but hands, money, and a proper limitation of the grazing farming, that are wanting to make almost the whole kingdom look like a garden, or like England; I need go no higher with the comparison.

"It is true, in some few counties of Ireland, in particular districts, nature either has not been so bountiful, or the farmers have not found out the internal manures; being obliged to carry sea-sand, and other sorts, many miles; in which however they find their account, notwithstanding the impolitically too much limited trade of the kingdom.

"Before I dismiss this subject, it may be proper to observe, that a second crop of potatoes is sometimes taken out of the same land successively; but this is not common, at least about me, though I believe the land is as good as any in the province. On the contrary, the usual way is, after the first crop of potatoes is taken off, if the soil is strong, they immediately sow bere in it, or keep it till the following spring for flax, which requires an equally strong soil: or if the ground be but of a middling good sort, they sow it, just after the potatoes are taken out, with wheat, or keep it till the April following for barley.

"The sky-farmer generally takes the land into his own hand after the first crop of potatoes, and sows it with bere, wheat, or barley, for two or three seasons; after which, if he refreshes it with a summer or a winter fallow, he sows the said kinds of grain in it for two or three seasons more; then he takes two or three crops of oats; and when it is well impoverished, or drawn (as they call it there), he lets it for several years together, in con-acres, to the poor people, for at least one third more than the real value.

"From hence we may judge how much an alteration of method in husbandry is wanting in those parts."

Mr. Irwin is certainly right in saying, that lime would very agreeably answer; for in the isle of Man, though they are no farmers, yet they cultivate exceeding fine potatoes, as they are their principal food.

Some bring in different sorts of land by the means of them: in moory ground, after the heath is burnt off it, they mark out the beds, upon which they spread out the lime in near about the same quantity that is required in liming ground, or rather more; upon which they lay the seed in the usual manner; and after cutting the turf in the furrow, lay it on the verge of the bed with the heathy side

undermost, and cover them over with the mould out of the furrow, in the common method.

After coming up, they weed, or give them a slight covering to keep down the weeds.

When they raise them, it takes a little more labour; yet while they are digging a crop of very fine dry potatoes, they are gaining a piece of ground which was before useless, and making it fit for ploughing and bearing corn the year following.

Lime is found to be of excellent service to potatoes in cold sour land, which they manage after the same manner, and reap potatoes greatly excelling those without lime, on the same ground.

Lime is certainly a very fine manure for potatoes: they use it in the isle above mentioned without any other thing, on all sorts of land, even upon a light rich lime-stone soil; and it betters the quality of the potatoe surprisingly: besides fermenting and meliorating the soil, it has the property of attracting and absorbing any cold sour matter which may be prejudicial to vegetation.

About Castletown, in the same isle, they take a great deal of care in their culture of potatoes, and their product pays them very well for their trouble.

After marking out the bed with the spade, and spreading on the dung, or lime they begin at one end, and dig across the bed, making it a spadeful, all along, higher than the neighbouring ground.

Then they dig and cast the mould out of the furrows upon the bed in the common method; and after finishing it, they, with a kind of dibble, or shaft of a spade shod with iron, some round and sharp, others square, about three or four inches broad, plant in the seed, about six or more inches distances from one another; and when they come up above ground, they weed them as clean as a garden, and after they are stronger and higher, with a hoe, earth up the mould about the stalk; by which they kill the weeds and have exceeding fine potatoes.

This excellent root is very valuable on several accounts.

1. It is esteemed, and now very generally used at the tables of persons of all ranks; and inestimable for the poor, being a cheap and very wholesome food.

2. It is good for several sorts of cattle, particularly for hogs, either for food or fattening them.

3. It is one of the greatest improvers of land, whether new broke up, or preparatory to any other crop; and is in itself very valuable for the crop it produces. It is so likewise from another circumstance, viz. That it refuses no kind of soil, if not very wet, but will grow to considerable profit on drained bogs, heaths, or waste lands; and is of very easy culture.

Mr. Marshall, in his Minutes of Agriculture, remarking the great waste arising from the common method of cutting potatoes for planting, made the experiment with a common ivory apple-scoop about half an inch diameter, to draw out the eyes of the large potatoes in the manner which cheesemongers try their cheeses, and drew out a plug of the pulp, of a cylindrical form, about three quarters of an inch long, with an eye in the center of its end. After extracting ten or a dozen of these plants out of a root of a quarter of a pound, in weight the diminution is barely apparent; at least three ounces remained. If it had been taken from a larger potatoe, the loss of weight would have been still proportionably less; and the remaining pulp of equal value to the hogs as the same weight of entire potatoes. He then remarks, if one eye with two drachms of pulp be as prolific as seven eyes with two ounces, (which is frequently the case) what a saving! And as too frequently those employed in cutting potatoes for sowing leave six or seven eyes in each piece, it has commonly taken from ten to twelve hundred weight an acre; as many as by this method would have planted four or five acres, besides leaving eight or nine hundred weight of hog food.

Potatoes are so generally cultivated in Ireland, particularly in the province of Munster, that they are the principal, and almost the only food of the poor there, for almost eight months in the year. They do not esteem the roots for being very large, which they cannot be in their manner of planting; for they cut the roots into as many pieces, commonly, as the potatoe has eyes or buds; one bud to each piece, and set them in the ground singly with a dibble about eight or nine inches distant every way. Sometimes they cut them in slices, not so thick as a crown piece, with an eye to each slice; and, in general, are not solicitous to leave much of the potatoe to each eye; which, with

with close planting, renders the potatoes commonly small, and but few large ones among them.

Mr. Young, in his *Annals of Agriculture*, gives the following observations and experiments of different correspondents on the use of potatoes; among whom the Rev. Mr. Close, of Trimley near Ipswich, says, "March the 30th, 1781, I planted an acre with kidney potatoes, and two days after, ordered two bushel of fresh lime to be sown over the surface of the ground, leaving two rows unlimed, to see if the experiment would have any visible effect upon the crop.

"The latter end of August following, I was surprised to find the rows which were left unlimed, very much grub-eaten, and the remainder a fine, clear, and perfectly sound crop, producing one hundred and ninety-two bushels, or sixty-four sacks. I planted four acres in 1782, dressing the whole with lime, and my crop quite free from the grub; fourteen acres in 1783, with the same success; when a headland, not-top dressed with lime, suffered much, almost every plant being damaged. I believe potatoes to be the most profitable root a farmer can cultivate; wheat succeeds well immediately after them; I had thirty-two bushels per acre from the four acres above mentioned, and two bushels more per acre from the potatoe-land in 1781, than from the bean-land in the same field, both twice hoed, the potatoes being allowed twenty loads of muck per acre, the beans only fifteen loads.

"I shall trouble you with an exact account of the expence and profit attending an acre in 1781.

Rent of land,	£. 1 0 0
20 loads of muck, at 2s.	2 0 0
5 sacks for seed,	2 0 0
Tythe,	0 4 0
Rates,	0 2 6
Ploughing and harrowing,	0 8 0
Baulking for the seed,	0 2 0
Three boys dropping one day,	0 1 6
Two men half a day, covering the seed with hoes,	0 1 6
Ploughing up,	0 10 8
16 women taking up ditto,	0 9 0
Carting home,	7 0 8
Sold 20 sacks, at 7s. 6d. per sack,	£. 7 10 0
Sold 20 do. at 9s. do.	9 0 0
Sold 24 do. not quite so large, at 5s. do.	6 0 0
Received	22 10 0
Expences	7 0 8
Clear profit,	15 9 4

"The above is an exact account of what I paid and received, except the valuation of the muck, which I think cannot be worth less than 2s. per load, if good, and twice hoeing, for which I paid 7s. this makes the clear profit 15l. 2s. 4d.

"I have for several years kept my hogs entirely upon my refuse potatoes, and can always, without difficulty, or the expence and trouble of confining them, sell those of about seven or eight stone weight, to the butchers, for roasting meat, at 4s. 6d. per stone: pork fed in this method is remarkably sweet, the flesh delicate and moist. This food succeeds admirably, except for bacon-hogs, and I find from experience, that it is necessary to keep those intended for that purpose about a fortnight upon ground pease mixed with boiled potatoes. If the hogs are forwarded with potatoes before they are confined, two bushels of pea-meal, and four bushels of boiled potatoes, well incorporated, will fat a hog of twelve stone, fit for hams or bacon; this method greatly reduces the expence commonly attending the fattening of swine."

The Rev. Mr. Fuller, of Heathfield in Sussex, in a letter to Mr. Young, vol. XII, says, "My general method has been to let the sheep of the true south down breed have the after-grass, and about the middle of the month of November, to take them into the yard, with a shed or lodge adjoining, and confine them till they are ready for the market of the end of February, or the first week in March. The potatoes are cut into two or more slices, as may be deemed necessary, and put into troughs, which are fixed under the shelter. On an average I have observed,

that each sheep will eat one gallon each day. I have generally purchased my lambs at twelve, thirteen, or fourteen shillings, at the utmost, and have always sold them at good prices, and I have seldom got less than four shillings per stone. They have ever proved well on examination, and at the age of two years have amounted to nine, ten, and eleven stone; the internal fat of one, which I had the curiosity to weigh, was equal to fifteen pounds. It will not admit of a doubt, but that if fair trial is made, the potatoe system will prove the most expeditious in fattening sheep. I have made the experiment with sheep of the same age, and of the same flock, on corn of different kinds, and even with oil-cake, and have found that potatoes will do the business in the shortest time. As a farther proof of what I have said in favour of potatoes, I have remarked, that on placing two sheep from the common flock, in the yard with those that had enjoyed the best after-grass, I have found, at the usual time of selling them, little or no difference at all in point of fatness, and have sold them at the same price: I presume, therefore, you will allow me to say, that I think this method of preparing mutton for the table is the most expeditious, if not the most profitable plant to be pursued in accomplishing the end desired. Observe, that I give the sheep a little hay, morning and evening; and if the yard is properly attended to, you may easily conjecture what a mass of manure, both in point of quality as well as quantity, may be thus procured. I forgot to mention that I always plant the golden globe, and grow generally from four hundred to four hundred and fifty bushels per acre.

"The old varieties of potatoes formerly in cultivation, dwindling in produce, and being, at length, in a manner destroyed by the disease of curled top, two new varieties were introduced, under the names of goldfinders and goldendabs; the former a yellow kidney-like root (but with a scurfy rind, not unlike that of the old russet potatoe); the latter of a similar colour, but of a different form, being somewhat bell-shaped. The consequence has been, the disease vanished with the old sorts, and is now (1786), and in this neighbourhood, where no other is in ordinary cultivation, in a manner forgot.

"In 1789, I met with a similar instance in Leicestershire, where the old red sort was entirely worn out with the disease, while a white sort, now in cultivation, was never known to curl.

"In Rutlandshire, I had ocular evidence of the same nature. Observing, in a large piece of potatoes, two stripes, which were almost wholly curled, while the rest of the piece appeared to be free from the disease, I inquired into the cause of disparity; and received in answer, without hesitation, that the healthy plants were Manley's, and the diseased stripes red nosed kidneys, which heretofore was the prevailing species; but being no longer to be cultivated with any degree of success, a new sort was, some years ago, introduced, under the name of the Manley, which still remains free from the disease.

"By information, that I have no reason to doubt, and in two or three different instances, 600 bushels an acre have been produced; seven strike a rood (of eight yards square has not unfrequently, been grown. Four to five strike a rood, or three to four hundred bushels an acre, is reckoned a fair good crop.

"The potatoe root is the principal food of all labouring persons and their families: when that root is at high prices, they with difficulty subsist. It is the leading crop in our culture, but repays little above its expences. The black sandy soil of the low lands is particularly adapted to the plant.

"I now arrive at an article of infinite consequence to the cultivators of this useful and necessary root: the plant is subject to a disease, which often reduces the produce above one half; the farmers very aptly call it the curl, the leaves curling to a great degree; when that happens, you find one or two small roots, not worth the expence of taking up: this happens sometimes to a fourth of the field, or more, to the farmers great detriment.

"It has long perplexed a variety of authors and cultivators to account for this disease, but all their conjectures proved merely imaginary. Last year I accidentally discovered the real cause: looking over a field of these plants, set with whole potatoes, I observed a plant with two stems, the one curled, the other perfect: on taking up the plant and root, I found a hole at that end where the curled stem grew, from which an insect escaped about an inch long, of the millipedes species. It immediately appeared to me, that that insect was the cause of the curl; the gardener took

up several more plants; every curled plant had either the hole, or nest, or the insect itself: there remained no doubt of the cause after this examination, which several successive experiments confirmed: thus we have discovered the cause, but the remedy remains undiscovered; perhaps there is none.

"In some of Mr. Young's Annals he takes notice, the cluster potatoes never curl; this probably arises from the insect's disliking the taste of the root; my practice confirms your remark: and very fortunately for this country, an excellent table potatoe has been introduced, of the cluster species, which the insect does not attack, as I find by my practice, having set about three acres of this species this year; these are of the late, or autumn potatoes. The early summer potatoe still remains subject to the depredations of the insect. It appears to me this plant is not sufficiently known over the kingdom, especially in all sandy soils, where it would precede the carrot to great advantage."

Nathaniel Turner, esq. of Stoke, near Ipswich in Suffolk, says, in a letter to Mr. Young, vol. I. "It is well known by most farmers that have cultivated potatoes, that the common cluster sort is a red one, and that when a root of it is cut, the heart is all streaked with red marks; the skin of that sort is also red: on the contrary, the kind which I have cultivated is a white cluster; the skin is white; and, when cut, the inside is of a yellowish colour, but it grows in the same conglomerate form as the common red clustered one. The quantity of land on which the experiment was tried, is four acres, two of which were planted with the red, and two with the white, for comparison. The soil, a rich sandy loam, quite dry, hanging on a slope to the river Orwell. It yielded turneps in 1781. Manured with one hundred and three loads of rich compost, dung, earth, and chalk; half ploughed in balks, harrowed down, and then ploughed as deep as the plough could go. The potatoes were cut in slices, an eye to each, and as large a piece left to it as the size would admit; dibbled along every other furrow, and from ten to twelve inches from set to set, in which way twelve bushels of seed plant an acre: the eye should lie upwards. Bush-harrowed to fill the holes. As soon as the rows were visible above ground, horse-hoed them. Then hand-hoed among the plants; and afterwards earthed them up with a double mould board plough, and finished by hand-weeding. Dug them with three-pronged forks, children following to pick them up. Being in possession of some very large wine-vaults (built for a merchant), the potatoes were laid in them, but from the warmth of the situation, the roots indicated a tendency to sprout; they were, therefore, drawn over to prevent it.

"The product of the common red-cluster seven hundred and twenty-nine bushels, or per acre three hundred and sixty-four. That of the white-cluster eight hundred and thirty-one bushels, or per acre four hundred and fifteen, of very large fine roots.

"Expences per acre.

25 Loads of manure at 1s. 6d.	£ 17 6
Ploughing and harrowing	0 8 0
Seed	0 10 0
Cutting,	0 6 0
Planting,	0 4 6
Horse-hoeing,	0 4 0
Hand-hoeing.	0 2 0
Weeding,	0 1 0
Taking up and sorting,	1 1 0
Carting home,	0 10 0
Rent,	£ 0 18 0
Rates,	0 2 0
Tythe,	0 3 6

"Produce.

364 bushels red-cluster sold at 10d.	15 3 9
Expences,	6 7 6
Profit,	8 16 3
415 bushels white-cluster, at 1s. 4d.	27 13 4
Expences as above,	6 7 6
Profit,	21 5 10

"Many of the red-cluster were given to hogs, of which stock sixty were kept a considerable time: the experiment does not permit me to decide by positive fact what the value is; but I am clear in my own mind, from attentive observation, that they are worth 6d. per bushel in this application. The most profitable method, however, is, not to let the hogs depend entirely on them, but have some beans given occasionally, or else a barn-door where there is great plenty of straw thrown out: hogs confined totally to potatoes are apt to grow tired, not coming on fast enough in flesh. At 6d. a bushel, the account would stand thus:

364 Bushels at 6d.	9 2 0
Expences,	6 7 6
Profit,	£ 2 14 6

"This moderate profit is applicable to all situations, where they cannot as well as where they can be sold; and it demands attention, that the crop, after paying an ample manuring and all charges, yields more in nett profit than turneps do in gross produce.

"But it is not only for hogs that this potatoe is to be recommended. I find that bullocks do exceedingly well on them: four (each thirty-five stone) will eat fourteen sacks a week, and seven pound of hay each per diem; and when they take to them kindly, nothing will bring them on faster.

"From the experience of several years, I can assert, that potatoes are by no means (as some persons have thought) an exhausting crop, but, on the contrary, an ameliorating one. My barley this year, after them, was so clean that not a weed was to be seen, and produced five quarters an acre."

A correspondent of Mr. Young, in vol. I. of his Annals, says, "I am situated on a breeding farm for horned cattle, but have no land to fatten them on; but now, I have got to planting potatoes, and fatten all that I breed. I think of planting ten acres this spring, if it is a dry one; for wet springs are very unkindly for potatoes.

"I plant potatoes on a wheat stubble, after three ploughings, and get a fine season, on light, dry, hazel mould, plant them in rows three feet apart, and twelve inches apart in the rows; cover them with rough dung out of the close, and the earth pulled over the dung with hoes; keep them very clean by hand and horse-hoeing; the crop from four to five hundred bushels per acre: they cost about 2½d. per bushel. It will require fifty loads of dung per acre, sixteen bushels per load, horse-dung the best; but when we have used all the horse-dung that we have, use the dung out of the close where the cattle have been eating potatoes, as we look upon that to be much stronger than where they eat only hay. I plant them as near the place where they are to be consumed as possible, for moving them far is attended with a great expence. Where I plant, one horse brings them in a cart to the place where they are laid up to be given to the cattle, which is joining to the close where they are fed. After potatoes sow wheat, and get from twenty to thirty-five bushels per acre.

"Give the potatoes to horned cattle in the cribs that we give them hay in. Give hay in the morning, about ten o'clock potatoes, at noon hay, about two o'clock potatoes, and at night hay. An ox of one hundred and forty stone (eight pounds to the stone) will eat one bushel and an half per day; from eighty to one hundred stone, one bushels, with about ten pounds of hay; they will not eat hay if they have that quantity of potatoes; we get very fat cattle with hay and potatoes, such as was never made before in this part of the country.

"I have this winter cleared about three acres of broom and goss, and intend to plant it with potatoes on one ploughing. I once grew five hundred bushels per acre, on such a piece of ground, of the eating sort."

Sir William Fordyce, in a letter to Mr. Young, vol. I. of his Annals, says of the Surinam potatoes for feeding horses, as follows: "They were boiled daily with the same fire that cooked the victuals for my table; and they were boiled in the usual manner, but not into a mash: each horse had a quarter of a peck daily, and they never fluxed them. My horses are always in a hurry, and so is their matter. I never gave them the potatoes raw, neither to them nor to my poultry, who, with pollard, live entirely on them; as did my hogs, excepting the last ten days, when I gave them pease. I had heard that pork fattened with

with them, lost the fat in boiling; but treated as above, I did not find it so.

"I have given my horses in town, sometimes chaff; but, having other affairs to mind, I can only say, that some of my horses in the stable (the young ones), and not much worked, have occasionally straw in rack, in general, good hay.

"The expence of feeding horses especially is become extreme about London. The returns which the cluster potatoe yields, if cultivated on lazy-beds, or by trenching, according to my experience, compared with the common potatoe, naturally led me to make a trial of the culture in trenches, from the opinion that unless so large a root as it grows to (oftentimes from a pound and a half, to three, four, and five, and sometimes to six, or even eight pounds weight each) was lightly covered with earth on the top of the trench, and more earth thrown upon the plants occasionally, they must be cramped in their growth, where the ground is not remarkably loose.

"Having, in the month of April 1775, ploughed half an acre of land which had been formerly trenched, which produced a good crop of turneps the preceding season, I spread upon it a quantity of litter immediately from the stable. The cuttings of the potatoes (with one or more eyes to each cutting) were laid at six inches distance from one another, on beds four feet and a half broad, and covered lightly with earth from trenches of two feet and a half. As soon as the plants appeared, three inches more of earth were thrown upon them. The plants had greater verdure, and larger leaves, than any of the common esculent sort; circumstances which probably contributed to the largeness of their growth. You could scarcely put down your finger on beds without touching the roots, they were so numerous; and, in some places, were seen like turneps above ground.

"I had the curiosity to cut one of six pounds eight ounces into twenty-four pieces, and planted them in my garden; the produce was taken up and weighed; and it yielded one hundred and sixty-five pounds weight from this one potatoe. The season was the driest I have known, and thought the crop but small; the ground was very light, and but just taken off the common.

"I sent a potatoe of eight pounds weight and upwards (by six ounces) for the emperor Joseph, by a friend.

"I had a peck boiled every day after the dinner was cooked in the kitchen, and gave my saddle-horses and my coach-horses (afterwards) a quarter of a peck each daily, on which they did their work well as long as they lasted, that is, upwards of two months, instead of oats, only a trifling quantity of which were now and then given. I doubt if they would be hearty enough for a long draught; but, from my observation in the streets, and to the five mile-stone, I never found the horses to flinch in the draught, or under the saddle. If they were roasted on kilns, as I understand other potatoes are done in some parts of England, particularly in Northumberland, and mixed with some ground oats, it would, I imagine, be a great saving in oats, and more hearty food. I found out, after a great expence in grain in my poultry-yard, that all sorts of poultry thrive extremely well on them when mixed with pollard."

Experiments on Potatoes, by John Kirby, Esq. of Ipswich.

"In the spring 1782, an old lay near Ipswich was ploughed: the first plough skimmed off the turf about an inch and half deep; women followed and laid the potatoe-fets (the globe-white, called also the champion) in that furrow; then came another plough that cut as deep as possible, covering the fets nine inches deep. There is no danger of burying them, as they rise freely. In this manner, without any manuring, planted every third or fourth furrow; part one, and part the other: in the first, the rows were twenty-seven inches asunder; in the latter, three feet. The former yielded the greater crop. They were all kept clean by horse and hand-hoeing; were taken up with three-pronged forks, at the expence of a halfpenny a bushel. The crop four hundred bushels an acre; and sold at 2s. a bushel, or 40l. an acre gained at a very trifling expence.

"Not having any cluster-potatoes of my own, I bought some of a neighbour, to try them in horse-feeding, and from the result, prefer them to carrots. They were given raw, but washed, to saddle-horses, each having a peck a day, and no oats whatever. The horses were worked moderately, the same as on oats, did their work very well, and

were in good order. At first they scoured, but it soon went off and did no more than keep their bodies gently open, To ascertain from this trial, the value of the potatoes, that of oats will decide it; reckoning half a peck of oats a day to be equal feeding, and the price 16s. a quarter, the value of the potatoes will be 1s. a bushel."

Artificial yeast made of potatoes, by John Kirby, esq. of Ipswich. See Mr. Young's Annals, vol. I.

"Boil potatoes of the mealy sort, till they are thoroughly soft; skin and mash them very smooth, and put as much hot water as will make the mash of the consistency of common beer yeast, but not thicker. Add to every pound of potatoes, two ounces of coarse sugar, or treacle; and when just warm, stir in, for every pound of potatoes, two spoonfuls of yeast. Keep it warm till it has done fermenting, and in 24 hours it may be used. A pound of potatoes will make near a quart of yeast, and when made, will keep three months. Lay your bread eight hours before you bake it.

"I have several times tried this receipt in the hard frost, when yeast was scarce, and found it to answer the purpose so well, as not to be able to distinguish the difference between the bread made from the one or the other."

In vol. X. of Mr. Young's Annals, is a letter on the culture and use of potatoes, from the rev. Mr. Abdy, who says, "in the winter 1786, I felled an acre of woodland of eighteen years growth, which, after deducting all expences, paid 3l. 10s. about 4s. per annum. I determined to stub it up in the spring, and plant it with potatoes. The produce of the acre was five hundred sixty three bushels. The expence as follows:

	£.	s.	d.
Rent of an acre of land	0	4	0
Tithe of ditto	0	3	0
Digging 160 square rod, at 6d	4	0	0
Twenty waggon loads of dung, at 4s, per load	4	0	0
Drawing ditto five days, with four horses, at 12s.	3	0	0
Ten bushels of potatoes for fets, at 2s.	1	0	0
Cutting ditto	0	2	0
Planting ditto, two men three days	0	8	0
First hand-hoeing	0	5	0
Second ditto	0	3	6
Taking up, at 3d. per rod	2	0	0
Carting home three loads, of 80 bushels, per day	1	8	0
	£.	16	13 6

"On the 5th of May I bought four Welch runts, at 5l. per head; kept them 19 weeks on clover, at 1s. 3d. per head, per week. I then put them into some aftermath, which my milch cows had the first bite of, where they staid seven weeks; the value of this keep was 1s. per week. I might then have sold them for 7l.

"They were then stalled up, and fed with potatoes and the best old hay. They eat, each of them, a bushel of potatoes and a quarter of a truss of hay, per day; the hay was worth 1s. 4d. per truss. A man, at 7s. per week, and a workhouse boy, at 4d. per day, attended these four stalled runts, five hiefters that were stalled upon grains and barley-meal, six milch cows, six Scots, and three horses in the straw-yard, and my fattening pigs; so that I reckon, supposing their dung of some value in this account, the attendance upon these runts to be worth one half-penny per day; they were up 84 days, and I then sold them for ten guineas each; their increase was 3l. 10s. a head in 84 days, eating potatoes and hay.

	£.	s.	d.
Attendance 84 days	0	3	6
Hay	1	8	0
84 bushels of potatoes, at 5½d.	1	18	6
	£.	3	10 0
Expence to procure 563 bushels of potatoes	16	13	6
563 bushels, at 5½d.	13	7	2½
Loss	£.	3	6 3½

"The potatoes were a good eating sort, and were sold at the time these were taken up, at nine-pence per bushel, had I sold them, instead of feeding these runts with them, the account would have stood as follows:

P O T

563 bushels of potatoes, at 9d.	£.	s.	d.
Expences in producing ditto	21	2	3
"Deducting the carting home, as the buyers fetched them away at their own expence	15	5	6
Profit	£.	5	16 9

"I must trouble you once more with a farming anecdote, which is the following :

Expence of half an acre of Potatoes, near my house.

Rent	£.	s.	d.
Tithe	0	9	0
Town charges for this land is rated, the other was not	0	1	6
Digging 80 rod, at 6d. full of bushes and stubs of trees	2	0	0
Five bushels of sets	0	10	0
Cutting and planting	0	4	0
Eighteen cart load of farm-yard dung, at 1s. 6d. per load; the other dung was carried in wag-gons, and the best dung from Epping being from the common fly horses	1	7	0
Carting ditto one day, two carts, four horses, two fillers	0	14	8
Digging, at 3d.	1	0	0
Carting home	0	12	0
	£.	6	19 8

"About Christmas, a Scotch cow, which had two calves, and flunk in November, was turned into the straw-yard: as it would be a long time before she would be fit for business (as it was a great chance she never might) I determind to sell her; 5l. 5s. was the most money offered for her; and the jobber I originally bought her of, advised me, as I had more potatoes than the four bullocks would eat, and my sheep did not like them, and the hogs would be then fattening on pease, to try her with some potatoes: I therefore put her up on the fourth of January, meaning to set as much flesh upon her as I could, before I gave away the meat, which, as warden of Stennard's charity, I am to give to the poor of the parish of Theyden Garren: the 563 bushels in the former account were kept by themselves, and the 230 from this half acre (which is a most wonderful produce), by themselves; as it happened the four bullocks were stalled up in the farm-yard, this cow was necessarily stalled in the cow-house, and therefore had these potatoes given her; until she was killed, I had hardly observed her, and therefore was astonished to find that she was as fat as any butcher could wish his prime beef to be: she weighed 60 stone, 8 lb. to the stone, and the way I have disposed of her, is as follows:

Sixty stone of beef, at 2s. 8d. per stone	£.	s.	d.
Fifty lb. of tallow, at 4d.	8	0	0
Hide	0	16	8
Tongue 2s. 6d. heart 1s.	0	14	0
	0	3	6
	£.	9	14 2

"She ate much the same hay as the four runts: a truss in four days, and about a bushel of potatoes per day: she was up fifty-one days.

I must charge a penny per day, attendance, as the other fattening beasts were gone	£.	s.	d.
Hay 51 days, at 4d.	0	4	3
Value of the beast	0	17	0
	5	5	0
	£.	6	6 3

Sold for	£.	s.	d.
Cost (exclusive of potatoes)	9	14	2
Fifty-one bushels of potatoes, in whole numbers	6	6	3
	3	8	0
	£.	3	8 0

exactly 1s. 4d. per bushel.

P O T

"Thus, then, stands the account of these potatoes:

320 bushels of potatoes, at 1s. 4d. per bushel	£.	s.	d.
Expence of procuring ditto	21	6	8
Profit upon half an acre of potatoes	6	19	8
	14	7	0

"The great difference between this, and the other account, arises from the dung being, though equally good for the potatoe fibres to run in, of an inferior value.

"There was no charge for keeping the beast, as in the other account: the carting the dung and of potatoes being so much less, indeed, the carting them home ought not to be charged; for the horses at plough, in the field, brought home, in the evening, what was dug in the day.

"As I have, yet, a great many potatoes still remaining, I put up, on the 25th, two small Scots, that I drew from the straw-yard; they were valued, this morning, at 5l. 15s. 6d.

They have cost me, as under:

Brought at Horlow beast-fair, two Scots, each	£.	s.	d.
Driving home, each	4	4	0
Keep, from the 10th of September to the 25th of February, on vetches, and in the straw-yard, 24 weeks, at 9d. per week	0	1	0
	0	18	0
	£.	5	3 0

In Mr. Young's Annals, vol. XV. he says, "four cows fed on 15 lb. of lucerne, and 12 lb. of wheat straw, gave daily, the first, six pints of milk: the second, five pints and three half setiers; the third, three pints and a half; the fourth, two pints and demi setier; in all, sixteen pints and an half.

"The 25th February, I changed their diet, I reduced the 15 pounds of lucerne, and substituted 30 pounds of potatoes, which by antecedent experiments I conjectured to be to the hay as one to two: I continued the straw.

"The day this new regimen was entered on, the milk of the four together amounted only to 15 pints 3-8ths; the 26th, 14 pints and an half; the 27th, the same; the 28th, 13 pints 1-8th; the 29th, 14 pints; the 30th, 13 pints 3-8ths; the 31st, 14 pints. February 1st, 14 pints; the 2d, 14 pints 1-8th; the 3d, 14 pints; the 4th, 15 pints; the 5th, 15 pints and an half; the 6th, 16 pints 1-8th; the 8th, 17 pints; the 9th, 16 pints and an half; the 10th, 17 pints and an half; the 11th, 18 pints; the 12th, 17 pints 3-8ths; the 13th, 18 pints and an half; the 14th, 18 pints; the 15th, 19 pints and an half. From this time to the 1st of March, the produce was constantly between 19 and 20 pints (of 2 lb. weight); an unexpected removal of the cows the beginning of March, and my own absence at the same time, hindered me pushing these observations farther.

"The result of this experiment, which I notice at the same time that I relate it, that these potatoes occasion the milk at first to diminish, which may be supposed to arise from the change of food, for it required near eight days to accustom the beasts to that food, which afterwards augmented their milk about a quart; and what appeared to me very singular is, that the milk of all the cows did not near follow the same progression, in its increase and its diminution; the milk of the first cow did scarcely decrease, and increased but very little; that of the second decreased at first three pints, and increased afterwards to six and an half; the two others valued much less, and in the same proportion.

"I also made some observations on the quality of the milk; but it will take up too much time to give my journal on that head; in detail, it will be sufficient to observe, that, the first days, the milk appeared to have less serum, and gave about one seventh less butter than before, and kept in this state about five or six days; after which the milk became thicker; the cream upon it was a greater quantity by about a quart, than it had been before the cows were put to this diet; without becoming yellow, the butter appeared less white; and many people who tasted of it, thought

thought it more pleasant, but that difference was not apparent to me.

"I had twelve cattle on potatoes this winter; eight steer beasts, and four cows; the steer beasts were taken from work in June, the cows had calves in the spring, the calves were weaned, so that it was the latter end of June before they were dried off; they lived on poor ground all the summer, and not so forward as I could have wished to have them when they were taken into the close, which was the 17th of November; two I sold the 16th of March, four the 6th of April, two the 20th of December, and two the 4th of May; they were sold at Tunbridge and Sevenoaks markets, to which markets butchers from London come to buy stock. The crop of potatoes last year was, on three acres and a half, 1750 bushels, and on three acres that were cleared of goss and broom with one ploughing, nine hundred bushels, without any manure. I have fattened cattle with potatoes for these ten years, and is an increasing culture in this part of the county; have sold this year potatoes to plant to the distance of twenty-two miles."

In vol. XIV. of Mr. Young's Annals are the following observations on potatoe sets. "Twenty-four loads of dung, of forty bushels, being spread on a piece of land, that had borne vetch, furrows were drawn a yard asunder, and part (sixty perches) planted with whole or uncut potatoes, the size generally from a large pullet's egg to that of a goose; and the rest (two hundred and sixty-five perches) with cut potatoes, about the size of a pullet's egg. Proportion of sets uncut $37\frac{1}{2}$ bushels per acre; of cut $20\frac{1}{2}$."

"The ground planted, three hundred and twenty-five perches in all: produce, three hundred and seventy-eight bushels. The acreable produce of the two methods nearly the same."

"The two hundred and sixty-five perch produced three hundred and twelve bushels. The sixty perch sixty-six bushels."

"If forty-eight bushels of sets, the whole quantity used, produced three hundred and seventy-eight bushels, then thirty-four bushels cut should produce two hundred and sixty-seven; but they produced three hundred and twelve, which is forty-five bushels more than the proportion."

"Again, if forty-eight bushels produced three hundred and seventy eight, then fourteen bushels uncut should have produced one hundred and ten, instead of which they yielded only sixty-six, which is forty-four bushels less than the proportion. A preference of forty per cent in favour of cut potatoes, in comparison with whole sets."

"I planted ten whole potatoes, at about eighteen inches distance from each other, whose average weight was about four ounces; and equi-distant, the parings of about fourteen potatoes, in nine divisions; the produce as taken up the beginning of October, was, from the ten whole ones twenty-nine pound four ounces, from the nine divisions of parings twenty-nine pound twelve ounces. From among these latter (a case of some admiration to me) there arose the largest bulbs, two from these parings weighing thirty-one ounces, the two largest from the whole sets twenty-five ounces; it may be requisite to remark, that the parings were from larger roots than the whole sets. These, from being pared thick, might have their gross weight diminished about one fourth, the other three-fourths answered their usual purposes. It may not be an useless intimation to observe, that such parings, in every soil and situation adapted for the usual sets, will prove an effectual substitute for the whole potatoe, and the farinaceous substance of this most edible root may be applied to all its culinary purposes."

Mr. Marshall, in his Rural Economy of the Midland Counties, says, "The species or rather varieties of potatoes, have of late years undergone a total change, in this district."

"The old varieties formerly in cultivation, dwindling in produce, and being at length in a manner destroyed, by the disease of curled-top, two new varieties were introduced, under the names of goldfinders and goldendabs; the former a yellow kidney like root (but with a scurfy rind, not unlike that of the old russet potatoe); the latter of a similar colour but of a different form, being somewhat bell-shaped. The consequence has been, the disease vanished with the old sorts, and is now (1786) and in this neighbourhood, where no other sort is in ordinary cultivation, in a manner forgot."

"In 1789, I met with a similar instance in Leicestershire; where the old red sort was entirely worn out with the dis-

ease; while a white sort, now in cultivation, was never known to curl."

"In Rutlandshire I had ocular evidence of the same nature. Observing, in a large piece of potatoes, two stripes which were almost wholly curled, while the rest of the piece appeared to be free from the disease, I enquired into the cause of disparity: and received in answer, without hesitation, that the healthy plants were manleys, and the diseased stripes red-nosed kidneys; which, heretofore, was the prevailing species; but being no longer to be cultivated with any degree of success, a new sort was, some years ago, introduced under the name of the manley, which still remains free from the disease."

"These are evidences, and strong ones, that the disease of curled-top is incident to varieties: and the circumstance of the old sorts, which have been in cultivation from the first introduction of potatoes into the island, being now almost wholly cut off by it, renders it probable that the disease is incident to declining varieties of potatoes; as the canker is to declining varieties of fruit."

"The cultivation of potatoes, in this district, though it does not require to be given in detail throughout, is entitled, in several particulars, to notice."

"Succession. Contrary to the practices of most other districts, potatoes, here succeed turf: are planted almost invariably on grass-land."

"Soil process. The plough is seldom, if ever, used here, in the cultivation of the potatoe crop. The soil is broken up with the spade: sometimes in two shallow spits, throwing the sward and the dung, if any be used, to the bottom; covering them in the gardener's manner, with the under spit: but, generally, in one full spit; merely inverting the sward; fitting the spits to each other; leaving a smooth even surface of clear free soil."

"Planting. On this surface the plants are dibbled very thick, about the middle of April. Potatoes are sometimes grown two years together on the same land; and, in this case, it is said to have been found that dibbling in the sets on the stale surface, as left on taking up the first crop, or only levelled with the harrow, without a previous ploughing or digging, is the most eligible method of putting in the second crop: this, however, by way of hint."

"The vegetating process consist in hoeing, once, twice, or as often as circumstances may require; the crop, throughout, being mostly, though not always, managed in a gardenly manner."

"The crop is taken up with forks, in the gardener's method, about the middle of October: the price of taking up is according to the crop; generally, I believe, from 1d. to 2d. a bushel."

"Preserving. The method of laying up potatoes, here, is, universally, that of camping them: a method which requires to be described."

"Camps are shallow pits, filled and ridged up as a roof, with potatoes; which are covered up with the excavated mould of the pit."

"This is a happy mean between burying them in deep pits, and laying them upon the surface."

"Camps are of various sizes; being too frequently made in a long square form like a corn-rick, and of a size proportioned to the quantity to be laid up. It has, however, been found, by experience, that when the quantity is large, they are liable to heat and spoil: much damage having sometimes been sustained by this imprudence."

"Experienced campers hold that a camp should not be more than three feet wide: four feet is perhaps, as wide as it can be made with propriety; proportioning the length to the quantity: or, if this be very large, forming a range of short ones, by the side of each other."

"The usual depth is a foot."

"The bottom of the trench being bedded with dry straw, the potatoes are deposited; ridging them up, as in measuring them with a bushel. On each side the roof, long wheat straw is laid, neatly and evenly, as thatch; and over this the mould, raised out of the trench, is evenly spread: making the surface firm and smooth with the back of the spade. A coat of coal ashes is sometimes spread over the mould; as a still better guard against frost."

"It is needless to observe that a camp should have a dry situation; or that the roots ought to be deposited in as dry a state as possible."

"These camps are tapped at the end; some battins, or a quantity of loose straw being thrust close in the opened end, as a bung or safeguard."

In Yorkshire, Mr. Marshall says, "there is only one species of potatoe, *Solanum tuberosum*: but the varieties of that species are endless. Every county has its favourite kinds; though very different from one another. To enumerate the sorts of any particular district would be filling the page with barbarous terms; without conveying any useful information to the reader.

"The varieties of potatoes are transitory in every district; having their entrances and their exits. The rough-skinned Russia potatoe of this district was long a favourite; but is now I believe, with many others which have flourished for a time, entirely lost.

"There is some reason to believe that the disease, which has of late years been fatal to the potatoe-crop in this and other districts, under the name of curled tops, has arisen from too long a continuance of declining varieties. Be this as it may, it appears to be an opinion established here, by some years experience, the fresh varieties, raised from seed, are not liable to that disease. This matter, however, may not yet be sufficiently ascertained, to be registered here as a fact. This disease made its appearance some years ago with more or less effect, in I believe, every part of the kingdom. In some parts of it, its continuance was short; its effects have ceased, and are now almost forgotten. In one instance, (which I may have occasion to mention hereafter) its removal was, in all probability, owing to the introduction of new varieties.

"The district under survey furnishes a remarkable instance respecting this disease. The Morelands are at present in a manner free from it, while the Vale is still in some degree infected with it. Plants procured from the Morelands remain free from it in the Vale, the first year; but, being continued, become liable to the disease.

"The disease of curled-tops is seldom obvious at the first coming up of the plants; but attack them as they increase in size; the entire top become dwarfish and shrivelled, as if affected by drought, or loaded with insects: they nevertheless live, and increase, though slowly in size; but the roots are unproductive. Some crops have been almost wholly destroyed by this disease.

"Where the attack has been partial, weeding out the diseased plants, as they failed, is said to have had a good effect. And, it is said, the morelanders got rid of the disease through this means.

"The method of raising potatoes from seed is known to some intelligent husbandmen here. The prevailing method is this: In autumn, when the apples are beginning to fall spontaneously, they are gathered by hand, and preserved in sand until spring, when they are mashed among the sand, or among fresh mould, separating the seeds, and mixing them evenly with the mould. As soon as spring-frosts are judged to be over, they are sown in fine garden mould; and as fast as the plants get into rough leaf, and are strong enough to be handled without injury, they are transplanted from the seed-bed into another bed of fresh, rich mould, in rows, which are kept clean during the summer. In autumn, bunches of small potatoes are found at the roots of these plants, varying in size the first year, from the hazel-nut to the crab. These being planted next spring produce potatoes of the middle size; but they do not arrive at their fullest bulk until the third or the fourth year.

"Where the use of the stove or the garden-frame can be had, this process may be shortened. The seeds being sown within either of these, early in spring, the plants will be fit to be planted out as soon as frosts are gone; by which means the size of the roots will be much increased the first year; and will, in the second, rise nearly to perfection.

"Potatoes raised from seed are a miscellany of endless varieties. Sometimes these varieties are planted miscellaneously; sometime particular varieties are selected.

"In selecting varieties from seedling potatoes, two things are to be attended to: the intrinsic quality of the potatoe, and its productiveness. If these two desirable properties can be found in one plant, the choice is determined. To this species of attention and industry we are indebted for the many valuable kinds which have been, and now are, distributed throughout the island.

"It is observable, however, that varieties of potatoes, like those of corn, are partial to particular soils and situations. Hence the propriety of husbandmen raising potatoes from seed; as by this means they obtain, with a degree of moral certainty, a sort adapted to their own particular soils and situations.

"But it has been already observed, that varieties de-

generate: the old favourite sorts of this district were driven until some of the individual plants barely produced their seed again.

"Whoever has attended closely to the work of taking-up potatoes, must have observed the great inequality in the productiveness of individual plants. The difference in the produce of adjoining roots, where no disparity of soil can influence, will sometimes be three or four-fold. Hence it is evident, that each variety has its sub-varieties; through whose means it can hardly be doubted, the parent variety may be improved, and its continuance be prolonged.

"Thus the farmer has another mean in his power of improving the quality and productiveness of his potatoe crop, by improving varieties, or in other words, selecting sub-varieties superiorly adapted to his soil and situation.

"Every attentive cultivator of this valuable root must be acquainted with the wide difference in neat profit between a full and even a middling crop. The rent of land, the seed, and the labour are the same, whether the produce prove great or small. How imprudent, then, to propagate an unproductive kind, when the means of obtaining a productive one are so easy and obvious.

"Considerable quantities of potatoes are raised in the district under survey. Almost every man, let his farm be ever so small, cultivates potatoes in the field: not in the ordinary method practised in most districts of the kingdom: not with the spade, but with the plough; a practice which has been followed invariably for near a century. I do not mean to speak of it as a practice peculiar to Yorkshire; but, I believe, there is no other county in which it is so prevalent. It therefore merits particular notice here.

"It will be necessary to consider separately, the succession; the soil and process; the manure and process; the seed and process; vegetating-process; harvest-process; and the effect of the potatoe crop on soils.

"In the common practice of the country, potatoes are cultivated as a fallow crop for wheat: the cleanest part of a stubble, or other ground, intended to be summer-fallowed for wheat being set apart for potatoes. They are seldom planted on sward, the common predecessor of the potatoe-crop in most other places. It is, however, understood here, that they do best upon fresh land; that is, land which has not been too long under the plough.

"Formerly potatoes were confined to light friable loams: and the sorts which were cultivated in those days might require this restriction: now they are grown in all soils: different varieties being found partial to different land. It is observed, however, that let the sort be ever so well adapted to the soil, heavy cold land seldom gives light well-flavoured potatoes.

"The soil is broke-up in winter or spring, and worked over two or three times with the plough and harrow, as for turneps; getting it as fine as the nature of an early spring-fallow will admit of; generally long strawy dung, which is set in heaps upon or near the patch to be planted; previous to the seed-ploughing. The quantity twenty to thirty cartloads an acre.

"Formerly it was the common practice of the district to plant whole potatoes. In taking up potatoes, they were sorted into large, small, and sets, which were of the middle size.

"At present, that practice is, I believe, entirely laid aside, it being now the custom to cut potatoes into more than one set: namely, middle-sized ones into two, large ones into three or four, leaving the cuttings much larger than is done in most other districts, where eight or ten single-eyed sets are sometimes cut out of one potatoe.

"The reason given for the use of large cuttings is, that the young plants may acquire the outset a strong vigorous habit, and thereby be enabled to throw out and maintain a sufficient number of roots and branches. And the reason I have heard given for using large potatoes in preference to smaller ones is, that large ones are more likely to produce large ones again. The reasoning, in both cases, appears to be good.

"The sets being prepared, the seed-ploughing is given. In this ploughing the land is laid up in ridgelets, similar to those in which gardeners leave the soil, in the operation called trenching, when it is not intended to be immediately cropped. The width of these ridgelets depends on the judgement of the planter: from two and a half to three feet is the usual width.

"This operation is performed with a common plough, in the way in which rice-balking is usually done; endeavouring to leave the bottoms of the drills straight, narrow

row, and clean. One strong horse, if the soil be light and fine, or two horses, one before the other, if otherwise, is the best team for this work. Horses abreast are apt to foul the drills. The usual depth of the drills is that of the cultivated soil.

"In these drills the sets are dropt, by women or boys, at twelve to eighteen inches distance, according to the judgment of the farmer. If the quantity of land be given, and the number of sets be indefinite, twelve inches may be a sufficient distance; but if, as is generally the case here, the quantity of land be greater in proportion than the number of sets, the farther they are planted asunder, the greater will be the produce in proportion to the plants.

"While one party are planting, another are carrying on the dung, in scuttles; either scattering it regularly along the drills, or applying it partially to the plants; covering each set with its due portion of manure. This may appear to be a tedious business: it certainly is a dirty one: but not so tedious as inexperience may suggest. If the loads be broken into three or four heaps, and these be distributed conveniently, five or six women will cover an acre a day in this manner.

"The plough closes the business of planting: the ridges are either returned upon the plants and dung, with a common plough, or are split with a double-mould-board plough; in either case, raising the soil into similar ridges over the drills of potatoes.

"As soon as the young plants make their appearance, the land is harrowed lengthway of the ridges; to tear up the seed-weeds which grow upon their crowns, and to smother those in the trenches with the mould. In a short time afterward the plough, with the share broad and sharp, is run through each interval, and the rows cleaned with the hoe. In a few weeks more the intervals are again stirred with the plough, and the hand-hoeing repeated. If leisure and the depth of the soil will permit, a second earthing may be given; and, when the plough and the hoe are no longer able to find admission among the tops, hand-weeding is, or ought to be, made use of.

"By these means land may be as effectually cleaned from seed-weeds as by fallowing; and no man, who has any regard for his own interest, or for his character as a farmer, would ever think of planting potatoes in a bed of couch and thistles.

"Formerly, potatoes were taken up with the plough; endeavouring to get the share below the potatoes, and to overturn the ridges. But without great care, many potatoes were cut in this operation, and many more unavoidably buried; so that picking again and again was necessary; and, at last, some were left in the land.

"At present, the prevailing practice is to take them up with common dung-forks: an operation which is at once effectual; and which is by no means so tedious when potatoes are grown in ridges, as when, in the ordinary way, the entire ground is to be dug over. In ridges, the roots are distinct, and are easily laid bare; being open on three sides, with free vent for the mould. The fork being forced down behind them, the whole ridges are at once exposed.

"The way of preserving potatoes, here, has been either to bury them in deep pits within the ground, or to house them in a barn or other out-building, guarding them on every side with straw. The dangers to be guarded against are frosts and wetness.

"At present (the evil effects of deep pits having been discovered) the growing practice seems to be that of laying them in long ridge-like heaps upon the surface of arable ground, and covering them up with the surrounding soil, ridged up in a roof-like form.

"A long arched vault, running endway into the side of a hill (or the side of a pit or other hollow), with a door at the end, level with the ground below, with a road over the top with one or more shooting holes, similar to those of coal-vaults under the streets of towns, would be an eligible receptacle for potatoes.

"Nor is the application of potatoes to fattening stock extensive. In this district swine are almost the only species to which they are applied. Some few may be given to cows.

"But in the bottom of the Vale of York, great quantities have of late years been applied to the fattening of cattle. They are, I believe, invariably given to them raw, with alternate meals of hay or barley meal: the method of fattening with potatoes being similar to that of fattening with turnips.

"The quantity of potatoes grown upon an acre under the management above described, and their profitableness as an article of food for cattle, I have not been fortunate enough to ascertain with sufficient accuracy.

"Various are the opinions of professional men on this subject. One asserts that they are great impoverishers of the soil; that they are hurtful to the corn, and ruinous to the grass which succeeds them. Another is clearly of opinion that they are friendly to corn, and not enemies to grass.

"The dispute may, perhaps, be settled satisfactorily in this manner:

"The potatoe contains, indisputably, a great quantity of nourishment; and is therefore, perhaps, as indisputably a great exhauster of the soil.

"But the quantity of vegetable nourishment carried off in the potatoe crop is not the only cause of exhaustion: it is notorious to common observation, that this crop leaves the soil in a singularly friable fertile state, causing an abundant produce of the crop which succeeds it.

"If taking the advantage of this prodigality of the soil, the husbandman keeps cropping it year after year with corn; and, when it will no longer answer his unreasonable expectations, lays it down to grass, it is no wonder that it should be unproductive: for having lavished all its riches on an ungrateful occupier, it is of course reduced to extreme poverty.

"On the contrary, if after a crop of potatoes, well dunged for, only one or two crops of corn be taken, and the land be laid down to grass, while yet in a state of fertility, the potatoe crop is, to vulgar appearance at least, friendly to the crop which succeeds it.

"Hence it follows, that land which has been cropped with potatoes should presently afterwards be laid down to grass, or should be timely replenished with a quantity of manure proportioned to the degree of exhaustion it has undergone.

"The value of potatoes as a fallow crop, and as an article of food for cattle, compared with turnips and cabbages for the same purposes, may be considered thus:

"Potatoes are more nutritious; and, in the opinion of those who have used them, fat cattle much quicker than either turnips or cabbages. Potatoes, too, being secured from the severities of winter, are a more certain article of fattening than turnips or cabbages; both of which are liable to perish under an alternacy of frost and thaw; and the turnep, more particularly, is locked up, or rendered more difficult to be come at, during a continuance of snow or frost. Turnips and cabbages, if they out-weather the severities of winter, occupy the soil in the spring when it is wanted to be prepared for the succeeding crop; while potatoes, if properly laid up, are a food which may be continued without inconveniency until the cattle be finished, or the grass has acquired the requisite bite for finishing them in the field.

"On the other hand, potatoes are a disagreeable crop to cultivate: the planting is a tedious dirty business; and taking them up, may be called the filthiest work of husbandry; especially in a wet autumn."

Mr. John Bywell, of Aglethorp, Yorkshire, says, "Four pecks, eight quarts to the peck, are sufficient for a large beast with a little hay, for twenty-four hours; they are superior to turnips in feeding, one third, both used in equal time. They are given to milch-cows with great advantage, and are healthy fodder. They are very good for draught horses, to give them half a peck a day, with hay. I never had my horses in so good condition as when fed with potatoes; they are a certain remedy to a horse with swelled legs, or out of condition (in other cases and disorders inwardly one peck a day); they are accounted good for hunters the day after they have had a severe run, to give them eight or ten large potatoes. The number of bushels of potatoes grown on one acre, are, upon an average, three hundred and sixty. I give them to cattle raw, as taken out of the ground.

"The manner of management for potatoes is to give the land three or four ploughings, and as many harrowings; twenty-four cart-loads of horse-dung to an acre; when the furrow is drawn, the plants to be planted at twelve inches distance one from another, the labourers to spread the dung, by hand, along the top of the plants with a little lime; if lime cannot be had at the time of planting, it is proper to spread a little over the ground, as they make their first appearance out of the earth; also to give them a light harrowing to mix the lime."

Mr. Young, in his Annals of Agriculture, vol. VII. gives the following account on the expences of raising potatoes, by Mr. W. Pitt, of Pondeford:

" 1784. Planted two acres of potatoes upon old turf.

	£.	s.	d.
Rent, tythe, and rates, per acre	1	1	0
20 cart loads of raw dung, at 2s. 6d. half to the potatoes	1	5	0
Digging and planting	2	10	0
20 bushels for seed, at 1s. 6d.	1	10	0
Hoeing and weeding	0	7	6
Taking up and sorting	2	10	0
	£	9	3

" Produce, per acre, 300 bushels, prime cost, 7½d. per bushel. N. B. By a bushel is always meant 80lb. weight.

" 1785. Two acres of clean clover lay, on good light loam.

	£.	s.	d.
Rent, tythe, and rates, per acre	1	5	0
Dung, as before	1	5	0
Trenching in the dung, and seed	1	5	0
Seed, as before	1	10	0
Hoeing, at 1d. the rod, of 8 yards square	0	6	3
Taking up and sorting	2	10	0
	£	8	1

" The trenching was performed by a man with a spade, digging a trench across several lands; a boy following, dropped in the seed, and another boy, putting the dung upon the seed; the man digging another trench, parallel to the former; the soil of which, covered up the former dung and seed, and the boys following, as before: it must be observed, the land was dry enough to lay quite flat; also, the lay was very mellow and tender, or the trenching could not have been done at so low a price after once ploughing.

" One acre of the above, planted with champions, and a few of other sorts, produced 300 bushels; prime cost, under 6½d. per bushel.

" The other acre, planted with a sort, called here ox-noble, which, I think, answer to your white Surinam produced 350 bushels, prime cost, therefore 5½d. per bushel.

" 1786. One acre, after turnips, upon light loam.

	£.	s.	d.
Rent, tythe, and rates, per acre	1	1	0
Dung, 16 loads, at 2s. 6d. half to the potatoes	1	0	0
One ploughing and harrowing	0	6	0
Ploughing in the sets	0	5	0
Harrowing, some time after	0	1	0
Five women dropping the seed	0	2	6
Two men dunging the seed in the furrows	0	2	6
Seed, 20 bushels	1	10	0
Taking up and sorting, the ground being light and mellow, only	1	17	6
Hoeing and weeding	0	6	3
	£	6	11

" Produce, as near as could be ascertained, 225 bushels. Prime cost, 7d. per bushel.

" The defect in produce I attribute to two circumstances; first, to dung being used too sparingly; and, secondly, the sort planted being champions, which, for cropping, are much inferior to some other sorts.

" 1786. Two acres of wheat stubble, upon a cool hazely gravel (indifferent land) has been summer-fallowed, and manured with lime, for the wheat.

	£.	s.	d.
Rent, tythe, and rates, per acre	1	0	0
Dung 16 load, half to the potatoes	1	0	0
One ploughing only, the seed being dropped in under the whole furrow	0	6	0
Five women and two men putting in seed and dung	0	5	6
Harrowing some time after	0	2	0
Seed, 20 bushels	1	10	0

Carried forward - - - £ 4 3 6

	£.	s.	d.
Brought forward	4	3	6
Hoeing	0	6	3
Taking up and sorting, at 7d. the rod, of 8 yards square	2	4	0
	£	6	13

" Produce as near as possible as before, 225 bushels per acre; prime cost, a little over 7d. per bushel.

" The defect in produce I attribute, as before, to want of more dung, (an article I did not care to be lavish in, the preceding harvest having given but small bulk of straw); also perhaps the whole furrow being turned over upon the seed, might be less favourable to produce than if the soil had been more broken or pulverised.

" The greater part of the above potatoe ground was sown with wheat, immediately after clearing of the potatoes; the wheat crop always equal to what might have been expected after any other preparation; but perhaps the wheat stubble not so clean or kindly as after fallow-wheat. I intend hereafter to dung for the potatoes more liberally, and to follow them with cabbages; either the early sort immediately; the large kinds the June following, or both.

" I have not observed in potatoes a tendency (some have charged them with) to foul the land, more than any other crop, provided the land be clean before. Indeed, if the land be previously full of couch, the dunging for the potatoes will make it run, and multiply abundantly; but upon clean land, the potatoes being in rows, may, by proper hoeing and hand-weeding, be kept as clean as turnips, or any other hoe-crop. I had an acre this season, I intend sowing with hemp in the spring, and the land at getting up the potatoes was fit to have received the seed, had the season been proper.

" The sorts of potatoes I have successfully cultivated, are the following:

" Champions, excellent for the table, come in early and have never curled; but inferior for cropping to some other sorts.

" Winter whites, Aylesbury whites, or white blossom, very good for the table, grow larger, and produce a bulkier crop than the former.

" A sort called here ox-noble, which I think answer to the cluster potatoe, and to your white Surinam; crop excellently, are readily sold in our markets, grow very large, but the large ones apt to be hollow, are very good for stock.

" A sort called here cow potatoe, and I think answers to your red surinam; very superior for cropping, on any land; have had 50 bushels (80 lb. to the bushel), upon twenty perches of indifferent land, without manure; are preferred to all other for cows, being tender and juicy, but are unfit for the table.

" A dark purple kind, called by some the pomegranate potatoe, crop very well, are hard, solid, and heavy; said to be very good for the table in spring, when other sorts decline, but have never tried them for anything but stock.

" The three last sorts, carrying long haulm, or tops, leave the land more mellow and kindly than the other sorts, whose tops wither early.

" The sort I had from you under the name of Cornwallis's, are, I think, excellent, and new to this country."

Thomas le Blanc, Esq. of Cavenham, says, " In April 1785, I broke up a saintfoin lay of four or five years growth, upon which Dutch clover had been sown with the saintfoin; the soil a blowing sand, but not so near the chalk as that on which they were grown before. It was ploughed deep with our common ploughs; part of it was sown with carrots, which totally failed; the other part, containing two acres 115½ rods, was planted in every second furrow with the cluster potatoe, both red and white; they were once horse-hoed, and once weeded by hand, at a small expence. The produce 900 bushels; the land exceedingly foul with couch-grass at the taking up the crop: if there was any difference in the produce of the two sorts, the white potatoe had the advantage; but they were not separately measured. For the consumption of this crop, I have now 13 sows, which have all littered within the last three weeks; which stock I should not think of keeping if I had not grown the potatoes. The failure of the carrot crop should not pass unnoticed, for I think it proves that carrots are more precarious than potatoes; they are more expensive in culture, and, I am convinced

vinced that they are inferior in feeding both horses and hogs."

Mr. Young, in his observations on the foregoing letter, says, "I considered the success of this trial as extraordinary: there were two circumstances to which it might be attributed; trench-digging, and the moisture of the season. The present experiment bears immediately on those points. Here is only one ploughing; and instead of a very moist season, the beginning of the summer was an uncommon drought. But so far were those circumstances from any effective operation in producing the former success, that the event of this year's trial has confirmed every conclusion to be drawn from the former. The crop amounts to 324 bushels per acre. The expenses I should calculate at about three pounds an acre; which sum produces 324 bushels, or prime cost about 2½d. per bushel. This is sufficient to shew the vast importance to saintfoin farmers of Mr. le Blanc's discovery. He has proved to them how easy it is to convert their old lays at once to great and immediate profit; a circumstance, till he took the pen in hand, quite unknown. Society is indebted to him for the attention and the care he that has matured so valuable a deduction from experimented fact."

Mr. George Bailey, of Sunderland, in a letter to Mr. Young, says, "the potatoes are set in drills about 15 inches asunder, and the seed planted about 9 inches distance in the rows. They are manured with what is bred in the farm-yard, by women and girls, who lay a little upon each potatoe; then the plough, drawn by one horse, and only one man, follows and covers up the seed. On the potatoes first coming up, the rows are harrowed down with a bush harrow, which destroys many annual weeds; in a few days the rows are earthed up with a plough and one horse; as soon as any weeds appear, they are hand-hoed and earthed again with the plough, and frequently hand-weeded after. A double mould-board plough is preferable to the common one, in earthing or furrowing potatoes, and will do twice as much work. Turnips are sown broadcast, and are hoed once or twice. After two ploughings and harrowings, and the couch-grass, if any, gathered off by women (at 6d. a day) from 15 to 20 loads of manure, all brought from Sunderland, a large trading town within four miles distance, consisting of coal-ashes and the rakings of streets, or with sea-weed, is laid on, and the ground again ploughed shallow; and as early as may be in June, the seed is sown, and harrowed in with a bush-harrow, and frequently rolled after. The barley and wheat, particularly the former, has a light dressing of Sunderland manure, or sea-weed, which is harrowed in with the seed.

"The produce of marketable potatoes, from 200 to 250 firkins an acre, besides the small, which may be reckoned 15 firkins more, and are found very serviceable in feeding cows and hogs, particularly the former, increasing the quantity of milk."

Mr. Thomas Bucke, merchant, at Worlington, Suffolk, in a letter to Mr. Young, says, "In conformity to your request, I send you the best account I can give of my two crops of potatoes, off a piece of ground little more than one acre and three rods; it was formerly pasture, but broke up about 15 years ago, from its producing small crops of grass in dry seasons, the soil being loose; and though it had been well manured whilst under the plough, of late it has afforded but light crops of grain, having been never rested, and was much subjected to warlock. Upon its falling into my hands, I gave it a summer-till; but as the summer proved extremely dry, little benefit accrued respecting the warlock, as I found by my two succeeding crops, which were of wheat and barley. Being determined to clear my land of this predominant weed, I had these crops weeded by hand; but finding this practice too expensive, it costing me 11. 4s. 6d. the first year, besides beer; and 11. 5s. 8d. the second, exclusive of beer; and not having effected my purpose, I planted it with potatoes, for the benefit of the hoeing, and now find it very clear.

"I first spread a few loads of short dung upon it, ploughed it very deep, and had the sets dibbled in at the small distance of about 10 inches, then bush-harrowed to fill the holes; and as soon as the rows appeared, it was hand-hoed, and repeated as soon as necessary; two thirds of the seed were of the Dutch upright species, the other of the pink-

nose kind. The former produced abundantly, and grew under the foil; the straw of the latter being frizzled (as they call it here) the crop was not so productive; a considerable quantity grew upon the surface, and as they were not earthed up, the colour of the upper part changed to a dull green; and many that were covered with the foil were of a rusty colour, and were porous, here called iron-moulded: the finest of this kind, as well as all of the Dutch uprights, were good flavoured. As other business prevented my taking them up till the 10th or 12th of November, what grew upon the surface suffered from three severe frosty nights; they were picked off the ground before the crop was taken up, and with those otherwise defective, were given to pigs, and charged at 6d. per bushel; though I erred in letting them continue in the ground so long, yet I think they are better in flavour for continuing in the ground till after Michaelmas, and will keep better than what are taken up earlier. This year my crop was forked up with three-pronged forks, and measured up 760 bushels; 696 were of excellent quality, and sold at 1s. per bushel; the remaining 64 bushels were the refuse.

"The year after, which was last year, I set the champion kind, and had near eleven hundred bushels off the same piece of ground; this is a prodigious crop, and exceeds, at any price, all other productions to be procured from such a foil; it was covered thinly with short dung, ploughed deep, and the sets dropped into the bottom of every second furrow, from 12 to 15 inches distant; the sets consisted of two, and some of them three eyes, and grew luxuriantly; the land was hoed twice, as before, but the crop ploughed up without a coulter. I could not perceive the horses injured the sets; nor did they or the plough produce; many persons differ respecting the earthing up the plants: from the little I have seen in my field and garden, I think some sorts (the pink-nose in particular) require such management; others will do well without; the richer and finer the moulds they are planted in, the better; and could I have spared more dung, I should have laid it upon the land. Those who are inclined to raise potatoes would do well to buy their seed early in the winter, as the price often advances cent. per cent. I am now selling at 2s. 6d. per sack, the seed of which cost me 7s. per sack.

"I am very sorry I cannot give you an account of expenses attending these crops, as they were not kept separate from other labour; this was the reason I did not write to you before upon the subject, and operates now very strongly with me, that my letter cannot be useful to you; but the method I pursued in setting and taking up my last crop must be considerably less expensive than that I used in the preceding. The first crop was very profitable, and so will the present, if I meet with a sale for what I have in hand at any tolerable rate.

"As my last crop exceeded my first greatly, I judge: from the small quantity of dung laid upon the land, that these crops are not very exhausting."

The following accurate Experiments upon Potatoes were made by Mr. Wynn Baker, in Ireland in the Year 1771.

"Notwithstanding, says he, potatoes are the principal food of the labouring people in the country, in this kingdom, and that every one cultivates them, more or less, and have done so for more than half a century: yet, extraordinary as it may seem, I find them quite incapable of answering a great number of questions, truly important to the advantageous culture and judicious choice of this useful vegetable.

"This circumstance, added to that of frequently obtaining poor crops myself, led me to try the following experiments, which I committed to the ground with the most scrupulous and minute exactness that human means were capable of; and myself attended every stage of the business in planting.

"I lay this little set of experiments before the public, by way of table, in order to have it in one view. Any one who consults it, perhaps, will be directed in their choice of potatoes, as well as in other points in dispute. To avoid all danger of inequality in the ground, I chose a bit where I had twice taken away the staple, so that they were planted in an under stratum of poor yellow earth.

Minute Experiments on the following Kinds of Potatoes, put down April 27th and 29th, 1771. The Rows 20 Inches
afunder, and each Potatoe set 12 Inches apart in the Rows, and 30 Sets in each Row.

N ^o			N ^o	lb.	oz.	N ^o	lb.	oz.	Total.
1	Spanish	Over dung, chiefly neat's dung.	Merchantable	91	12 4	Small	98	3 6	15 10
2	Red French		Ditto	63	13 8	Ditto	51	2 4	15 12
3	Common Wife		Ditto	103	16 2	Ditto	86	5 4	21 6
4	Crones		Ditto	53	12 4	Ditto	60	4 2	16 6
5	Munster White		Ditto	62	12 8	Ditto	59	3 8	16 0
6	Apple		Ditto	50	15 8	Ditto	53	4 10	20 2
Total			Ditto	82	2	Ditto	23	2	105 4
7	Spanish	Under dung, chiefly neat's.	Merchantable	54	7 12	Small	60	3 8	11 4
8	Red French		Ditto	40	9 0	Ditto	60	1 12	10 12
9	Common Wife		Ditto	89	15 2	Ditto	84	4 8	19 10
10	Crones		Ditto	56	9 12	Ditto	44	2 1	11 13
11	Munster White		Ditto	54	9 14	Ditto	53	3 8	13 6
12	Apple		Ditto	58	14 14	Ditto	40	2 8	17 6
Total			Ditto	66	6	Ditto	17	13	84 3
13	Spanish	Very small sin- gle eyes or sets under dung, chiefly neat's.	Merchantable	47	5 12	Small	40	2 8	8 4
14	Red French		Ditto	18	4 8	Ditto	45	2 1	6 9
15	Common Wife		Ditto	74	13 8	Ditto	49	2 12	16 4
16	Crones		Ditto	48	9 0	Ditto	50	2 8	11 8
17	Munster White		Ditto	40	6 8	Ditto	27	1 7	7 15
18	Apple		Ditto	40	11 0	Ditto	36	3 4	14 4
Total			Ditto	50	4	Ditto	14	8	64 12
19	Spanish	Large feed, under dung, chiefly neat's.	Merchantable	74	8 12	Small	27	1 4	10 0
20	Red French		Ditto	40	9 4	Ditto	33	1 12	11 0
21	Common Wife		Ditto	131	18 2	Ditto	60	4 2	22 4
22	Crones *		Ditto	42	7 0	Ditto	27	1 8	8 8
23	Munster White		Ditto	62	8 12	Ditto	31	2 0	10 12
24	Apple		Ditto	60	12 8	Ditto	32	2 4	14 12
Total			Ditto	64	6	Ditto	12	14	77 4
25	English White	Under dung.	Merchantable	71	13 0	Small	2	3 4	16 4
26	White French		Ditto	45	13 4	Ditto	6	2 8	15 12

"Whoever shall cast an attentive eye over the preceding table, will see that several circumstances of information are immediately pointed at; there are very many others which are omitted; those before us appear to be so satisfactory, in the several variations which arise upon the face of the table, that I shall, at convenient time, pursue all the changes which the subject before us will admit of. In the mean time let us proceed upon the present information.

"The first question before us is this, Whether planting potatoes under or over the dung, is most advantageous to the crop? This question appears to be conclusively answered, by every species of potatoe, in the first and second set; and the totals of each clearly determines in favour of putting the seed over the dung.

N ^o 1 to N ^o 6, over dung, gross produce	105 4
7 to 12, under dung, ditto	84 3

Over dung superior to under by 21 1

"This difference of 21 pounds, upon so small a quantity of ground, would be a very great object upon an acre. Happily in this kingdom, the potatoes are chiefly laid over the dung. In England, they practise the contrary in many places.

"Our second object in this enquiry was, to determine by fair experiment, whether the small seed is equally prolific (as thousands assert it to be) with that which is reasonably large. For this purpose, I cut single eyes with my

own hands, and was careful not to cut them thin, but like pellets. This set was planted under dung; and therefore we must compare it with our second sets of experiments.

N ^o 7 to N ^o 12, under dung, gross produce	84 3
13 to 18, under dung, gross produce	64 12

Reasonably large feed, preferable to very small, by 19 7

"This upon an acre would be a prodigious difference: and I think seems decisive in favour of seed moderately large. Whereas N^o 19 to 24, both inclusive, seems by no means to prove very large feed to be necessary: for if we compare those numbers, with N^o 7 to 12, both inclusive, we see the greater produce from the larger feed is by no means regular, and therefore that point is not decisive in the present enquiry; and the remark upon N^o 22 should not be forgotten.

"Our third object in this enquiry, is a truly important one to the poor labourer of Ireland, viz. to ascertain with accuracy, which kind is most prolific upon poor broken ground. As N^o 25 and 26, did not come to hand time enough to introduce them in the whole set of experiments, I must throw this part of our enquiry into two divisions, as there is so material a difference between planting over and under dung. To do this in the shortest manner, I shall only throw the several kinds into two little tables, according to their merit in quantity; the quality is a consideration chiefly at the gentleman's table.

* "Here in N^o 22, Crones, we have a considerable breach in the uniformity of our table, in which nature all the way appears to have been very regular. I cannot account for this great difference, other than to say, that we have a strong suspicion, that whilst the man I depended upon came home with the preceding parcel to weigh them, that the fellow he left to dig the next number, took some of N^o 22 for roasters: if he did, he ought to be hanged; because it was doubly villainous to overset such an enquiry. I immediately took him to task about it, but he stood it out, although I offered him five guineas, only to let me weigh the potatoes, and I would forgive him; however, he shall never approach a minute experiment of mine again."

N ^o			N ^o	lb.	oz.		lb.	oz.	lb.	oz.	
3	Common Wife	Over Dung.	Merchantable	103	16	2	Small	5	4	21	6
6	Apple		Ditto	50	15	8	Ditto	4	10	20	2
2	Red French		Ditto	93	13	8	Ditto	2	4	15	12
5	Munster White		Ditto	62	12	8	Ditto	3	8	16	0
4	Crones		Ditto	53	12	4	Ditto	4	2	16	6
1	Spanish		Ditto	91	12	4	Ditto	3	6	15	10
N ^o			N ^o	lb.	oz.		lb.	oz.	Total.		
9	Common Wife	Under Dung.	Merchantable	89	15	2	Small	4	8	19	10
12	Apple		Ditto	58	14	14	Ditto	2	8	17	6
26	White French		Ditto	45	13	4	Ditto	2	8	15	12
25	English White		Ditto	71	13	0	Ditto	3	4	16	4
11	Munster White		Ditto	54	9	14	Ditto	3	8	13	6
10	Crones		Ditto	48	9	12	Ditto	2	1	11	13
8	Red French		Ditto	40	9	0	Ditto	1	12	10	12
7	Spanish		Ditto	54	7	12	Ditto	3	8	11	4

“ Here we also have the order of merit in point of quantity of the merchantable potatoes, from equal culture. Our totals vary a little as in the preceding table. The wife and apple potatoes keep their place in both tales, as to produce; but the red French and Munster white, and crones, contend pretty closely as to produce; and in the second table vary in their places of merit. Hence we may conclude, that some of these kinds agree better by being put under the dung than others; but every examination of the latter point, clearly proves, that under dung lessens the crop. The Spanish potatoes, which are certainly the

best in the world for eating, uniformly keep their place, of being last in the point of produce.

“ There is another very material point, worthy of the cultivator’s attention, in his choice of his potatoes in these tables. He will observe, doubtless, that I have given the number of the merchantable potatoes of each kind; he will therefore see that there is a prodigious difference in their sizes, a circumstance that comes strong against the wife potatoes. However, for the reader’s inspection, I shall attempt a little table upon that point, framed from the preceding ones, according to the order in point of size.

A T A B L E of S I Z E S.

N ^o		N ^o	lb.	oz.	
6	Apple	50	Weight	15	8
26	French White	45	Ditto	13	4
4	Crones	53	Ditto	12	4
2	Red French	63	Ditto	13	8
5	Munster White	62	Ditto	12	8
25	English White	71	Ditto	13	0
3	Common Wife	103	Ditto	16	2
1	Spanish	94	Ditto	12	4
					Average Weight per Potatoe 5 Ounces
					Ditto - - - - - 4½
					Ditto - - - - - 3½
					Ditto - - - - - 3¾
					Ditto - - - - - 3¼
					Ditto - - - - - 2¾
					Ditto - - - - - 2½
					Ditto - - - - - 3⅞

The following table of the poor man’s potatoe, distinguishes the quantity, and the gentleman’s the quality, according to the foregoing experiments.

The Poor Man’s Potatoe.	The Gentleman’s Potatoe.
First. Common Wife.	First. Spanish.
Second. Apple.	Second. English White.
Third. Red French.	Third. Munster White.
Fourth. Crones.	Fourth. White French.

Mr. Baker finding it very expensive to pick and sort his potatoes for planting in the common way, got a large riddle made of very strong iron wire, the meshes whereof were 1¼ inch. “ I set to work with this, says he, a man and boy, and I am sure they will do more in a day than forty pickers. The riddle cost me five shillings and five-pence, and I am persuaded has saved me twenty pounds since I had it: but I find I must have a set of them, of different sizes.”

Land well reduced by tillage, will produce good crops of potatoes without manure, provided they are hoed with the hand-hoe; and still better by horse-hoeing. But poor or ordinary land should be well manured; and upon such land they are commonly manured highly, both for the benefit of the potatoe crop, and for the crop that succeeds; the manure and tillage given to the potatoes, by ploughing the land for them, hoeing and digging them up, together with the cover of their succulent leaves, while growing, prepare the land admirably for another crop. But though a plentiful manuring for the potatoe crop is of great service, it may be over done, and then the potatoes will be wet, and not fit for the table, but must be given to the hogs.

When land is well tilled for potatoes, and the surface made fine, a sudden dash of rain, and dry weather afterwards, will sometimes bind the surface, and form so hard a crust upon it, that the broad succulent leaves of the potatoes cannot rise and get through it. In that case, the surface should be harrowed to break the crust, taking care

that the tines do not go so deep as to wound the tops of the plants; and if proper care is taken in this respect, it is best to harrow or hoe, and loosen the surface of every crop of potatoes, when the plants are advancing towards the surface of the land.

There is a new species of potatoe lately introduced into England, by some called the Bedford potatoe, which resembles a congeries, or cluster of roots of potatoes grown together. This potatoe has a surprising force of vegetation beyond any common potatoe, but is not so pleasant tasted, and therefore not fit for the table. However the produce of it is so great, that it merits the attention of farmers, who keep many hogs, or such cattle as will eat potatoes. Some of these potatoes have weighed nine or ten pounds; and one small cutting has produced thirty pounds of potatoes, in about four square feet of ground.

Mr. Marshall, amongst many other useful experiments, says, that having planted potatoes between cabbages, though at intervals of more than three feet wide, the halm became so luxuriant that the cabbages did not thrive, being in danger of being smothered; and regretting at the same time, that so much succulent herbage should be suffered to rot where it grew, broke off some of the stems, and threw them before the cows. They eat them readily. This induced him to set some men to work with a sickle, to cut a patch of it, to try if the cows would eat it in any quantity; and likewise to try its effect on the roots. The first was presently devoured: they eat as many as a man could wheel in a large wheel-barrow presently, leaving only the woody-part of the stem; and these were thrown to the hogs, who eat them greedily or sucked them, so that the refuse might be contained in the crown of a hat. By the cows eating the halm and the roots suffering no bad effect what a saving there must be. For though the potatoes were planted wide, there was herbage equal to the middling crop of tares, besides the surface being left open for the cabbage; which could be hoed and earthed-up with the hand-hoe as if no potatoes were there. It was his opinion that checking the rising sap may reflect it to the roots, and

instead of an evil prove beneficial. The cows in consequence of their food yielded a considerable increase of milk, and of a richer quality than before; the butter was perfectly and remarkably sweet; and the cows increased in their desire of the halm. By this process the whole receives a perfect fallow, for the intervals of the potatoes are tilled before the cabbages are planted; and the intervals of the cabbages after the potatoes are taken up. The soil by this method gives four crops: viz. the halm, the potatoes, the cabbages, and the sprouts. Upon examination it appeared that the potatoes which had their halm cut were not so large as those that had their halm remain uncut, but does not the gain of the halm more than balance the loss in the roots? By some it is said that the potatoes have done growing when the halm begins to turn; therefore Mr. Marshall recommends the cutting the halm when the roots have grown large, and before the tops of the halm have lost their succulence; if possible soon enough for the halm and late enough for the potatoes.

POULTRY, is a term given to all kinds of domestic fowls brought up in a farm-yard, as cocks and hens, ducks, geese, turkeys, &c.

The country-yard cannot be said to be complete till well stocked with fowl, which advantage will appear to every one who keeps them. The poorest villager may reap the same benefit from the products as the most substantial farmer, they being able to shift for themselves the greatest part of the year, by their feeding on insects, corn, or any thing almost, that is edible by any sort of animal.

I shall not enter into a minute description of the several sorts of cocks and hens, only advise you to choose those that are the best breeders, and the best layers; the oldest being always reckoned the best sitters, and the youngest the best layers; but no sort will be good for either, if they are kept too fat; the best age to set a hen for chickens is from two years old to five, and the best month to set them is February; though any month between that and Michaelmas is good. A hen sits twenty-one days, whereas geese, ducks, and turkeys, sit thirty. Observe to let them have constantly meat and drink near them, while they sit, that they may not straggle from their eggs and chill them.

One cock will serve ten hens.

If fowls are fed with buck or French wheat, or with hemp-seed, it is said, they will lay more eggs than ordinary; and buck-wheat, either whole or ground, made into paste, which is the best way, is a grain that will fatten fowls or hogs very speedily; but the common food used is barley-meal, with milk or water, but wheat-flour moistened is best.

A good hen should not differ from the nature of the cock; she should be working, vigilant and laborious, both for herself and her chickens; in size, the biggest and largest are the best, every proportion answerable to those of the cock, only instead of a comb, she should have upon her crown a high thick tuft of feathers.

She should have many and strong claws; but it will be better if she has no hinder claws, because they often break the eggs, and besides, such as have, do sometimes prove unnatural.

Crowing hens are neither good layers nor good breeders.

The elder hens are rather to be chosen for hatching than the younger, because they are more constant, and will set out their time; but if you choose for laying, take the youngest, because they are lusty, and prone to generation; but do not choose a fat hen for either of these purposes; for if she be set, she will forsake her nest; the eggs she lays will be without shells, and besides she will grow slothful and lazy.

Those eggs that are laid when the hens are a year and a half, or two years old, are the best; you must at that time give the hens plenty of victuals, and sometimes oats, with fenugreek to heat them, if you would have large eggs; for those that are fat commonly lay but small ones; mix some chalk with their food, or mix some bruised brick with their bran, moistened with a little water, and give them their belly-full of half-boiled barley, with vetch and millet.

Some hens have the ill faculty of eating their eggs: to prevent this, take out the white of an egg, and put moist plaster round about the yolk, and suffer it to grow hard; and when the hen attempts to eat it, and finds she cannot do it, she will soon give over breaking her eggs.

You may likewise pour a clear plaister upon the yolk of an egg, and let it harden, so that it may serve for a shell, and put into the nest; or you may shape an egg of plaister, or chalk, and let that be for a nest egg.

Those hens that have spurs often break their eggs, and generally will not hatch them, and they will sometimes eat them; these must be scowered, as well as those that scratch and crow like a cock; first by plucking their great quills out of their wings, and by feeding them with millet, barley, and paste, cut into bits, pounded acorns and bran, with pottage or crumbs of wheat-bread, steeped in water, or barley-meal.

Keep them in a close place, and at rest, and pull the feathers from their heads, thighs and rumps. If a hen be too fat, or has a looseness, she will lay windy eggs.

A hen will sit well from the second year of her laying to the fifth: the best time to set a hen, that the chickens may be large and most kindly, is in February, in the increase of the moon, that she may disclose the chickens in the increase of the next new moon, being in March; for one brood of this month's chickens is worth three of those of any other month.

Hens may set from March to October, and have good chickens, but not after that time, for the winter is a great enemy to their breeding.

A hen sits just twenty-one days, and if you sit a hen upon the eggs of ducks, geese, or turkeys, you must set them nine days before you put her own eggs to her, of which a hen will cover nineteen; but always set an odd egg, what number soever you set her with.

It will also be proper to mark one side of the eggs when you put them under the hen, and to observe whether she turns them from the one side to the other; and if she does not, then take an opportunity when she is from them to turn them yourself. But a hen that does not turn them herself is of the less value.

Take care that the eggs you set a hen on be new, which may be known by their being heavy, full and clear; this may be discovered by looking through them in the sun; nor do you choose the largest, for they have oftentimes two yolks, and though some are of opinion that such will produce two chickens, it proves commonly a mistake, and if they do, they generally prove abortive and monstrous.

A hen must not be taken off or disturbed from her nest, for that will make her utterly forsake it.

While she is sitting you must place her meat and water near her, that her eggs may not cool while she is gone to seek her food. If she would absent from her nest, stir up the straw, and make it soft and handsome, and lay the eggs in the same order she left them.

It is very necessary to perfume her nest with rosemary or brimstone, and you must take care that the cock does not come at the eggs and set upon them; for he will endanger the breaking of them, and cause the hen not to like her nest so well as before.

When hens are laying, the old straw should be taken away, and fresh put in, that it may not breed fleas, or other vermin, which much incommodes them.

The maladies incident to hens are as follow:

Setting hens are sometimes troubled with lice and vermin: for the cure, pound burnt cummin and stapulgar, of each equal quantities, and mix it with wine, and rub the hens with it, or wash them with a decoction of wild lupines.

If hens are troubled with a looseness, mix a handful of barley-meal, and as much wax, in some wine; make it into a mass, and give it them in the morning before they have any other meat, or else let them drink a decoction of apples or quinces.

Hens, by laying too many eggs, sometimes exhaust their strength, and languish: the same likewise happens by hens sitting too long; to remedy this, take the white of an egg, which you must roast till it looks as if it was burnt; mix this with an equal quantity of dried railins, also burnt, and give the hen this fasting.

Your hen-house must be large and spacious, with a pretty high roof and strong walls, to keep out both thieves and vermin; let there be windows on the east side, that they may enjoy the benefit of the rising sun, strongly lathed and close shut; upwards and round about the inside of the wall upon the ground, should be made large pens of three feet high, for geese, ducks, and large fowls to set in, and near unto the covering of the house should be

be long perches, reaching from one side of the house to the other, on which should set cocks, hens, capons and turkies, each on such perches as they are disposed.

At another side of the house, at the darkest part of the ground pens, fix hampers full of straw for nests, in which hens should lay their eggs; but when they sit to hatch chickens, then let them sit on the ground, otherwise it will be dangerous.

Also let their be stakes stuck in the walls, that the poultry may climb to their perches with the greatest ease.

The floor must not be paved, but made of earth smooth and easy. Let the smaller fowl have a hole made at one end of the house, to go in and come out at when they please, or else they will seek out roofs in other places; but of larger fowl, you may open the door morning and evening.

It would be better if the hen-house was situated near some kitchen, brewhouse, bakehouse, or kiln, where it may have the heat of the fire, and be perfumed with smoke, which is to pullets both delightful and wholesome.

As soon as your chickens are hatched, if any be weaker than the rest, wrap them in wool, and let them have the heat of the fire; it will also be very good to perfume them with rosemary; the first hatched chickens may be kept in a sieve till the rest are disclosed, for they will not eat for two days; some shells being harder than others, they will require so much more time in opening; but unless the chickens are weak, or then unkind, it will not be amiss to let them continue under her, for she will nourish them kindly.

When they are two days old, give them very small oatmeal, some dry, and some steeped in milk, or else crumbs of fine white bread; and when they have gained strength, curds, cheese parings, white bread, crusts soaked in beer or milk, barley-meal, or wheaten-bread scalded, or the like soft meat, that is small and will be easily digested.

It is necessary to keep them in the house for a fortnight, and not to suffer them to go abroad with the hen to worm. Green chives chopped among their meat is very good, and will preserve them from the rye or other diseases in the head, and never let them want clear water, for puddle water will be apt to give them the pip.

Nor must you let them feed upon tares, darnel, or cockle, for these are very dangerous to young ones, nor let them go into gardens till they are six weeks old.

If you would have them crammed, coop them when the dam has forsaken them, and cram them with dough made of wheaten meal and milk, which dip in milk, and thrust down their throats, but let them not be too big, lest you choak them; and they will be fat in a fortnight.

To distinguish whether a chicken is good or not: after a chicken is killed it will be stiff and white and firm in the vent, if new killed; but tender, and green in the vent if stale.

If you rub your finger on the breast of a scalded chicken, if it be new killed it will feel rough; but if stale, slippery and slimy.

A crammed chicken, if it be fat, will have a fat rump, and a fat vein upon the side of the breast of her, like a pullet.

In order to fatten chickens, you must put them into croups, and feed them with barley-meal; put likewise a small quantity of brickdust into their water, which they ought never to be without: this last will give them an appetite to their meat, and fatten them very soon; for in this case it must be considered, that all fowls and birds have two stomachs, as they may be called, the one is their crop, that softens the food, and the other the gizzard, that macerates the food; in the last we always find small stones and sharp sand, which help to do that office, and without them or something of that kind, a fowl will be wanting of its appetite to eat; for the gizzard cannot masticate, or as it may be said, grind the food fast enough to discharge it from the crop, without such sand or stones: and in this case the brickdust is assisting.

To cure the Pip in Poultry. This disorder is occasioned by eating foul meat, and drinking dirty water, or the want of water. It is known by a thin white scale on the tip of the tongue, which prevents the fowl from eating; and it is cured by taking off the scale with your nail and rubbing salt upon the tongue.

To cure the Rump. This complaint is a swelling on the rumps, which disorders the fowl prodigiously; and observable by the feathers on the affected part, standing out of their natural position. Pulling out the feathers, opening the sore, forcing out the core, and washing the part with brine, or with salt and water, will effect the cure.

To cure them of the Flux. Eating too great a quantity of moist food occasions this disorder, which is cured by giving them bran and peas scalded.

To cure stoppage in Fowls. This costiveness affects the poultry to such a degree, that they are unable to walk. Its cure is effected by anointing the vents, and then feeding them with corn, or small bits of bread soaked in urine.

To cure their sore Eyes. An approved remedy for this disorder, is to chew leaves of ground-ivy in your mouth, squeeze out the juice and spit it into the affected part.

To cure those stung with venomous Insects. The method is to anoint them with rue and butter. They may be known to be afflicted with this disorder, by their swelling and looking very heavy.

Ducks are very necessary for the husbandman's yard, in that they require no charge in keeping; they live on lost corn, worms, snails, &c. for which reason they are very good for gardens. Once in a year they are very good layers of eggs, especially a sort of duck that turns up the bill more than the common kind; when they sit they need little attendance, except to let them have a little barley, or offal corn and water near them, that they may not straggle far from their nest to chill their eggs.

In general it is found more profitable to set a hen upon the duck's eggs, than any kind of duck whatever, because the old one leads them when hatched too soon to the water, where, if the weather be frosty, some will be lost. They follow the hen a good while upon the land, and so get hardy before they venture to the water.

About thirteen eggs is the proper number to let a duck sit upon; the hen will cover as many of these as of her own, and will bring them up well: so that every way she is more profitable for that purpose.

When the ducklings are hatched they require no care, if the weather be tolerably good; but if they happen to be produced in a very rainy season, it would be right to keep them under cover a little, especially in the night; for, though the duck naturally loves water, it requires the assistance of its feathers, and, till they are grown, is easily hurt by the wet.

The fattening of ducks at any age is very easy, and whether it be the duckling, or the grown duck, the method to be used is exactly the same. They are to be put in a quiet dark place, and kept in a pen, where they are to have plenty of corn and water: any kind of corn will do, and with this single direction, they will fatten themselves extremely well in fifteen or twenty days: and will bring a price that very well repays their feeding.

The benefit arising from *Geese* are, for food, their feathers, and their grease. They will live upon commons, or any sort of pasture, and need little care and attendance; only they should have plenty of water. The largest geese are reckoned the best, but there is a sort of Spanish geese that are much better layers and breeders than the English, especially if their eggs are hatched under an English goose.

Geese lay in the spring, the earlier the better, because of their price and of their having a second brood. They commonly lay twelve or sixteen eggs each. You may know when they will lay, by their carrying of straw in their mouths, and when they will sit, by their continuing on their nest after they have laid. A goose sits thirty days; but if the weather be fair and warm, she will hatch three or four days sooner. After the goslings are hatched, some keep them in the house ten or twelve days, and feed them with curds, barley-meal, bran, &c. After they have got some strength, let them out three or four hours in a day, and take them in again, till they are big enough to defend themselves from vermin. One gander will serve five geese.

If you fatten green geese, you must shut them up when they are about a month old, and they will be fat in about a month more. Be sure to let them have always by them in a small rack some fine hay, which will much hasten their fattening. But for fattening of older geese, it is commonly done when they are about six months old, in or after harvest, when they have been in the stubble-fields,

from which food some kill them, which is a good way; but those who have a mind to have them very fat, shut them up for a fortnight or three weeks; and feed them with oats, splitted beans, barley-meal, or ground malt mixed with milk, the best thing to fatten them with being malt mixed with beer. But in fattening of all water-fowl you may observe, that they usually sit with their bills on their rumps, where they suck out most of their moisture and fatness, at a small bunch of feathers, which you will find standing upright on their rumps and always moist, with which they trim their feathers, which makes them oily and slippery more than other fowl's feathers are, that the water may slip off them, which if cut away close, will make them fat in less time, and with less meat than otherwise. Geese will likewise feed on and fatten well with carrots, cut small, and given them; or if you give them rye before or about Midsummer, it will strengthen them, and keep them in health, that being commonly their sickly time.

In some countries they shear the geese for their feathers, and some pull them twice a year; but this latter way is more injurious to them, and therefore it is better staying till moulting time, or till their death, for their feathers.

Turkeys are fowls that prosper very well in open countries, where there is not much shelter to harbour vermin to destroy them: for they are naturally inclined to ramble. The hens likewise are so negligent of their young, that whilst they have one to follow them, they never take any care of the rest; and therefore they must be a great deal of care taken of them whilst they are young, to watch them, and to keep them warm, they being a bird that cannot bear the cold. But some, where they have a conveniency of a small cover near the house, let them take their liberty, and seek their own nests; but it is only in some particular places that they do well with such management. I knew a gentleman that had a hen-turkey of the wild kind from Virginia, of which, and an English cock, he raised a very fine breed, that bred wild in the fields, and always became tame when grown up; they were a very hardy breed, and much larger than ours, and reared their young ones without any care or trouble, breeding much better than our English.

If you keep them with corn, they are very great feeders, and will devour a great deal; but if left to their liberty when grown up, they will get their own living, without either trouble or charges, by feeding on herbs, seeds, &c.

Turkeys being very apt to straggle, will often be laying their eggs in secret places; and therefore the common sort of them must be often watched, and made to lay at home. They begin to lay in March, and will set in April. Eleven or thirteen eggs are the most they sit on. They hatch in between twenty-five and thirty days; and when they have hatched their brood, you must be careful to keep the young ones warm, for the least cold kills them. Feed them either with curds, or green fresh cheese cut in small pieces. Let their drink be new milk, or milk and water. Some give them oatmeal and milk boiled thick together, into which they put wormwood chopped small, and sometimes eggs boiled hard, and cut in little pieces. You must feed them often, for the hen will not take much care of them, and when they have got some strength, feed them abroad in a close walled place where they cannot stray; you must not let them out till the dew is off the grass, taking care to have them in again before the night, because the dew is very prejudicial to them.

For the fattening of turkeys, sodden barley is very excellent, or sodden oats for the first fortnight, and for another fortnight cram them as you do capons. They are only to be crammed in the morning, which must be given to them warm, and let out all day, being sometimes fed with corn while out; because, being a fatten bird, they are apt else not to fat so kindly.

Their eggs are reckoned very wholesome, and a great restorer of nature.

POUNCES, the talons or claws of a bird of prey.

PREGNANT, teeming, breeding, fruitful.

PRESS UPON THE HAND: a horse is said to resist, or press upon the hand, when either through the stiffness of his neck, or from an ardour to run too much a-head, he stretches his head against the horseman's hand, refuses the aid of the hand, and withstands the effects of the bridle.

To press or push a horse forwards, is to assist him with the calves of your legs, or to spur him to make him go on.

To PRICK, or PINCH, is to give a horse a gentle touch of the spur, without clapping them hard to him.

Prick with the right: pinch with the left: pinch with both.

To PRICK, or PINCH, is an aid; but to bear hard with the spur, is correction.

PRICKER, [Hunting-term] a hunter on horseback.

PRICKER, a spitter, or young male deer of two years old, that begins to put forth the head.

PRICKING [with Sportsmen] the footing of an hare, when she beats on the hard heath way, and her footing can be perceived.

PRICKING, a term used by farriers, &c. to signify the driving a nail into the soft part of a horse's foot.

If a lameness proceeds from pricking in shoeing, the foot should be pared thin on the wounded side; and after dressing with tar and turpentine, let it be stopped with two ounces of common turpentine, melted down with four of lard.

If the nail penetrates to the joint of the foot, where matter may be formed, and by its long continuance putrify, so as to erode the cartilages of the joint, the case is incurable.

If the nail has passed up to the nut-bone, it is incurable, because this little bone cannot exfoliate; and cause the cartilaginous part of it is destroyed, as soon as injured.

If the nail has not passed to the tendon, the horse will do well, without a necessity for drawing the sole: but if the tendon is wounded, the sole must be carefully drawn, because a sinovia and gleet is discharged.

When gravel is the cause, it for the most part follows the nail-holes, and if it gets to the quick, cannot return, unless it is scraped out; for the make of the hoof, which is spiral like an ear of corn, favours its ascent, so that the gravel continues working upwards towards the coronet, and forms what the farriers call a quittor-bone.

The nature of this disorder points out the method of cure, which is to be as expeditious and careful as possible in getting out the gravel: if it is found difficult to effect this, let the sole or hoof be pared thin; and if necessary, the wound enlarged to the bottom, and then dressed up as usual. Should the coffin-bone be affected, remember, always to bathe the hoof with vinegar, or repellents, in order to allay the heat and inflammation, which often happen on such occasions; and should the pain and anguish affect the legs, treat them in the same manner, or charge the leg and pastern with a mixture of wine lees and vinegar.

PRICKT, otherwise called ACCLOYED, CLOYED, or RETRATED, &c. in respect to horses, signifies only the having a prick by the negligence of the farrier in driving the nails, by their weakness, ill pointing or breaking them, which if not presently taken out, will, in time, break out into a foul sore: you may discern it by the horse's going lame; but if you would know it more certainly, pinch him round the hoof with a pair of pincers, and when you come to the place aggrieved he will shrink in his foot; or else you may try where he is pricked by throwing water on his hoof, for that place where he is hurt will be sooner dry than the rest.

PRONG, an implement much used in husbandry, consisting of two or three pieces of iron, inserted into a handle, for taking up corn, straw, dung, &c.

PRONG-hoe, a term used to express an instrument used to hoe or break the ground near, and among the roots of plants.

The ordinary contrivance of the hoe in England is very bad, it being only made for scraping on the surface; but the great use of hoeing being to break and open the ground, besides the killing the weeds, which the ancients, and many among us, have thought the only use of the hoe, this dull and blunt instrument is by no means calculated for the purposes it is to serve.

The prong-hoe consists of two hooked points of six or seven inches long, and when struck into the ground, will flir and remove it the same depth as the plough does, and thus answer both the ends of cutting up the weeds and opening the land. The ancient Romans had an instrument of this kind, which they called the bidens; but they were afraid of its use in their fields and gardens, and only used it in their vineyards. The prong-hoe comes into excellent use, even in the horse-hoeing husbandry; in this

the hoe-plough can only come within three or four inches of the rows of corn, turnips, and the like; but this instrument may be used afterwards, and with it the land may be raised and stirred, even to the very stalk of the plant. *Tull's Husbandry.*

PROPAGATION, the continuance or diffusion of successive production.

The ingenious Mr. Barns has given us the following method of propagating trees by the bud and branch:

"Every leaf, says he, upon the branch of a tree, or shrub, has usually a young bud in its bosom; and it is certain each of these buds has in it the rudiment of a tree of the same kind: therefore it appeared reasonable to think that every branch might afford as many new plants as there were leaves upon it; provided it were cut into so many pieces, and a proper dressing was found to prevent the raw ends of each piece from decay. The best mixture for this purpose, upon careful and repeated experience, I have found to be this:

"Melt together, in a large earthen vessel, two pounds and a half of common pitch, and half a pound of turpentine. When they are melted, put in three quarters of an ounce of powder of aloes: stir them all together; and then set them on fire: when it has flamed a moment, cover it up close, and it will go out: then melt it well, and fire it again in the same manner: this must be done three times. It must be in the open air, for it would fire a house; and there must be a cover for the vessel ready. After it has burnt the last time, melt it again, and put in three ounces of yellow wax shred very thin, and six drachms of mastich in powder. Let it all melt together till it is perfectly well mixed; then strain it through a coarse cloth in a pan, and set it by to cool.

"When this is to be used, a piece of it must be broke off, and set over a very gentle fire; it must stand till it is just soft enough to spread upon the part of the cutting where it is wanted; but it must not be very hot. It is the quality of this dressing, to keep out wet entirely; the part which is covered with it will never decay while there is any principle of life in the rest; and, this being secured, nature will do the business of the growing.

"This I have found true in practice; and by repeated trials, in more kinds than one, I have found that I could raise from any piece of a branch as many good plants as there were leaves upon it."

PRUNIFEROUS trees, those which bear a pretty large and fleshy fruit, with a nucleus in the middle.

PRUNING. See ORCHARDS and TIMBER.

PUBLIC PATHS. See PATHS.

PUCKBALL, a species of mushroom, full of dust.

PUDDOCK, or PURROCK, a small inclosure.

PULSE, a term applied to all leguminous plants, as tares, pease, &c.

All the species of pulse afford great abundance of excellent manure, in the state in which nature presents them. The custom of ploughing in green succulent plants, is very ancient. All the Roman writers commend it highly, and with much reason. Columella recommends particularly lupins, as a manure, which, if cut down and turned in while green, will have as good effect as the best and strongest dunging whatever. They may be sown upon poor land about the middle of September, and will enrich it greatly if ploughed in before they attain their full growth. In gravelly soils they should be cut down after they have put forth their second flower; and in strong lands, after the third. In the former of these grounds they are turned in while young and tender, that they may quickly rot; and in the latter, they are let stand till they grow stronger, that they may bear up the more solid and stiff clods of earth, and keep them the longer suspended; by which means the air has freer access to the soil, and these clods, being heated and dried by the summer sun, are the more easily opened, and resolved into dust. Thus says this judicious author, justly remarkable for his superior skill in husbandry. But Mr. Miller is of a contrary opinion.

The *Maison Rustique*, a work of very high repute, as is evident from the great number of editions it has gone through, strongly and rightly recommends pease, beans, lupins, vetches, and other succulent plants, as excellent manures, especially for sandy ground. These plants enrich the earth greatly if ploughed in, either green, or when in bloom. In strong land they should not be turned down till the pods begin to harden.

In Piedmont and other places where they fatten their

land with this manure, lupins are sown upon the fallow ground towards the end of June, immediately after the second ploughing, so that they are still green when the third ploughing is given and the corn is sown. Experience shews the husbandmen in those countries, that this method of using these plants for manure makes them ample amends for the loss of the pulse or fodder they might otherwise reap from them: but those who do not like to lose any thing, plough in the husks after they have taken out the grain.

Dr. Lister likewise recommends for the improvement of sandy, light ground, or any clay well sanded, all plants of the pulse or pea kind, and particularly, "upon experience, the wood vetch, which, besides its being perennial (at least with respect to its roots) and its thriving even in woods and among bushes in almost every country, has these farther qualifications, that it shoots out a thousand roots far and wide, and spreads itself under ground, like quick-grass; whilst it is so rampant above ground, that it will climb a fathom and a half upon measure, and preserve itself in spite of weeds or drought. It may be set, as well as sown, in furrows. For the former of these purposes the roots may be dug up in September, which is also the time for gathering the ripe seed. The growth of the plants will be greatly advanced by setting their roots; for the older they are, the stronger, more numerous, and fuller of buds their shoots will be. I sowed in the latter end of March the seed which I had gathered in September, and had that year a very great increase, the bed being thick covered over with grass above two feet high: but it did not flower that year. I reckoned that one pea had put forth above thirty shoots in August of the first year. In the second year, it flowered by the middle of June, and bore a wonderful crop, the roots being innumerable. I have observed this pea very common in all the mountains as well as plains of England, where bushes or hedges are. Both the pea and grass are very sweet, and very agreeable to cattle, as I have tried."

Buck wheat and vetches are the two plants most commonly sown in England for manure. The best time for ploughing them in, is when they are in bloom; being then in their most succulent state. Some farmers turn down their second crop of clover, to enrich the land for wheat in the autumn. This should be done early enough to give the plants sufficient time to putrefy thoroughly before the grain is sowed; otherwise, it might prove prejudicial, by bringing on a heat which would hurt the corn.

The reverend and ingenious Mr. Elliot, of New England, prefers millet to every other plant for green dressing of land, on account of the cheapness of the seed, and the largeness of the stalks and leaves, which must afford a good coat to turn in when ploughed. An old farmer who had long been in the practice of green dressing, assured this gentleman that he had increased the strength of his land to a great degree, in a few years, by the following method: After his oats were harvested, he added a little seed to the scattered grains, and then ploughed them in. Towards the end of September, he ploughed in the green oats, and sowed rye; and the next summer, when the rye was well grown and full of sap, he ploughed that in at the usual sowing season, then sowed wheat, and always had a large crop. See BEANS, PEASE, &c.

PUNCH, a well-set, well-knit horse, is short backed, and thick shouldered, with a broad neck, and well lined with flesh.

PURGING; the operation of evacuating the impurities of an animal body by stool.

Purging is often necessary in gross full horses, in some disorders of the stomach, liver, &c. but should be directed with caution. Before a purge is given to any horse, it is necessary some preparation should be made for it, in order to render the operation more safe and efficacious: thus a horse that is full of flesh should first be bled, and at the same time have his diet lowered for a week, especially those that have been pampered for sale; several mashes of scalded bran should also previously be given, in order to open the bowels and unload them of any indurated excrement; which sometimes proves an obstacle to the working of the physick, by creating great sickness and griping.

Let it be remembered, that a horse is purged with difficulty; that the physick generally lies twenty-four hours in the guts before it works; and that the tract of bowels it has to pass through is above thirty yards; and laying horizontally,

zonally, consequently resinous and other improper drugs may, and often do, by their violent irritations, occasion excessive gripings and cold sweats, shave off the very mucus or lining of the guts, and bring on inflammations, which often terminate in mortifications and death.

It is remarkable too, that the stomach and guts of a horse are but thin, compared to some other animals of the same bulk, and therefore must be more liable to inflammation and irritation.

Horses kept much in the stable, who have not the proper benefit of air and exercise, in proportion to their food, should in spring have a mild purge or two, after a previous preparation by bleeding, lowering their diet, and scalded mashes.

Horses that fall off their stomach, whether it proceeds from too full feeding, or ingendering crudities and indigested matter, should have a mild purge or two.

Horses of a hot temperament will not bear the common aloetic purges; their physic therefore should be mild and cooling.

Purging is always found very beneficial in stubborn dry coughs; but mild mercurials joined with them, make them yet more efficacious.

Horses that have those sorts of lamenesses, that are said to proceed from humours flying about (which are of the rheumatic kind, and in young horses proceed from fizy blood, and occasion lameness in every limb) require frequent purging; and should also have, between whiles, medicines that attenuate and thin the fluids.

Horses of a watery constitution, who are subject to swelled legs, that discharge a sharp briny ichor, cannot have the causes removed any ways so effectually as by purging.

The first purge you give to a horse should be mild, in order to know his constitution.

It is a mistaken notion, that if a proper prepared purge does not work to expectation, the horse will be injured by it; for though it does not pass by stool, its operation may be more efficacious, as an alterative to purify the blood, and it may pass by urine, or other secretions.

Purging medicines are very successfully given in small quantities, mixed with others; and act then as alteratives.

If mercurial physic is given, care should be taken that it be well prepared; and warmer cloathing, and greater circumspection is then required.

Purges should be given early in the morning upon an empty stomach; about three or four after the horse has taken it, he should have a feed of scalded bran; and a lock or two of hay may then be put in his rack. The same day give him two more mashes; but should he refuse warm meat, he may be allowed raw bran.

All his water should be milk warm, and have a handful of bran squeezed in it; but if he refuses to drink white water, give it him without bran.

Early the next morning, give him another mash; but if he refuses to eat it, give him as much warm water as he will drink: let him be properly cloathed, and rode gently about. This should be done two or three times a day, unless he purges violently, once or twice will then be sufficient: at night give him a feed of oats mixed with bran.

During the working, a horse should drink plentifully; but, if he will not drink warm water, he must be indulged with cold, rather than not drink at all.

We shall here insert some general forms of purges.

Take succotrine aloes ten drams jallap and salt of tartar each two drams, grated ginger one dram, oil of cloves thirty drops; and make them into a ball with syrup of buckthorn.

Or,

Take aloes and cream of tartar each one ounce; jallap two drams, cloves powdered one dram, syrup of buckthorn a sufficient quantity.

Or,

The following, which has an established character among sportsmen:

Take aloes, from ten drams to an ounce and a half, myrrh and ginger powdered each half an ounce, saffron and oil of aniseed each half a dram.

Mr. Gibson recommends the following:

Take succotrine aloes ten drams, myrrh finely powdered half an ounce saffron and fresh jalap in powder, of each a dram; make them into a stiff ball with syrup of roses, then add a small spoonful of rectified oil of amber.

The succotrine aloes should always be preferred to the Barbadoes, or plantation aloes, though the latter may be given to robust, strong horses, but even then, should always be prepared with the salt, or cream of tartar; which by opening its parts, prevents its adhesion to the coats of the stomach and bowels; from whence horrid gripings, and even death itself has often ensued. This caution is well worth remarking, as many a horse has fell a sacrifice to the neglect of it.

Half an ounce of Castile soap, to a horse of a gross constitution, may be added to any of the above; and the proportions may be increased for strong horses.

When mercurial physic is intended, give two drams of calomel over night, mixed up with half an ounce of diapente, and a little honey, and the purging ball the next morning.

The following, when it can be afforded, is a very gentle and effectual purge, particularly for fine delicate horses; and if prepared with the Indian rhubarb, will not be expensive.

Take of the finest succotrine aloes one ounce, rhubarb powdered half an ounce or six drams, ginger grated one dram; make into a ball, with syrup of roses.

The following purging drink may be given with the utmost safety; it may be quickened, or made stronger, by adding an ounce more fenna, or two drams of jalap.

Take fenna two ounces, infuse it in a pint of boiling water two hours, with three drams of salt of tartar; pour off, and dissolve in it four ounces of Glauber salts, and two or three of cream of tartar.

This last physic is cooling, easy, and quick in its operation; and greatly preferable in all inflammatory cases to any other purge, as it passes into the blood, and operates also by urine.

When horses lose their appetites after purging, it is necessary to give them a warm stomach drink, made of an infusion of camomile flowers, aniseeds, and saffron: or the cordial ball may be given for that purpose.

Should the purging continue too long, give an ounce of diascordium in a pint of Port wine, and repeat it once in twelve hours, if the purging continues. Plenty of gum arabic water should also given, and in case of violent gripes, fat broth glysters, or tripe liquor, should be often thrown up, with an hundred drops of laudanum in each.

The arabic solution may be thus prepared:

Take of gum arabic and tragacanth of each four ounces, juniper berries and caraway seeds of each an ounce, cloves bruised half an ounce; simmer gently in a gallon of water, till the gums are dissolved, give a quart at a time in half a pail of water; but if he will not take it freely this way, give it often in a horn.

When a purge does not work, but makes the horse swell, and refuse his food and water which is sometimes the effect of bad drugs, or catching cold, warm diuretics are the only remedy; of which the following are recommended:

Take a pint of white wine, nitre one ounce, mix with it a dram of camphor dissolved in a little rectified spirit of wine; then add two drams of oil of juniper, and the same quantity of unrectified oil of amber, and four ounces of honey, or syrup of marshmallows.

Or,

Take Venice turpentine one ounce, incorporate with the yolk of an egg; nitre one ounce, then add juniper berries, and fresh aniseeds pounded, each half an ounce, unrectified oil of amber two drams; make into a ball with syrup of marshmallows.

PURLIEU, all that ground near any forest, which being antiently

anciently made forest, is afterwards, by perambulations, separated again from the same, and freed from that servitude which was formerly laid upon it.

PURLIEU-*Man*, one that has land within the purlieu, and forty shillings a year freehold; upon which account he is allowed to hunt or course in his own purlieu, with certain limitations.

PURSE-NET, a net used for taking both hares and rabbits, at certain times, and three or four dozen of them are sufficient to lay over their holes: they are to be fastened, by tying strings to sticks thrust into the earth, otherwise when the rabbits bolt out, they will run away and get out of the nets; but when the nets are fixed, and all things in order, there must be one or two to lie close, to see what game comes home; while, in the mean time, you beat the bushes, to force them homewards.

Another way to take rabbits with these nets, is at their coming out of their parraces: and they should be secreted in this manner.

First hunt them up and down, to force them all in, then put in a ferret with a bell about her neck, which gives the rabbit notice of her coming, who endeavouring to avoid the ferret, runs into the net.

PURSINESS IN HORSES, is a shortness of breath,

either natural or accidental. The natural is when the horse is cock thropped; for that his thropple or wind-pipe being so long, he is not able to draw his breath in and out with so much ease as other horses do which are loose thropped, because the wind-pipe being so strait, that should convey the breath to the lungs, and vent it again at the nose, makes him pant and fetch his breath short; and in like manner when his pipe is filled with too much fat, or other phlegmatic stuff, which suffocates him, and makes his lungs labour the more.

Pursiness accidental is sometimes caused by a horse's being hard ridden after a full stomach, or presently after drinking, which causes phlegmatic humours to distil out of the head into the windpipe, and fall upon the lungs, where they settle and congeal.

It also proceeds from heats and colds, &c. causes dullness and heaviness in travelling, makes him sweat much, and ready to fall down upon every strain.

For the cure: pound aniseeds, liquorice, and sugar-candy, to a fine dowder, and put four spoonfuls into a pint of white-wine; brew them well, and mix with them half a pint of fallad oil. Give this to the horse ever after a travel, and a day before he sets out on a journey.

Q.

QUARTER BEHIND, is when a horse has the quarters of his hind feet strong; that is to say, the horn thick, and capable of admitting a good gripe by the nails.

When a horse's quarters or feet are wasted and shrunk: For the cure: raze the whole foot with a red hot knife, making large razes of the depth of a crown piece, from the hair to the shoe: and avoiding the coronet, then apply a proper poultice, and charge the foot with a *remolade*.

QUARTERS OF A SADDLE, are the pieces of leather, or stuff, made fast to the lower part of the sides of the saddle, and hanging down below the saddle.

QUARTERS OF A HORSE, fore-quarters, and hind-quarters; the fore-quarters are the shoulders and the fore-legs; the hind-quarters, are the hips and the legs behind.

QUARTERS OF A HORSE'S FOOT, are the side of the coffin, comprehended between the toe and the heel on one side, and the other of the foot: the inner-quarters are those opposite to one another, facing from one foot to the other; those are always weaker than the outside quarters, which lie on the external sides of the coffin.

QUARTER-CAST; a horse is said to cast his quarters when for any disorder in his coffin, we are obliged to cut one of the quarters off the hoof, and when the hoof is thus cut, it grows and comes on a new.

QUARTER EVIL, a disease in cattle. Mr. Young, in his *Annals of Agriculture* vol. XIV. inserts the following, by A. P. Anderson, esq. "I have procured a recipe for a preventive of that evil, which has been successfully used with us; for since it has been a rule in many of the principal dairies to apply it, the complaint has been less common. But, if the antidote is not administered before the disorder has made its attack, I never heard of its being removed.

It is generally applied the latter end of October, or beginning of November, keeping the cattle in your driest pastures.

"Take rue, wormwood, lavender-cotton, a few heads of garlic, and a little favin, cut very small; add to it flour of brimstone, diapente, and elecampane powder; boil all together in urine; then take it off the fire, and let it stand until it about milk warm.

"Give each calf two hornfuls [(bullock's horns, commonly used for giving drenches to cattle) with about a table

spoonful of Barbadoes tar in each horn, first taking off about one quart of blood from each calf.

"Put a little tar over their noses, on their loins, and on their ribs, for them to lick.

"The ingredients of this drench are to be given all together, without straining. And observe, it cannot be made too strong of the herbs, without being too thick for a drench; except only, as to the favin, which must be sparing and discreetly used."

QUEEN-BEE, a name given by late writers to what used to be called the king-bee, or king of the bees; a large and long-bodied bee, of which kind there is only one found in every swarm, and which is always treated with the greatest respect by the rest. See the article BEE.

This is, indeed, the parent of the swarm; and from the fecundity of this one female, a whole hive is easily and soon re-peopled.

It is to be observed, that the autumn and winter seasons destroy a great number of the bees; so that a hive, which was full in the summer, is often found so thinly peopled before the end of winter, that the bees seem only a few inhabitants in a very large city: by Midsummer again this same hive shall, however, be found so well filled with inhabitants that there shall be a necessity of sending out a colony in the name of a new swarm, and yet the hive will remain as full as it can well hold. This increase might well appear very amazing, if all the remaining bees of the hive were supposed to be females, and to join in it, but how much more so when it must be acknowledged, that it is all owing to one female, and that this queen-bee, or mother-bee, alone, has given origin to such an immense progeny?

The form of this bee, and there being only one such in a hive, naturally led all who saw it into an opinion of something singular in its nature, and the antients determined that it must be the king over the rest: they made it an absolute monarch, and have supposed that all the business of the hive was done by its immediate orders; and that the several parties of bees allotted to work in the making of the combs, in the filling their cells, in the stopping the crevices of the hives, and in carrying away the filth, &c. had all their several stations allotted them by this wise and provident monarch. This was giving great talents to the monarch bee; but this was mere fancy, and it is plain, that if this creature rules, it is over a people who all perfectly well know their several

several businesses : but it rather appears, that there is no sovereignty at all, but that this creature is respected in a very high degree by the rest, as the common parent of the whole nation.

There were not wanting among the antients, however, some who believed this large bee to be a female, and these pretend that she brought forth only females like herself, which succeeded her in her reign. They had a very different opinion as to the origin of the common bees, not supposing them generated of animal parents like themselves, but produced out of corruption, and born of the flesh of a bull or cow. Among the later writers, this opinion, notwithstanding the sanction of the poet Virgil, has been laughed out of the world ; yet it was long before the true origin of bees even after this, was known. The author of the Female Monarchy, though well apprized of this great bee being of the female sex, yet supposed that she only produced young ones like herself ; and pretended that the common bees copulated together for the production of other bees like themselves : this, however, has been since found to be wholly erroneous, the female, or queen-bee, giving birth to all, and these common bees being of no sex at all. Many of the authors who have not given into the idle opinion of the bees being bred of putrid flesh, have yet given them an origin not less idle and ridiculous. They pretend that the bees are exempted from the pain of producing either eggs or young ; and that the offspring are formed of the juices of flowers, the different kinds, as the drones, females, &c. owing their rise to the juices of different kinds. These and a number of other false notions, have been propagated in regard to bees ; but their true origin could not well be found till we were in a condition to see what passes at certain times within the recesses of the hive, which is done by the use of that excellent invention, the glass hive. By this, and by the help of dissections, we may easily inform ourselves perfectly of the true state of the case. The parts of generation are the subjects of our enquiry for this purpose, and, though the bodies of these animals are so small, these are usually sufficiently large to be distinguished, often taking up more room in the abdomen than all the other parts together. Thus, if the large long-bodied bee be opened, the abdomen will be found to contain vast numbers of oblong bodies, which any one acquainted with insects will easily distinguish to be eggs : vast numbers of these are large enough to be observable by the naked eye, but when the assistance of glasses is called in, there are discerned a vast number of other small eggs, which exceed all computation. It is easy to determine from this, that this creature, so long esteemed a male, is in reality, a female, and is in condition to give birth to a very numerous posterity.

In order to distinguish this, however, a proper time must be chosen for the dissection, and the most proper of all is when the creature is just ready to deposit her eggs. This is in the months of April and May, and the most certain time of all is when she is in a hive where a new swarm have been received about ten days before : if she be dissected at other times, the eggs are less visible ; and, particularly in winter, there requires a good glass to shew the rudiments of them. This is a disagreeable experiment, indeed, because it is always the destruction of a future swarm ; all the eggs we see in the dissected female being what would have produced bees to labour for our benefit.

When the body of one of the drones is opened, there is found, instead of these vast numbers of eggs, a part seeming proper for a male organ of generation, and in the abdomen a number of vessels running in several windings of contortions, and filled with a milky humour. These seem destined for the important use of impregnating the eggs in the belly of the female, and it is very natural to determine from this, that these are the males.

The common bees, when dissected, at whatever time of the year, never shew the least marks of any seeds at all. The intestine of these bees are found at times to be more or less distended with honey, and with rough wax ; but there are never discovered any eggs, nor any of the winding seminal vessels, so that it is plain they have no share in propagating the species : and the observation of the swarms from time to time, with the assistance of glass hives, gives proof to what the dissections seem to make sufficiently certain without this evidence.

The female bee resides within the centre of the hive, always living in one of the spaces between the combs ; if she occasionally comes out to the surface, and is seen walking

over the edge of a comb, she is to be well observed at those times ; for her only business is the laying her eggs in some of the empty cells of that part of the comb : which done, she always retires again.

In order to see the female, or mother-bee, employed in this operation, we are to observe in the morning hours, between seven and ten, what passes in a glass-hive, into which a swarm have been received a few days before. The speed with which the common bees labour in making their combs on this occasion is almost incredible ; and they seem not only to labour to have cells to deposit their honey in, but to know that the parent bee is at this time loaded with eggs for the production of a numerous progeny, and that she has an immediate necessity of cells for the depositing them in. This necessity is so urgent, that she is often forced to deposit them in cells not yet finished ; though the bees labour so vigorously, that they often will erect a whole large comb in one day. If the hive be narrowly watched at these times in the morning hours, the female bee will be soon found employed in her work, and will be seen dropping her tail by turns into several cells every day. If the combs be examined a day or two after this, they will also be found to contain the eggs ; one of these is placed in each cell, and appears in form of an oblong white body, fixed either to the solid angle of the base, or to one of the angles composed by the rhombs which form the triangular base of the cell, and is always attached in such a manner, that it lies nearly in an horizontal position.

The flat glass hives are the most favourable for the making these observations, since in those the combs are so narrow and so numerous, that the whole is taken in view at a time, from one side or the other ; and there are always several combs to be made choice of for the operation : in the morning hours of April and May, the female or mother-bee will be usually seen walking very soberly over one or other of these combs, attended by a guard of about twenty of these common bees, all placing themselves in such a manner, that their faces are turned towards her, and all paying her the greatest marks of homage and adoration. As she walks along in this state, she examines every cell as she passes over, and such as she finds yet empty and fit for her purpose, she rests at : and, introducing the hinder part of her body at the top, plunges it so deep in that her tail touches the bottom. Then she deposits one egg, and no more ; and this is at that time covered with a glutinous matter, which fastens it to the place where it is laid : from this cell the female passes to several others, where she deposits her eggs in the same manner.

Some authors who have written of the polity of bees, have represented the time of the female bee's laying her eggs as a season of festivity and rejoicing in the hive ; but this does not at all appear to be the case ; the few bees which attend her on this occasion seem the only ones that know any thing of the matter, and their behaviour favours more of homage and respect than of joy : they are continually stroking and brushing her clean with their legs and with their trunks, and offer her from their own mouths the finest honey, when she has occasion for food. The rest are all employed in their proper offices, and the work of the hives go on as usual ; and, indeed, it is well that it does so, for this time of rejoicing would be of very bad consequence to the affairs of the hive, if carried on as supposed, since the female bee is thus employed, more or less, during the whole summer months.

When the female bee has laid six or seven eggs, she always takes a time of respite or repose ; and, during this time, the bees which form her levee are doubly busy in their caresses, some brushing her head and breast with their trunk, but several being always employed together to cleanse the hinder rings of the body, which have been fouled by being thrust into the cells. When this is done, she begins again : but Mr. Reaumur observes that he never could see a female lay more than ten or twelve eggs at one time : he supposes that his presence disturbed the creature, and finally drove her into the inner parts of the hive, where she might continue her work in cells less exposed. It is not difficult to compute the number of eggs which the female lays every day, from the swarm which is ready to leave the hive at the end of May : this swarm usually amounts to at least twelve thousand ; and as the hive out of which these depart is not less peopled by their loss, it is evident that they were all the produce of the eggs deposited by the female in the preceding months of April, with a part of March, and a few of the first days of May. On a moderate computation, on these principles it will appear, that the female bee cannot lay

lay less than two hundred eggs every day, for a long space of time together: and this, though seemingly a monstrous increase, is yet much less than that of some other of the winged insects; in one of which, a two-winged fly, that author counted no less than twenty thousand living worms, all ready to be deposited by the parent, and to become flies of the same kind.

It has been strongly objected against this system, that, though the female bee lays eggs, she is not the only one that lays; and many will not give up the opinion of the common bees also laying some eggs, though but a few in number; observing, that if each of these lay only four or five eggs, it would be enough to give birth to a whole swarm, without supposing that this prodigious fecundity belonged to the female bee alone; but this is running into the old error of the female producing only females like herself: whereas, if we observe the cells in which we see the female deposit her eggs, we shall in the sequel find the common bees produced from these eggs, and issuing out of these cells: this is a sufficient proof to any fair reasoner, since it appears very plain, that, if the female produces them, they do not produce one another. It is also evident that not only these common or working bees, but also the drones, or male bees, are produced from the eggs of this same female: and there is this remarkable forecast in the female, that she always deposits the eggs which are to give origin to these in peculiar cells, proper for the reception of the worms which are to be hatched from them. It is observed, in examining a hive, that there are always some combs, or some parts at least of combs, the cells of which are much larger than those of the other parts or combs: these large cells are destined for the residence of the larger worms, which are to produce the drones or male bees. It has been observed as a miraculous singularity by some, that the female bee always knows before-hand, whether the egg she is going to lay will produce a male or a common bee; and that, according to this knowledge, she never deposits the eggs for a male in a smaller cell, nor that of a common bee in a large one; but there is, in reality, less wonder in this than is supposed, for the eggs of which the drones are to be hatched are much larger while in the body of the female than those of which the common bees are to be produced, and the whole occasion of this choice in regard to the placing of them is, that, when the creature finds a large egg coming forth, she seeks one of the large cells to deposit it in; and when the common small eggs are coming, she contents herself with the common cells.

It is very natural to believe that the female bee lays a third kind of eggs; and that, besides producing many thousand common or working bees, and many hundreds of the males or drones, she ought to lay one egg at least capable of producing a female like herself, which is to be the mother of a future progeny, and the queen of the present race; since, without such a one for their leader, the young brood would never leave the hive in the nature of a colony to settle themselves elsewhere. What we thus perceive ought to be the case, is also found in reality to be so; and the female, besides the other kinds of eggs, is found by a strict observation to lay also eggs of this kind. We might perhaps only expect one female bee to be produced for each swarm; but, as nature has seemed every where prodigal in the manner of the increase of her works, so it is in this also. What millions of seeds are produced on a common elm-tree, for one that strikes and succeeds so well as to grow up to be a tree! and, of the number of young produced from the spawn of a carp, how few live to the size of a parent? Thus it also is in regard to the female bees: nature, though it has allotted only one of this kind, as absolutely necessary to the new swarm, yet has given abundance of chances for that one to succeed by the female's usually laying at least ten eggs for the production of the female offspring, and often not less than twenty: there are, indeed, some seasons when not one female is produced; but in those seasons there is no swarm going out from the old hive, the creatures being informed by nature, that they have no business for combs and cells when they can have no offspring to rear in them.

The working bees are not only very obedient to, and very careful of their queen, or female parent, but they are also very solicitous about her progeny. This is very evident in the structure of the cells which they prepare for the reception of those eggs which are to be hatched into females. It has been before observed, that they prepare larger cells for the eggs which are to become drones, or

male-bees, than for those which are to produce workers like themselves. The large cells destined for the drones are, however, of the same shape and figure with the others, differing only in size; but this is not the case with those destined for the female offspring: these are not only very large, but very clumsily contrived, for the sake of strength; their sides being much thicker than those of the rest, and their figure oval. The bees are extremely sparing of their wax on all other occasions, but for the construction of these royal cells, as they may not improperly be called; they are as remarkably profuse: one of the royal cells will weigh more than an hundred and fifty of the common kind. The bees are no more sparing of the room than of the materials in the construction of these royal habitations: they are often placed near the centre of a comb, and a vast number of other cells are destroyed for their base; often also, they hang down from the rest of the comb, in form of stalactites from the roofs of subterraneous caverns.

A cell of this kind, when first formed, represents an acorn cup; but it is soon lengthened beyond the possibility of retaining that figure, and it remains thus till the creature is hatched from the chrysalis or nymph state, and comes out of it; after which the bees, to lose no room in the hive, form other common cells upon it, and the only remaining mark of the female cell, is the appearance of a knot in the place where it once stood.

The number of cells destined to receive the eggs which are to produce female bees are so few, and they are commonly placed in such close parts of the hive, that there is no great probability of seeing the female employed in laying her eggs in them; there is no reason to doubt the fact; however, since, we know that she lays eggs for the production of the females like herself.

It might seem much harder to conceive how so vast a number of bees should be produced from this one, as we know are produced from her; but, when one of the females is opened, the vast number of eggs discovered in each of her ovaries make the prodigious increase no way wonderful.

Swammerdam observed, that the number of vesicles in the ovary of the female bee was astonishingly great; he easily counted an hundred and fifty in each ovary, and could count about seventeen eggs in each vesicle large enough to be distinctly visible; each ovary contains, therefore, two thousand five hundred and fifty eggs, and both ovaries five thousand one hundred. When we find so many eggs at once distinguishable by their size, it will be easy to conceive, according to the common course of nature in the propagation of insects, that there may be many more too small to be yet distinguishable; and, at that rate, the number of twelve thousand bees, which is the quantity that composes a moderate swarm, is not wonderful for the product of the eggs of one female for one season. *Reaumur's Hist. Inf.*

QUICK, or **QUICKSET-HEDGE**, a general name for all hedges, of whatever sorts of plants they are composed, to distinguish them from dead hedges; but in a more confined sense of the word, it is applied to the white or hawthorn, the sets or young plants of which are raised by the nursery gardeners for sale. *See the article FENCE.*

QUICKSILVER, a very ponderous fluid mineral, generally called mercury.

In the year 1765, a discovery was made (or rather revived, for it is mentioned by Mr. Bradley), that quicksilver was a sovereign remedy for destroying insects on trees.

The narrative of this discovery was contained in a letter written by Dr. R—— to Dr. P——; in which the former begs the assistance of the latter "in laying before the learned world an account of some experiments, that have been tried with success, and which, when fully known, will, he believes, be of great service to the vegetable part of the creation, by totally destroying those pernicious insects, that are apt to infect the tender leaves and young shoots of our choice fruit-trees: and for which, no remedy, that he had ever heard, or read of, has been as yet proposed, that is either adequate to the disease, or effectual to the cure." Dr. R——, therefore, in the following part of the letter, desires Dr. P—— "to lay before the Society for the Encouragement of Arts, &c. the following experiment, that was tried last spring, with success, by one George Bradford, a clothier in the city of Hereford, and a very ingenious young man: in order, after the ex-

periment has been fully tried, that they may reward him in proportion as he may seem entitled to it." But Dr. R—— adds, that, "whether he may be thought worthy of any recompence, or not, he very chearfully submits it to the trial of the curious; and hopes they may reap the same advantages he did last year, by clearing their trees of those pernicious insects." The doctor then proceeds as follows, to give the relation of Mr. Bradford's invention and success. "The first tree he tried the experiment upon, was a favourite plum-tree: I think a green gage. He was afraid of trying it on the whole body of the tree at first, as he did not know but that it might kill it at once: and therefore he selected out a particular branch, that was designed to be cut quite away, at the winter pruning, for the subject of his first essay. The method of the experiment is this: he took a small awl, and pierced, sloping, through the rind, and into part of the wood of the branch, but not to the heart or pith of it; and poured in a small drop or two of quick-silver, and stoppt it up with a small wooden plug made to fit the orifice: and the result of this experiment was, that the insects all dropt off, from that very branch, the next day; and, in a day or two more, from off the other branches of the tree, without any other puncture: and the tree continued in full vigour, and throve well all the summer after. Encouraged by this success of the first essay, he next tried it upon a honey-suckle; the leaves of which were quite covered with them: and here he scraped away the top of the ground with a trowel, and run his awl, in the same sloping manner, into the main stem just above the roots; but with the same caution as above, not quite to the inner pith; and the success was the same as before. The insects all dropt off dead the next day after the experiment was made. The above facts you may safely depend upon: and I saw both the trees, on which the experiments were made, since Christmas last; and they then seemed to be both very healthy and well. I did not indeed see the operation performed, as I was at that time on my residence at L——; but the method, manner, and success, as above related, I had from Mr. Bradford's own mouth."

This letter from Dr. R——, was dated March 11, 1765, though the delivery of it to the Society was deferred from accident till February last. But Dr. P——, in his letter to the president, desiring him to lay the other before the Society, remarks, that experiments have been since made, which conform the first observations. He says, "the advantage, however, hath arisen from this delay, that Dr.

R——hath had fuller proof of the success of this discovery."

We shall only add, that this method has since been tried by several members of the Society, and found fully to answer the intended purpose.

QUINCUNX, a disposition of trees originally formed into a square, consisting of five trees, one at each corner, and a fifth in the middle; which disposition often repeated, forms a regular grove, and then viewed by an angle of the square or parallelogram, represents equal and parallel alleys.

QUIT-RENT, a small rent payable by the tenants of most manors, whereby the tenant is quit, or free, from all other services, and is said to be an acknowledgement of their subjection to the lord of the manor.

QUITTOR, an ulcer formed between the hair and hoof, usually on the inside quarter of a horse's foot; it often arises from treads and bruises, sometimes from gravel, which by working its way upwards, lodges about the coronet: if it is only superficial, it may be cured with cleansing dressings, bathing the coronet every day with spirit of wine, and dressing the sore with precipitate medicine.

But if the matter forms itself a lodgment under the hoof, there is no way then to come at the ulcer, but by taking off part of the hoof; and if this be done artfully and well, the cure may be effected without danger.

When the matter happens to be lodged near the quarter, the farrier is sometimes obliged to take off the quarter of the hoof, and the cure is then for the most part but palliative; for when the quarter grows up, it leaves a pretty large seam, which weakens the foot: this is what is called a false-quarter, and a horse with this defect, seldom gets quite sound.

If the matter, by its confinement, has rotted the coffin-bone, which is of so soft and spongy a nature, that it soon becomes so, you must enlarge the opening, cut away the rotten flesh, and apply the actual cautery, or hot iron, pointed pyramidically, and dress the bone with dossils of lint, dipped in tincture of myrrh, and the wound, with the green or precipitate ointment. When the sore is not enlarged by the knife, which is the best and least painful method, pieces of sublimate are generally applied, which bring out with them cores, or lumps of flesh: blue vitriol powdered, and mixed with a few drops of the oil is used also for this purpose, and is said to act as effectually, and with less pain and danger. *Bartlett's Farriery, p. 303.*

R.

RABBIT, a well known animal of the hare kind, with a very short tail.

The female or doe rabbit goes with young thirty days, and then she kindles; and if she takes not buck presently, she loses her month, or at least a fortnight, and often kills her young, and eats them.

In England they begin to breed at a year old, but in some places much sooner; and they continue breeding very fast from the time they begin; four, five, six, or seven times a year being common with them. They have usually from four to seven in a litter, and hence it is that a small number at first will soon stock a whole warren, if left to breed a little while undisturbed. The does cannot suckle their young till they have been at buck again: this therefore is to be done presently, else there is a fortnight lost of the time for the next brood, and the present brood probably lost. When the buck goes to the doe, he always beats and stamps

very hard with his feet, and when he has copulated with her, he falls backwards, and lies as it were in a trance; in this state it is easy to take him, but he soon recovers from it.

The buck rabbits, like our bear-cats, will kill the young ones, if they can get at them; and the does in the warrens prevent this, by covering their stocks, or nests, with gravel or earth, which they close so artificially up with the hinder part of their bodies, that it is hard to find them out. They never suckle the young ones at any other time than early in the morning, and late at night, and always, for eight or ten days, close up the hole at the mouth of the nest, in this careful manner, when they go out. After this, they begin to leave a small opening, which they increase by degrees, till at length, when they are about three weeks old, the mouth of the hole is left wholly open, that they may go out: for they are, at that time, grown big enough to take care of themselves, and to feed on grass.

People

People who keep rabbits tame for profit, breed them in hutches, but these must be kept very neat and clean, otherwise they will be always subject to diseases. Care must be taken also to keep the buck and does apart, till the latter have just kindled, then they are to be turned to the bucks again, and to remain with them till they shun and run from them.

The general direction for the choosing of tame rabbits, is to pick the largest and fairest: but the breeder should remember, that the skins of the silver-haired ones sell better than any other. The food of the tame rabbits may be colewort and cabbage-leaves, carrots, parsnips, apple-rinds, green corn, and vetches, in the time of the year; also vine leaves, grass, fruit, oats, and oatmeal, milk-thistles, sow-thistles, and the like; but with these moist foods they must always have a proportionable quantity of dry foods, as hay, bread, oats, bran, and the like, otherwise they will grow pot-bellied, and die. Bran and grains mixed together have been also found to be very good food. In winter they will eat hay, oats, and chaff, and these may be given them three times a day; but when they eat green things, it must be observed that they are not to drink at all, for it throws them into a dropy. At all other times a very little drink serves their turn, but that must always be fresh. When any green herbs or grass are cut for their food, care must be taken that there is no hemlock among it, for, though they will eat this greedily among other things, when offered to them, yet it is sudden poison to them.

Rabbits are subject to two principal infirmities. First, the rot, which is caused by the giving them too large a quantity of greens, or from the giving them fresh gathered, with the dew or rain hanging in drops upon them. It is over moisture that always causes this disease; the greens therefore are always to be given dry, and a sufficient quantity of hay, or other dry food, intermixed with them, to take up the abundant moisture of juices. On this account, the very best food that can be given them, is the shortest and sweetest hay that can be got, of which one load will serve two hundred couples a year; and out of this stock of two hundred, two hundred more may be eat in the family, two hundred sold to the markets, and a sufficient number kept in case of accidents.

The other general disease of these creatures is a sort of madness: this may be known by their wallowing and tumbling about, their heels upwards, and hopping in an odd manner into the boxes. This distemper is supposed to be owing to the rankness of their feeding: and the general cure is the keeping them low, and giving them the prickly herb, called tare thistle, to eat.

The general computation of males and females is, that one rabbit will serve for nine does; some allow ten to one buck, but those who go beyond this, always suffer for it in their breed.

Wild rabbits do great damage to vineyards, and all sorts of corn, their teeth sparing nothing that they come near; and in such countries as abound with vine-yards, they will eat the young shoots as soon as they begin to appear, and will do them so much damage, that it will endanger their ruin without some proper remedy; to prevent which, take some very small sticks of willow, well dried; dip one end of them into some melted brimstone, and stick the other into the ground; let them be about a fathom distant from each other, and set fire to them; and this will prevent the rabbits (who hate the smell) from entering into any vineyard, on the side which those sticks are set: the smell will last four or five days, at the expiration of which you must renew it, and so a third time; insomuch, that in about sixteen days, the shoots of the vine will be so strong as not to be in danger of the insults of these animals.

The wild rabbits are to be taken either by small cur dogs, or by spaniels bred up to the sport; and the place of hunting those who straggle from their burrows is under close hedges, or bushes, or among corn-fields and fresh pastures. The owners use to course them with small greyhounds, and, though they are seldom killed this way, yet they are driven back to their furrows, and are prevented from being a prey to others. The common way is by nets, called purse-nets, and ferrets. The ferret is sent into a hole to force them out, and the purse-nets, being spread over the hole, takes them, as they come out. The ferret's mouth must be muzzled, and then the rabbits get no harm. For the more certain taking of them, it may not be improper to pitch up a hay net or two, at a small distance from the burrows that are intended to be hunted: thus very few of the number that are attempted will escape.

Some who have not ferrets smoke the rabbits out of their holes with burning brimstone and orpiment. This certainly brings them out into the nets; but then it is a very troublesome and offensive method; and is very detrimental to the place; as no rabbit will; for a long time afterwards come near the burrows which have been fumed with these stinking ingredients:

"Having heard, says Mr. Weston, that a person had kept rabbits; by digging a circular ditch, and confining them to a little hill in the middle, I, from that description took the hint, and made a small artificial warren, in a lawn in the garden; in the following manner. It was a very agreeable object; and the rabbits succeeded very well in it.

"Pare off the turf of a circle, about forty feet diameter, and lay it on the outside; then dig a ditch within this circle, the outside perpendicular, the inner sloping; and throw earth sufficient into the middle, to form a little hill, two or three feet higher than the level of the lawn; the rest must be carried away. Then lay down the turf on the hill, and beat it well to settle it.

"The ditch at bottom should be about three feet wide, and three and an half deep, with two or three drains at the bottom, covered with an iron grate, or a stone with holes; to carry off the hasty rains, in order to keep the rabbits dry. In the outside bank should be six alcoves, the sides and tops supported, either by boards, or brick work, to give the rabbits their dry food in; by their different situations, some will always be dry: six boxes; or old tea chests, let into the bank, will do very well.

"If the ground be very light, the outside circle should have a wall built round it, or some stakes, driven into the ground, and boards or hurdles nailed to them, within a foot of the bottom, to prevent the bank from falling in. The entrance must be, either by a board, to turn occasionally across the ditch, or by a ladder.

"The turf being settled, and the grass beginning to grow, turn in the rabbits, and they will immediately go to work, to make themselves burrows in the side, and in the hill. By way of inducing them rather to build in the sides, to keep the turf the neater, make a score of holes, about a foot deep, and they will finish them to their own mind; and if there be a brick wall round it, it should be built on pillars, with an arch from each, to leave a vacancy for the burrow.

"Another way is, to dig the ditch only about two feet deep, which will yield about earth enough to make the hill; put some pales, about a foot high, on the outside; for that will be a sufficient height to keep the rabbits in.

"Feed them as other tame rabbits are fed; and in wet weather, sprinkle saw dust at the bottom, by which means, the quantity of manure will be increased: once a week is often enough to take it away: the quantity will be surprising; nor will the smell be in the least offensive, even though it be quite close to the house. In a very large lawn, two or three of these hills, with the rabbits feeding on tops, will not be unpleasing objects.

"If the bucks happen to be mischievous, in killing the young ones, they must be chained in an alcove; or else have their liberty, as in a warren.

"After a great snow, they will want some assistance, early the next morning; because the ditch will be near filled, and perhaps the alcove, where the hay is, will be blocked up.

"It is a great improvement to castrate the young bucks, and keep them till they are full grown, before you kill them; the flesh will be amazingly finer, whiter, and tenderer. But then it will be best to take them away, and keep them in another warren, lest they should be too numerous, and disturb the breeding does; or else have a few hutches in the alcove, to fatten them in.

"As oil cakes are found of great use in fattening cattle, it is probable they would be as useful in fattening rabbits: it is asserted, that some of the oil mixed with the pollard, or buck wheat, is cheaper than the cakes; never having made the experiment, I cannot ascertain its superior advantages.

"There ought to be one buck to every eight or ten does; and attention should be had to the breeding those sorts, whose skins are in the greatest esteem with the furriers and hatters. These skins are generally of more value than the flesh, especially in the winter, against which time contrive to have the greatest quantity of these fattened bucks.

"Where does are kept in hutches, they are supposed to breed

breed six times a year, and only five young ones are left to each, which was thirty from each doe : but as these are in a more natural way, and the young ones difficult to be gotten at, let us suppose about thirty-six to be produced from each doe, reckoning only seven pence for each ; there is a guinea profit from each doe ; as the additional value of the skins in winter, and the dung, will more than pay the expence of food, and attendance on them.

"It is quite necessary, that those who keep many rabbits, should cultivate some lucern, parsley, and carrots, as no other vegetables are such proper food for them as these ; they should also be fed on some of the best upland pasture hay ; for if it be coarse, so far from eating, they will waste it. Lucern hay is very proper for them.

"If a warren be made on the same plan for hares, it ought to be much larger, and some furz and thorns planted on it, for cover for them, but if there be not several rods of ground in it, there will be no chance of their breeding : therefore the warren can only be supported by turning leverets into it." *Weston's Tracts*, p. 133.

Mr. Marshall, in his Rural Economy of Yorkshire, says that "the Vale affords few rabbit warrens ; the northern margin is the only part of it adapted to this species of live-stock. At Dally there are two pretty large warrens. At Lockton there is one now planting. And there are other parts of these heights which might be profitably stocked with rabbits. In general, however, property is too much intermixed to admit of an improvement so singularly adapted to the nature of these high grounds.

"In situations where the ground, as well as the soil, is suitable to rabbit-warrens, and where an extent of it sufficiently large can be collected together in one property, there is a very strong reason why it may be profitably stocked with rabbits.

"The hide of a bullock (of some breeds) is not worth more than one-twentieth of his carcase. The skin of a sheep may, in full wool, be worth from a sixth to a tenth of its carcase. But the fur of a rabbit is worth twice the whole value of the carcase : therefore, supposing the rabbit to consume a quantity of food in proportion to its carcase, it is, on the principle offered, a species of stock nearly three times as valuable as either cattle or sheep.

"This theory is strongly corroborated by an incident of practice. One of the warrens of this district contains eighteen hundred acres of surface ; most of it covered with a black moreland soil ; part of it a barren dead gravel ; some little of it a thin limestone loam ; not worth perhaps, on a par, for the common purposes of husbandry, a shilling an acre ; nevertheless, these eighteen hundred acres are let, as a rabbit-warren, for three hundred pounds a year.

"I will not pretend to say that the warren here alluded to is worth three hundred pounds a year, nor assert that it is not worth a shilling an acre to a husbandman. If it be worth two hundred and fifty pounds as a warren, and supposing it to be worth even two shilling an acre as a farm, it still is a sufficient evidence of the profitableness of rabbit-warrens, in proper situations.

"As I shall, in giving a sketch of the husbandry of the Wolds, have occasion to speak fully of this species of stock, it is needless to dwell on the subject in this place."

In his Rural Economy of Norfolk. Min. 79, he says, 1782, February 23. "A considerable part of a farm which lies toward the coast, being hilly and very badly soiled, more especially the tops and sides of the hills, which have always been full of rabbits in spite of all endeavours to destroy them, the tenants last year applied for leave to convert this part, about ninety acres, into a rabbit-warren. Leave was given, and an allowance made them of half the estimated expence of raising a sodwall fence round these ninety acres.

"The fence is nearly finished, and the warren has this year turned out beyond expectation : it is valued, by one who ought to be the best judge of its worth, at forty pounds a year ; which is nine shillings an acre.

"As the part of a farm, these ninety acres are not worth five shillings an acre : at the present price of barley, they are not worth more than four shillings an acre.

"Thus, for ten pound, a real improvement of twenty pound a year has been made and secured ; for the warrener will, through necessity, hereafter keep the fence in repair.

"The fence is made about four feet high, and three feet thick ; faced with green-sward ; and capped with furze, so as to project eight or ten inches over the face. Some of it was done for a shilling a rod ; but the spring putting in,

fourteen or fifteen pence a rod of seven yards was obliged to be given.

"A neighbouring warrener, this winter, gives nine-pence for the wall, without the capping ; which he does not mean to put on till the wall be thoroughly settled. This is very judicious : several rods of that abovementioned, shot down in different places.

"There are several patches in the vallies, and some on the tops of the hills which have usually been tilled. Some of these were last year, and some of them ought to be every year, cultivated for the rabbits ; when the grass gets foul or mossy, plough it up ; fallow, sow turnep-seed for present feed (they will not let rape get up), and prepare the soil for barley and grass-seed the ensuing year. Thus a regular succession of feed might be kept up.

"The way the Norfolk warreners take to destroy eagles, kites, and other birds of prey, is natural and simple. These birds are shy and suspicious ; they like to settle where they can have a clear view round them for some distance : a naked stump or hillock is their favourite resting-place. The warreners, therefore, raise mounds of earth of a conical form, in different parts of the warren, and place steel traps upon the points of those artificial hillocks."

In Min. 38. he says "the soil of this county, viewed at large, might be termed a rabbit-soil ; and it is highly probable that, before its present system of husbandry took place, a considerable part of it was occupied by this species of live stock.

"At present, however, they are, in this district, wisely confined to the heathlets, and the barren hills upon the coast. A level country is unfit for rabbit-warrens, but convenient for the plough : on the contrary, rabbits delight in the sides of sandy hills ; which, where turnwrist ploughs are not in use, are extremely inconvenient for tillage ; and, when cultivated, are generally unproductive.

"The rabbit, on level ground, finds it difficult to make its burrow ; the excavated mould is all to be dragged upward to the surface : hence a piece of ground, altogether level, can seldom be stocked successfully with rabbits, unless it be first laid up, by art, at a great expence, into inequalities.

"On the contrary, against the side of a steep hill, the rabbit has no difficulty to encounter : the declivity affords him a ready vent for his mould ; his work is all down hill : and unless the soil be too stubborn, or too rocky, for the rabbits to work freely among, a broken hilly country may generally be stocked with advantage ; provided a tolerable market for the carcases can be had within reach.

"There are, perhaps, few sandy or other loose soiled hills, which would not pay better in rabbit-warrens than under any other course of husbandry."

RACK, a wooden frame made to hold hay or fodder for cattle.

RACKING FRUIT LIQUOR. See ORCHARD.

RADICLE, that part of the seeds of plants, which upon vegetating becomes its root, and is discoverable by the microscope.

WOOLLEN RAGS, and the nippings of the pitch marks upon sheep, are singularly good manure. The rags should be chopped small, about an inch or two square, and scattered on the earth at the second ploughing ; for being thereby covered, they will begin to rot by seed-time. They imbibe the moisture of dews and rain, retain it long, and, as Dr. Home observes, thereby keep loose soils in a moist state. They cost about four-pence a bushel at London, from whence many loads are sent every year to Dunstable, which is thirty-three miles, where they are laid even on stiff-lands, just after the sowing of the corn, allowing to the acre four sacks, of six bushels each.

RAG-WORT, or as it is called in Yorkshire, scagrim, is a very pernicious weed.

The reverend Mr. Comber, of East-Newton, has obliged the public with the following observations on the growth and destruction of ragwort, or scagrim.

"This plant, says he, has a stalk, in its early state, green, but, as it advances in age, inclining to violet or purple, especially downwards. Its flowers are yellow, and thick set, and composed each of a number of small pointed leaves. It runs to seed in the latter end of summer. The seed, both of the stalk and leaves, which are jagged, (whence probably it obtains its name), and the flower itself, are offensive to all animals, I think ; for I have observed, that hardly any creatures feed upon it, except almost starved. I have not indeed observed whether or no asses reject it.

" Like most other weeds, it thrives best in the best soils, either natural or artificial ; and I took up a plant of it in my orchard, about two years ago, (with the root) which, when in flower, touched my chin ; (my height is about five feet eight or nine inches) and its root, which is round, and thick set with taws, was much larger than a new born child's head : but the usual dimensions are much less than these.

" About four years ago, I observed the spreading of this weed in that part of this estate which was in our own hands. I took notice, that neither cows nor horses eat it ; and when I smelled it, I ceased to wonder that they did not. It was obvious to remark, that a weed so bulky as this, and so gross, must extract much nourishment from the earth, and that it was advisable to get rid of it as fast as possible. The most easy method was mowing ; I therefore ordered a servant to mow these weeds in the pastures as near to the ground as he could ; and I hoped that the common mowing in the meadows would be sufficient to destroy them : but I soon found my mistake ; for in a very few weeks these offensive strangers shot up again in a stalk and leaf, and even flower, though all in much smaller size than before, but with this disagreeable circumstance, that the root was so far from being injured with the scythe, that for one stalk several arose, and the roots seemed to have gained new vigour from the wound.

" I now applied myself to plucking up by the roots these odious inmates, and found new difficulties. For while the ground was dry, as it usually is in the latter end of summer, I found the stalks of such of the seagrims as were longest, and afforded the tightest grasp, either break in plucking, and leave the root in the ground entirely, or at best bring with it only a small part of the root ; and when the wet weather came on, and loosed the ground, and made it possible, or even easy, to bring away the whole ball of the root, yet the season of feeding was come on also, and the earliest ripe seeds had dispersed themselves, and produced an assurance of a larger crop for succeeding years than the most careful plucking of the present crop could destroy.

" But if these were the difficulties which attended my attempts to eradicate those seagrims, which had happened not to be mowed, I was much more embarrassed by those which had been ; for here it was impossible to get any such fast hold, as to pluck them up with much, or even any root.

" I now applied myself to inquire what gentlemen or farmers were plagued with this weed, and what methods they had tried with success to destroy it.

" I was told by a gentleman in my own neighbourhood, that Sir G. Cayley, of Brimpton, near Scarborough, baronet, had been plagued with this weed, and had pursued the method of plucking, with success.

" Animated by this assurance, I resolved to pursue this method with great attention ; and as it seemed to be a work which requires great care, both in the choice of season and manner of plucking, I resolved not to depute the work to others, but to endeavour to clear a spot in my cow pasture with my own hands, that, if my labour succeeded, I might employ others to follow the same method under my own eye in the rest of this pasture.

" Accordingly, in the evenings of the summer, or rather autumn, of 1762, after showers, I applied myself to this work ; and by the help of a pair of strong gloves, and a tight grasp, I brought up almost every root, in a space of about two hundred yards square, whole ; so that I had good hopes I should see this spot clear in the succeeding summer. It is true, I saw leaves of the species of this weed, and of a very vivid green too, around the plants which I pulled up : but as I reasonably concluded these to be fed by the taws which spread themselves from the main root, so I (methought reasonably) concluded also, that this main root being destroyed, the side taws would die, and consequently these young leaves.

" But how was I disappointed, when in the summer of 1763, I saw this spot of ground as much over-run with seagrims as any part else of the pasture which had been unpul-
led !

" Conversing, however, with G. Watson, of New Malton, esq. towards the latter end of the summer, on this subject, I was assured by him, that by a repetition of this labour of plucking for some years, he thought he had lessened the number of his seagrims, though they were still numerous. Urged by this example, I have gone through the whole of my pasture, which is about ten acres, and

kept five cows, at the latter end of last summer, of 1763, with the same care as was used to a small part of it in 1762 ; yet am I not elated with much hope of success ; for a little plot before my garden (in which my horses run, and which was managed with still more accuracy on account of the odious appearance of the seagrims from my windows), seems to threaten another considerable crop.

" As I did not confine my enquiries about the method of destroying this hateful weed to any one rank of men, I was told by an honest quaker, a farmer in my neighbourhood, that he had found turning of sheep in winter into his cow-pastures the only effectual method of destroying this hateful weed.

" I thought this method very likely to succeed ; for sheep are such close eaters, that I have known them destroy whole beds of the rankest docks, which could not be killed by any other means.

" I have not been able to try this experiment considerably ; for, as I am raising quick fences, both in my meadow and pasture, I keep no sheep. I have, however, occasionally admitted some of my tenant's sheep into the small plot before my garden this winter ; and, upon an accurate examination this morning, I do not entertain any sanguine hopes of great success from this method. I find that many of the young leaves of this weed, now level with the surface of the ground, are untouched by the sheep ; and that such others as appear bitten by them, do not seem in a dying condition.

" The truth seems to me, that sheep, though they may not have the same aversion to this weed as horses and cows, yet are far from being fond of it ; and if any great success is to be hoped for from their bite, (which may prepare beds for the water, and so decay the root), the sheep should be folded pretty close upon it, and obliged to eat it near, and at such a season that the winter rains may have time to work its destruction. And such a method, if carefully pursued, seems to be most probable for the extirpation of this pernicious weed.

" If the method of plucking is followed, I would subjoin some caution.

" First, In order to prevent the large plants from seeding, I would advise to cut off all the tops, and the tops only, when the flowers begin to die, that then good hold of the stalks may be gotten.

" Secondly, I would defer the plucking till the rains have moistened the ground sufficiently to bring up the whole main root.

" Thirdly, I recommend striking the root so brought up against the ground, in order to disperse the earth which adheres to it, by way of manure.

" Fourthly, I always pile the plants thus pulled up and cleaned from earth, that, if the season prove favourable, they may be burnt, and the ashes arising from them spread on the ground ; or if this cannot be conveniently done, (though it is much the better method, and may, with a sufficient fire, be done when they are ever so green), left to rot and manure the soil.

" The grossness, and even stench, of this weed, is a proof of the great quantity of salts it contains ; and in the same proportion as any plant exhausts the ground of its salts, it repays when reduced to manure. There can, however, be no question, but whilst weeds are left to rot, great quantity of the salts, which by burning would mingle with the soil, are carried into the air.

" I suppose your readers will be curious to know, in what manner I account for the sudden appearance of seagrims in vast abundance, in this estate, where they were hardly ever known before.

" I will give you an account, which, I dare say, you will esteem perfectly satisfactory. About eight years ago, I undertook to improve a piece of ground of about fourteen acres, which was overrun with thorns of both sorts, brambles, broom, and furze.

" When I had got it cleared of all this trash, my next business was to pare the hills off, and pile them, and after a winter's mellowing, to break and spread them with a mixture of lime, and all other kinds of manure which I could collect. As the soil was very poor, having been exhausted by the great quantity of trash it had nourished for many years. I was not yet satisfied, but resolved to take the advantage of the first dry summer, to lead out the riches of a pond of about thirty yards long and half as many broad, which had been occupied by a great number of greese, &c. and never thoroughly cleaned

during near thirty years. I got through this work, though at a great expence, being obliged to employ a considerable number of draughts, lest the rain should make the mud too thin, or the heat bake it too much, the mud being for a considerable space a yard perpendicular.

"All this mud I laid on my newly-improved ground, except a few cart-loads, which were brought and laid by the wall of a kitchen-garden, to be mingled with the other soil.

"I had divided my improved ground, reserving about four acres for meadow.

"Behold! the succeeding year gave me a crop of seagrims both in my new meadow, my new cow-pasture, and the plot of ground in which the mud for my garden had been scattered; and more particularly on those parts where the ground had been broke, either to stub the thorns, &c. or to take away the hills, while the adjoining ground on each side was free from this pernicious weed.

"As I knew little or nothing of this weed, I suffered it to seed before I took any necessary precautions for its destruction. The succeeding year presented me with a much larger crop, and I have been ever since struggling for its extirpation, and have the mortification to see its encroachments on adjoining grounds by the seeds which winds have carried.

"This fact, and another of the same kind, in a piece of ground which I improved since, at some distance from the former, have confirmed me in an opinion, which I before thought very probable, viz. "That all soils are originally impregnated with the seeds of almost all grasses and weeds, (though of some in greater quantities) which only want a proper stirring and manure to awaken them to vegetation, though at the expence of one another, some being suffocated by that process which gives life to the others."

"I will add another striking instance in confirmation of this sentiment, notorious in this neighbourhood.

"A considerable quantity of the park at Gilling was overrun with brakes and moss, and that wretched grass which grows in such company. Lord Fairfax, the owner, finding that he could not have his venison fat as it ought to be, destroyed his park, and applied himself seriously to the improvement of it at a vast expence. In course of time, by due tillage, he brought this worst part of it to be not only good corn-land, but even tolerable, though coarsh, meadow and pasture; yet both of them thick set with seagrims, a weed never seen there till the quantity of lime which his lordship put into that poor soil had warmed it sufficiently.

"I have only to add, on this subject, that I am persuaded seagrim does more harm in meadow than pasture land; for in the latter it only exhausts the ground, on which it stands, to no good purpose; but in the former it communicates its disagreeable stench in the sweat to the good hay, and destroys its sweetness. I advise, therefore, that hay-makers be ordered to throw it with their rake-shafts out of the swarth whenever they meet with it." *Museum Rusticum*, vol. V. p. 117.

RAM, the male of the sheep kind. See the article SHEEP.

A correspondent of the editors of the *Museum Rusticum* has obliged the world with the following method of gelding rams:

"It was, says he, a long time before I came into a proper method of gelding my rams: I used, like my neighbours, always to employ a common gelder, who cut and seared them; however, I observed that this not only put the animal to great pain, but was a considerable time before it healed, and the sheep or lamb always lost flesh in no slight degree.

"Whilst I was musing how to improve this practice, a friend of mine, a farmer, who came accidentally to see me, out of Bedfordshire, advised me to leave off gelding my rams in the manner I had practised, and, instead of it, to have them knitted.

"The method of doing this he described as follows. First take some small, yet strong, twine, not too hard twisted; add three of these together, and slightly twist them on your knee, as the shoe-makers do their thread; then wax it well with shoe-maker's wax, and it is ready for use.

"When you are thus prepared, take a proper length of this twine; tie each end of it to a short bit of stick, as thick as a walking-cane; then put it round the cod, and tying a single knot, do you take hold of one stick, and draw

it, whilst another man draws the other, as tight as you well both can; for on the tightness of the drawing depends the success of the operation.

"The animal immediately loses all sense of feeling in the cod, the circulation of the blood thither is stopped; and if it was to be let alone, it would rot off, but this is a bad, as well as a nasty and dangerous practice; for the sheep sometimes die of the stench.

"The best way is, at the end of nine days, to cut off the cod; but then you must take a great deal of care you do not cut it too close to the tying; if you do, the string may chance to slip off, and the consequence be dangerous; as by such a neglect many sheep may be lost in a season.

"Many farmers, I am informed, when they knit their rams, trust to the strength of one man's arms; and this may sometimes be well enough, when your workman is strong, attentive, and willing; but if he is failing in any of these points, ten to one but an accident happens: I therefore always chuse to employ two men at this work.

"The season I chuse, is the spring of the year, though some prefer November, after the ramming season is over: I have many reasons for this preference, and particularly, I think that the warm weather coming on, hinders them from pining, or falling off their flesh, and soon re-establishes them in their perfect health. When this operation is performed in November, and the winter is either wet or frosty, the sheep are pinched by the cold, and pine away considerably, not having that heartening food, to keep them in spirits, as they meet with in the spring of the year.

"I have observed, that if the rams are not in good flesh, or have not been pretty well fed, they do not undergo this operation so well: I therefore always take care to keep them particularly well some time before, and also some time after the business is done. This is an attention by no means thrown away, for without it some miscarriages may happen, which would otherwise be avoided.

"When I say I prefer knitting my rams in the spring, I mean before the hot weather comes on; as to the particular time, I am governed by the season: if it is deferred till summer, the flies will surely be troublesome." *Museum Rusticum*, vol. IV. p. 159.

In a succeeding Number of the same work, another correspondent has laid down the following method, which he thinks preferable to the former. He declares he has practised it for ten years, and in that time he had not lost a single one by gelding, out of several hundreds; neither do they lose flesh: on the contrary, some of them, that did not thrive before, rather fatten better after, if the pasture does not fail. The success he imputes to the evacuation of the humours, by cutting the scrotum, &c. may be the occasion of it.

"What, says he, is necessary to be observed, by way of caution, is as follows: When I am about to have my lambs gelt, I take dry, fresh weather to do it in; for which purpose I defer it until they are about two months old, which brings, at least, the middle of May for that work to be performed in; but, in order to have a settled state of weather, and the moon in decrease, I do it either a little sooner, or a fortnight latter, when I judge the work may be done with safety, according to the above caution.

"I have the lambs put into a fold that has a good wall, or dyke, about it, by seven or eight o'clock in the morning, or as soon as the dew is off. A man is appointed to stand within the fold, with his back against the wall or dyke, who may be called the holder: another is appointed to take the lambs, one at a time, taking care not to heat them either in folding or taking them.

"When he has taken a lamb, he brings it to the holder, who takes it by the hinder hough, and presses its back against his breast, with its head over his shoulders: the operator then, who generally is the shepherd, takes his knife, and cuts about an inch from the lower end of the cod quite off: he then puts one of his hands close up to the creature's belly, while he presses back the cod with the other; and by that means he causes the bare stones to put out, so that he can easily gripe them one at a time with his teeth, and pull them slowly out.

"He then takes a little salt water, which is prepared on purpose, and set near him, into his mouth, and warms it a little; then he squirts it up the cod, and all is done: the holder handing the lamb over the wall, or dyke, to one that sets it on its feet on the other side, pulling its tail.

tail pretty hard when he lets go, which makes it stretch itself out.

" Thus, in half a minute, a lamb is gelt; and in three or four days all danger is over, if kept from lying on nettles, and the like.

" It is proper to walk the lambs gently about three or four hours after they have been half a day gelt.

" If old rams are to be gelt, I do it about the same season; and the operator takes no other method than that used with the lambs, only putting a bit of salt and butter up the cod instead of squirting up a little salt water; the holder, indeed, must not now stand, but sit on the ground, gripping the ram by the houghs, while he lies on his back, with his head over one of the holders thighs, &c.

" My reasons for letting the lambs be about two months old before they are gelt, besides the reason before given, are, that at that age they are better able to bear the pain of the operation than when they are young and weakly; and the strings as they are called, are so strong that they do not break, but come entirely out along with the stones, which makes a free passage for matter to issue out by the cod; whereas, when they are gelt very young, as is the practice with some, the tunica albuginea or strings as they are vulgarly called, being but weak, they often break, probably occasioning inflammations, &c. which certainly ought to be avoided, if possible. This occasions more to die, when they are gelt young, by the operation, than when cut at two months old.

" I mentioned having the moon in decrease when I have my lambs, &c. gelt, which by some, perhaps, will be thought a circumstance not worth notice: but let such only attend to the wonderful effects the luminaries have on fluids as well the juices of the animal oecconomy, as others, when they are in the positions that constitute new and full moon; and they will, I dare say, be disposed to think the hint is not quite impertinent.

" The reasonableness of my conclusion is not deduced from argument only, but has the authority of experiment, as follows:

" I attempted to geld my lambs, one year, just at full moon: the first lamb that was cut bled very sorely; the next did the same. I tried as far as half a dozen, and none of them were otherwise. I then apprehend there was danger, so deferred cutting any more for five days, when there was a great abatement in the bleeding: besides, one of the six gelt at full moon dropt, and none of the others that were gelt five days after did, although they were above twenty times the number of the former (the weather and usage were nearly the same.) This, I own, carried conviction enough for me. Those that will not be convinced by my relation of this fact, I, notwithstanding do heartily wish them no worse luck than I have had in that way; but withal they had as good use circumspection." *Museum Rusticum, vol. IV. p. 331. See SHEEP.*

RAPE, the name of a plant much cultivated for its seed, and also as a food for cattle. *See the article COLE.*

In 1769, Mr. Baker began to make some experiments upon rape, but these were only small; in 1770, he extended them further, upon land which he thus describes. " A shallow soil, of a strong adhesive nature when wet, and when perfectly dry, in lumps, almost impregnable; but between wet dry, reducible. It lies upon a bed of limestone quarry, and has a natural declivity to the north-west; naturally very poor, and, I believe, never received any manure until I dressed it. Three acres of this land was in 1768, under potatoes, in the ordinary method of the country, in

seven feet beds, and four feet trenches. In 1769, it was under drilled turnips.

" The frost, snow, hail, and rain, which we had this year in the months of March and April, rendered it impossible to get the ground in any tolerable condition for the rape seed before the 28th day of April. On that day twenty broad sets were sown, with twelve ounces of rape-seed to each set, or ridge. I intended to have sown it earlier, but the event will shew, that, as it was, I sowed it too early, at least upon this ground.

" It was slow in coming up, and made but a poor figure until July. After which it shot forward; but instead of affording a plentiful mowing crop for the purpose of foddering cattle, it soon began to run up very fast, broke out into branches, with few and small leaves, like rape in blossom from autumn sowing, but with strong branches and few leaves: and, in a short time after, began to grow hard, pipey, and the seed to form.

" In September, I began to mow it for cattle, and they eat it with great eagerness; but every day it became worse, by growing harder; insomuch, that before it was exhausted, there was very great waste, as to the object of fodder, but it wonderfully raised the dughill, which in my mind is of the first moment to the farmer: for if he has manure in plenty, and disposes of it judiciously, there is hardly any thing he need to fear, except climate.

" It was pretty far in October, before all this rape was cut (and the seed coming forward very fast) although it was brought home in great profusion. It was so strong, that the mowing of it could not be accomplished with a common scythe; it would have broken an hundred; but I have by me a short, strong scythe, with a thick back, intended to mow bushes, and other rubbish: with this instrument I got it mowed, but not so close to the ground as I wished, it being next to impossible to mow such strong plants as these were close to the ground; and I became the less solicitous about it, as from the strength of the rape stumps and roots, and the weeds which were upon the ground, owing to the rape shooting up in tall stems, I gave up my intention of sowing the ground with wheat, as was originally intended. Hence I conclude, that the rape was sown much too early.

" On the 16th of July, I transplanted some of this rape; in rows upon ridges four feet wide; these plants flourished much better than the former, and were at least four times the size of any of those left in the ground where they were sown. Nevertheless, these also ran to seed; but the cold nights coming on, prevented their forming their seed like the former. They were vastly more sappy, and much better food for cattle.

" On the 24th of July, I drilled rape seed upon the same ground.

" No. 1. Six ridges four feet wide, and thirty-two perches long, in single rows.

" 2. Six ridges the same length and breadth, in double rows, ten inches asunder.

" N. B. The double and single rows were drilled alternately on the same ground, on the 18th day of July.

" 3. Six ridges, four feet wide and thirty-two perches long, drilled in single.

" 4. Six ridges, the same length and breadth, in double rows, ten inches asunder.

" N. B. These were sown in alternate rows, on the same ground, on the 24th of July.

" The several rows were thinned the latter end of August, and twice horse-hoed during the summer.

" On the 3d of April, 1771, I had a row of each of these cut and weighed, and the produce was as follows:

	Ton cwt. qr. lb.				Prod. p. Plantation acre.		
					Ton cwt. qr. lb.		
" No. 1. Single row produced	1	2	1	11	} Sown July 18th.	29	6 1 16
" 2. Double row ditto	1	4	3	13		32	12 2 23
" 3. Single row ditto	1	5	2	22	} Sown July 24th.	33	14 1 26
" 4. Double row ditto	1	6	3	25		34	18 0 6

" The last sowing in July, we see, affords considerably greater produce than the first, for the plainest reason, that the earlier we sow this seed, the sooner it runs; and consequently affords the less produce for our purpose of foddering cattle in the yards, for making dung, and seems to account very strongly for the state of our first experiment.

" The double rows produced uniformly more than the

single rows; and indicate that the double are to be preferred in drilling rape for foddering cattle.

" Rape-seed sown Broad-cast.

" On the 24th of July, two acres were sown broad-cast, with ten pounds of seed to each acre, in the same field where the other experiments were carried on: but the soil not

R A T

“ There is yet another circumstance, which renders this a truly valuable fodder. The milk of the cows increased prodigiously ; and the milk and butter were as good, sweet, and well flavoured, I think, in every particular, as ever I tasted in June. Even the cream for the tea, appeared to be perfectly free from any foreign flavour. The cows got hay every day, in the same manner as I have in former years mentioned them to have, when feeding upon cab-bages.

“The simplicity of the culture for rape, for this purpose of feeding cattle, I cannot but think a particular recommendation of it to the farmer, and the cheapness of the seed in purchase, or the ease with which he may raise it, are objects which cannot fail, I think, of being persuasive to him. And all persons, who have annexed to their farms, any bog, or other waste ground, the improvement of which, that can be executed by burning, might surely raise such quantities of rape for the purpose of mowing pasture, as would enable them to keep almost any number of cattle; by which they would not only be bringing in the waste land, but making that the foundation of improvement to their sound land, by the immense quantities of dung they might raise by this means, from the waste land. Here the advantage to the cultivator would be double.

“ On the first day of May, I had four perches of this rape measured out for weighing. It was mowed, immediately drawn home, and weighed. The four perches afforded seven hundred and two quarters: multiplying this by forty, shews our acreable produce to be fifteen tons. The quantity indeed but small. However, the season in which it is to be had, renders it more than ordinary valuable, and I think bids fair to make it an object of husbandry, as a pasture for cattle.

“ This year Mr. Baker ploughed up six acres of wheat stubble, as soon as the wheat came off, harrowed it down the 12th, 13th, 14th, and 15th of September, then sowed rape seed over the whole field, and gave it a light bush-harrowing. The rape came up very thin, and made so poor an appearance in the spring, that he ploughed up the field, and sowed spring corn. This is a strong indication, that but little is to be expected from sowing rape upon wheat stubble; because, after the wheat comes off, it seems to be too late in the year to sow rape. But something may be charged, as he observes, to the natural moisture of the soil. See COLE SEED.

“Recapitulation of Experiments on Rapes, as Pasture for Cattle.”

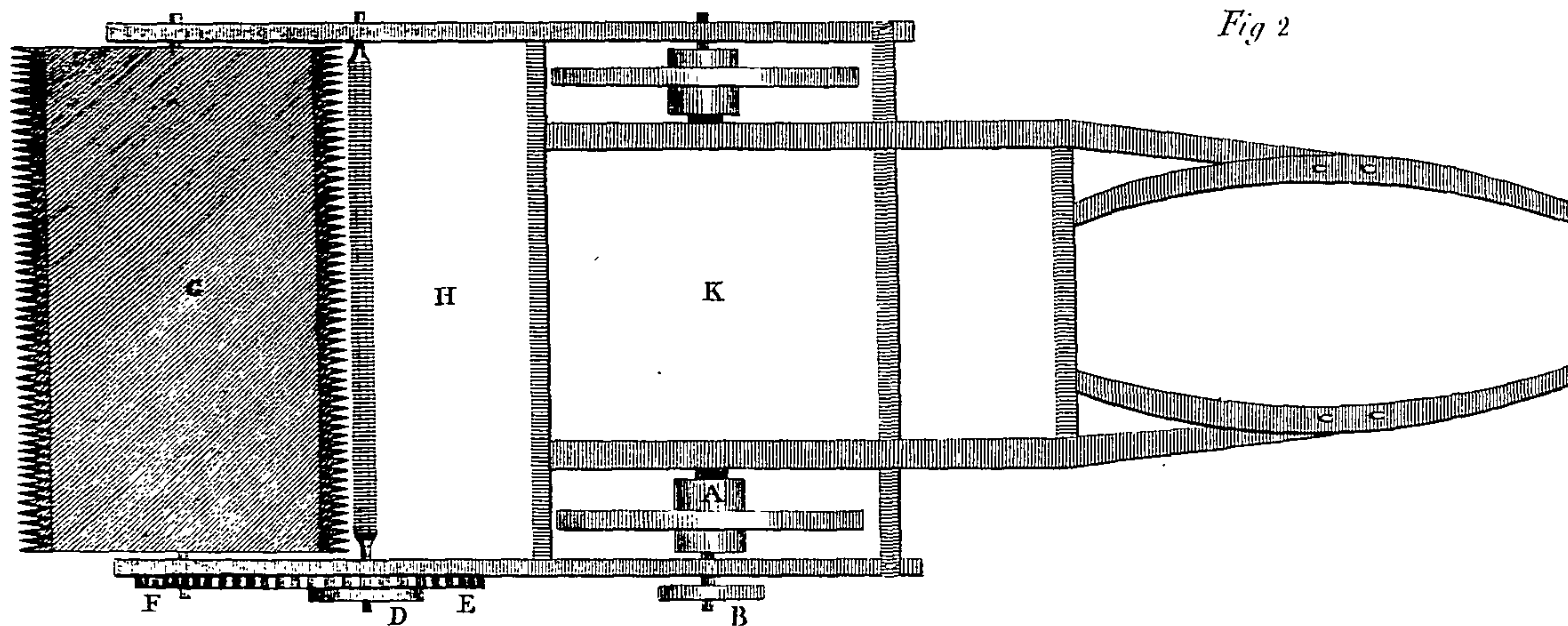
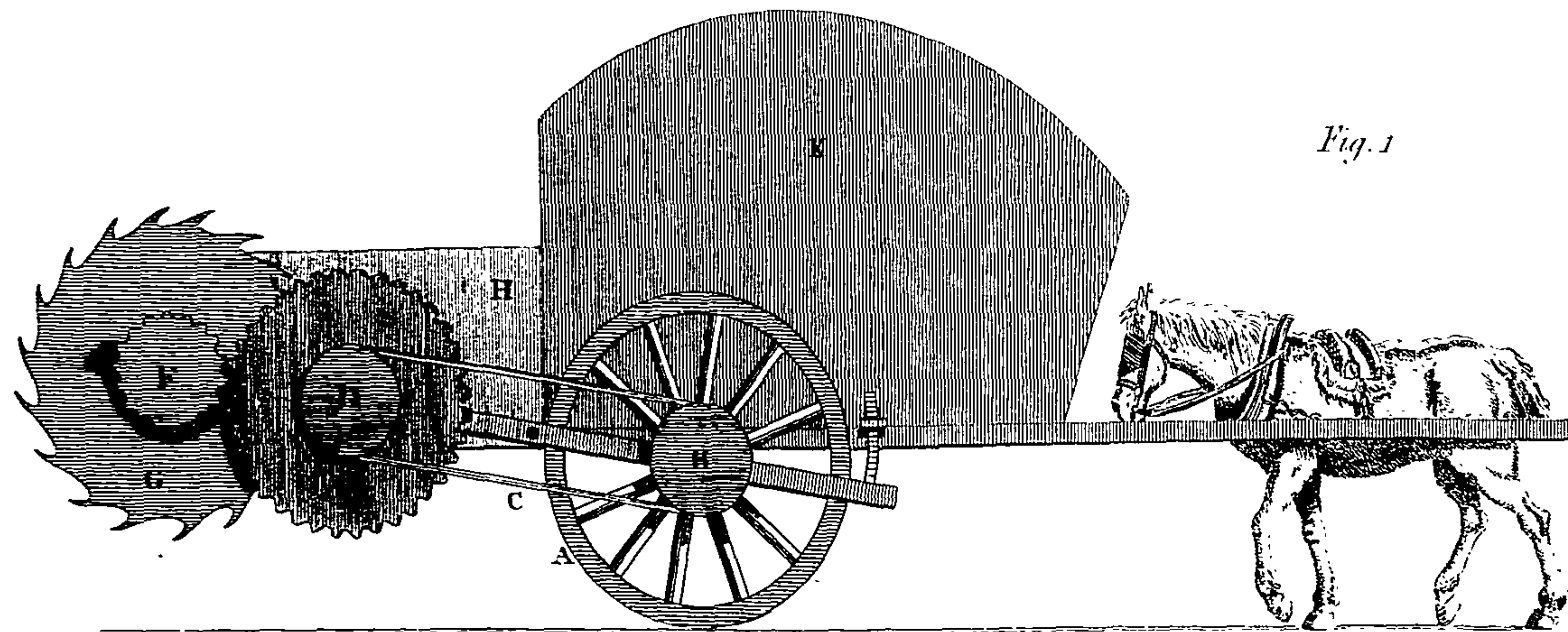
" II. Ditto transplanted. Also run, but not so soon as the other.

								Ton.	cwt.	qr.	lb.
" III.	July 18, fowing	{	Single rows produced per acre	-	-	-	-	29	6	1	16
		{	Double rows ditto	-	-	-	-	32	12	2	23
"	July 24,	{	Single rows ditto	-	-	-	-	33	14	1	26
		{	Double	-	-	-	-	34	18	0	9
" IV.	Ditto		Broad-cast ditto	-	-	-	-	15	0	0	0
" V.	September fowing		on wheat stubble ditto	-	-	-	-	0	0	0	0

"Baker's Report for 1771."

in an unusual manner, the rest take the alarm, and become so shy and wary, that they elude all the devices and stratagems of their pursuers for some time after. This place, where the rats are to be assembled, should be some closet, or small room, into which all the openings, but one or two, may be secured: and this place should be, as near as may be, in the middle of the house, or buildings. It is the practice, therefore, to attempt to bring them altogether in some such place, before any attempt be made to take them; and, even then, to avoid any violence, hurt, or fright to them, before the whole be in the power of the operator.

The means used to allure them to one place are various : one of those most easily and efficaciously practised is, the trailing some piece of their most favourite food, which should be of the kind that has the strongest scent, such as toasted cheese, or broiled red-herring, from the holes or entrances to their accesses in every part of the house, or contiguous buildings, whence it is intended to allure them. At the extremities, and in different parts of the course of this trailed tract, small quantities of meal, or any other kind of their food, should be laid, to bring the greater number into the tracks, and to encourage them to pursue it to the center place, where they are intended to be taken; at that place, where time admits of it, a more plentiful re-



paſt is laid for them, and the trailing repeated for two or three nights.

Befides this trailing, and way-baiting, ſome of the moſt expert of the rat-catchers have a ſhorter, and perhaps more effectual method of bringing them together; which is, the calling them, by making ſuch a kind of whiſtling noiſe as reſembles their own call, and by this means, with the aſſiſtance of the way-baits, they call them out of their holes, and lead them to the repaſt prepared for them at the place deſigned for taking them. But this is much more difficult to be practiſed than the art of trailing; for the learning the exact notes, or cries, of any kind of beaſts or birds, ſo as to deceive them, is a peculiar talent, not eaſily attained to in other caſes.

In the practiſing either of theſe methods of trailing, or calling, great caution muſt be uſed, by the operator, to ſuppreſs and prevent the ſcent of his feet and body from being perceived; which is done by overpowering that ſcent by others of a ſtronger nature. In order to this, the feet are to be covered with cloaths rubbed over with aſſa ſœtida, or other ſtrong ſmelling ſubſtances; and even oil of rhodium is ſometimes uſed for this purpoſe, but ſparingly on account of its dearneſs, though it has a very alluring, as well as diſguiſing effect, as will be obſerved below. If this caution of avoiding the ſcent of the operator's feet, near the track, and in the place where the rats are propoſed to be collected, be not properly obſerved, it will very much obſtruct the ſucceſs of the attempt to take them: for they are very ſhy of coming where the ſcent of human feet lies very freſh, and intimates, to their ſagacious inſtinct, the preſence of human creatures, whom they naturally dread. To the above-mentioned means of alluring by trailing, way baiting, and calling, is added another of very material efficacy, which is, the uſe of oil of rhodium, which, like the marum ſyriacum in the caſe of cats, has a very extraordinary fascinating power on theſe animals. This oil is extremely dear, and therefore ſparingly uſed. It is exhale in a ſmall quantity in the place, and at the entrance of it, where the rats are intended to be taken, particularly at the time when they are to be laſt brought together, in order to their deſtruction; and it is uſed alſo, by ſmearing it on the ſurface of ſome of the implements uſed in taking them, by the method before deſcribed, and the effect it has in taking off their caution and dread, by the delight they appear to have in it, is very extraordinary.

It is uſual, likewiſe, for the operator to diſguiſe his figure as well as ſcent; which is done by putting on a ſort of gown or cloak, of one colour, that hides the natural form, and makes him appear like a poſt, or ſuch inanimate thing; which habit muſt likewiſe be ſcented as above, to overpower the ſmell of his perſon: and beſides this, he is to avoid all motion, till he has ſecured his point of having all the rats in his power.

When the rats are thus enticed and collected, where time is afforded, and the whole in any houſe and out-buildings are intended to be cleared away, they are ſuffered to regale on what they moſt like, which is ready prepared for them, and then to go away quietly for two or three nights; by which means thoſe, which are not allured the firſt night, are brought afterwards, either by their fellows, or the effects of the trailing, &c. and will not fail to come duly again, if they are not diſturbed or moleſted. But many of the rat-catchers make ſhorter work, and content themſelves with what can be brought together in one night or two; but this is never effectual, unleſs where the building is ſmall and entire, and the rats but few in number.

The means of taking them, when they are brought together, are various. Some entice them into a very large bag, the mouth of which is ſufficiently capacious to cover nearly the whole floor of the place where they are collected; which is done by ſmearing ſome veſſel, placed in the middle of the bag, with oil of rhodium, and laying in the bag baits of food. This bag, which before lay flat on the ground with the mouth ſpread open, is to be ſuddenly cloſed when the rats are all in it. Others drive, or fright them, by ſlight noiſes or motions, into a bag of a long form, the mouth of which, after all the rats are come in, is drawn up to the opening of the place by which they entered, all other ways of retreat being ſecured. Others, again, intoxicate or poiſon them, by mixing with the repaſt prepared for them, the coculus Indicus, or the nux vomica. A receipt for this purpoſe has appeared, which directed four ounces of the coculus Indicus, with twelve

ounces of oatmeal, and two ounces of treacle or honey made up into a moiſt paſte with ſtrong beer; but if the nux vomica be uſed, a much leſs proportion will ſerve than is here given of the coculus. Any ſimilar compoſition of theſe drugs, with that kind of food the rats are moſt fond of, and which has a ſtrong flavour, to hide that of the drugs, will equally well answer the end. If, indeed, the coculus Indicus be well powdered, and infuſed in the ſtrong beer for ſome time, at leaſt half the quantity here directed will ſerve as well as the quantity before mentioned. When the rats appear to be thoroughly intoxicated with the coculus, or ſick with the nux vomica, they may be taken with the hand, and put into a bag or cage, the door of the place being firſt drawn to, leſt thoſe which have ſtrength and ſenſe remaining eſcape.

By theſe methods, well conducted, a very conſiderable part of the rats in any farm, or other houſe, and the contiguous buildings, may be taken. *Muſeum Ruſticum, vol. I. p. 395. See VERMIN.*

RAT-TAILS, excreſcences which creep from the paſtern to the middle of the ſhanks of a horſe, and are ſo called from the reſemblance they bear to the tail of a rat. Some are moiſt, and others dry; the former may be treated with drying ointment and waſhes, the latter with mercurial ointment. If the hardneſs does not ſubmit to the laſt medicine, it ſhould be pared off with a knife, and dreſſed with turpentine, tar, and honey, to which verdigris or white vitriol may occaſionally be added; but before the uſe of the knife you may apply this ointment:

Take black ſoap, four ounces; quick-lime, two ounces; vinegar enough to make an ointment. *Bartlett's Farriery, p. 296.*

Coach-horſes of a large ſize, that have their legs charged with fleſh, hair, &c. are moſt ſubject to this, and ſuch like infirmities, which ſeldom happen to middle-ſized horſes.

The cure: ride the horſe well till he be warm, which will make the veins ſwell and appear better: afterwards bleed him well on the fetlock veins, on both ſides, and next day waſh the ſores with warm water, and then clip away all the hair about it, and anoint the part aggrieved with the following ointment:

Take green copperas and verdigris, of each four ounces; of common honey, half a pound; reduce the copperas and verdigris to a fine powder, and work them up with the honey to a due conſiſtence; uſe this ointment till the ſore be healed. Or, take a quarter of a pound of Flanders oil of bays, a quarter of an ounce of oil of turpentine, and ſix drachms of quickſilver, mix the quickſilver and oil of turpentine well together, and then add the oil of bays, and ſtir all together till you cannot diſcover any of the particles of the quickſilver; with which anoint the horſe's legs twice a day; and when he comes from exerciſe let his legs be well waſhed with ſoap and warm water and wiped dry.

REAPING CORN. Mr. Young, in his *Annals of Agriculture, vol. VIII*, gives the following account of a machine for reaping corn, by Mr. William Pitt of Pen-deford. *See PLATE XXV.**

"In purſuance of the idea contained in Mr. Loſt's tranſlation, from Pliny and Palladius, *vol. IV. p. 205*, the enclosed drawings are deſigns for a machine for reaping, or rather rippling corn in harveſt, by an horſe or ox. The farther proſecution of this idea, is earneſtly recommended to Mr. Winlaw, as preparatory to his rubbing mill; as, were it brought to perfection, the buſineſs of rippling being cheaply and expeditiouſly done in the field, the corn is rendered fit for the rubbing mill, without farther preparation. Fig. 1, ſection of the machine to be pushed forward by an horſe or ox; as the machine goes forward, the wheel A gives motion to the pulley B, fixed on the ſame center and by means of the band C, to the pulley D, and tooth wheel E, which latter gives motion to the pinion F, and rippling cylinder G, the rippling cylinder going round twice, for the wheel A once, and its iron combs or teeth, rippling off the ears of corn in rotation, let them fall into the ſmall car A, from whence a man with a prong or ſhovel is to remove them into the great car K, which being filled, the beaſt may be turned the contrary way and the whole drawn to the ſtore-rooms.

"The grain thus collected in a ſhort time of the moſt favourable weather, the ſtraw may be cut and collected at leiſure, and with leſs regard to rain or ſhowers than is neceſſarily the caſe in the common mode of harveſting."

Fig. 2. Plan of the machine : the same letters referring to the same particulars as before. See HARVESTING.

RED-CLOVER, See the article CLOVER.

RED-GAME, an English name of a bird, common in the mountainous parts of Yorkshire, and some other of our northern counties. It is of the shape of a partridge, but much larger, and of a mixed colour of red and black, and is feathered down to the ends of the toes.

RED-LAND, a term much used by husbandmen to express a sandy soil of a reddish hue, interspersed for the most part with pieces of sand-stone of the same colour, or somewhat deeper.

There are several varieties of this soil, one of which is almost entirely made up of sand ; another with an admixture of clay with the sand, the whole making a loose loamy earth, and a third full of fragments of a poor sandy iron ore, and often containing shining specks of selenitæ. *Morston's Northamptonshire.*

RED-WATER. See SHEEP.

RED-WORM, the name of an insect very destructive to young corn.

" I have often (says Mr. Baker, in his Report to the Dublin Society) heard of the havoc which red-worms make in young wheat, barley, and oats ; and in some few writers upon husbandry have read of them, but never saw them till May 1764 ; when to my great mortification, in a few days, they destroyed, almost totally, nine acres of my wheat, for I did not reap above half a barrel per acre. This misfortune induced me to propose to the consideration of the Dublin Society, whether the offer of a premium might not probably produce a discovery of some effectual method for destroying so injurious an insect, to the infinite advantage of the public : and the Society were pleased to offer a premium accordingly.

" I have now the honour to lay before them, what has occurred to me upon that subject.

" The most ingenious M. de Chateaufieux speaks of an insect, which is certainly of the same kind, if it be not the very insect which I have now under consideration. This gentleman, after saying, ' our wheat, in the month of May, 1755, sustained a loss which even that cultivated according to the New Husbandry did not escape, describes the worm thus : we found in it many little white worms, which afterwards became of a chestnut colour. They pos themselves between the blades, and eat the stems. They are usually found between the first joint and the roots ; every stalk, which they attacked, grew no more, but became yellow, and withered. The same misfortune happened to us in the year 1732. The insects appeared about the middle of May, and made such havoc, that the crops were almost destroyed.'

" It perhaps might be expected, that this great man should have made the very enquiry which we are now upon, as the loss appears to have been very great in Geneva, at the two periods which he mentions : but when we consider, how much the high office which he held in the city and republic of Geneva, must have engaged his attention, it is rather astonishing, that he could oblige the world so much as he hath done, by his repeated experiments in husbandry, and his judicious observations upon them : it is therefore less to be wondered at, that this circumstance escaped him.

" The ingenious Mr. Benjamin Stillingfleet also, in the second edition of his Miscellaneous Tracts, in a note, in page 175-6, speaks of an insect, which is probably the same as that which we are seeking to destroy. His words are,

" Thus in Suffolk, and in some parts of Norfolk, the farmers find it their interest to encourage the breed of rooks, as the only means to free their grounds from the grub, from which the tree or blind-beetle comes, and which in its grub state destroys the roots of corn and grass, to such a degree, that I myself have seen a piece of pasture-land, where you might turn up the turf with your feet.

" Mr. Matthews, a very observing and excellent farmer, of Wargrove in Berkshire, told me, that the rooks one year, whilst his men were hoeing a turnep field, fate down in part if it, where they were not at work, and that the crop was very fine in that part, whereas in the other part there were no turneps that year.

" We see, that M. de Chateaufieux describes this worm as being first white, and afterwards becoming of a chestnut colour. I have carefully sought them at different periods, during the past year, but always found them of the same chestnut colour, never varying in any particular except

that of size, which I find to be the case at all seasons, in which I have seen them.

" The insect which Mr. Stillingfleet speaks of, he calls a grub, which, he says, destroys corn and grass : this induces me to believe, that it is the same insect (though the report which he relates from Mr. Matthews seems to contradict it) because I have observed, that the red or chestnut worm, never appears voluntarily upon the surface ; but when the earth is turned up, either with plough or spade, the rooks and crows are very bold in their approach to pick them up ; a circumstance, which I own has in some degree abated my enmity to these birds : I therefore never destroy nor frighten them off my land whilst I am ploughing it ; but when I sow, when the corn rises, and when it is ripe, I destroy or banish them as well as I can, because the mischief which they do at those times is intolerable.

" A member of the Dublin Society informed me last summer that some of his turneps were destroyed by a worm ; I had some few which decayed in their leaves, and became of a lemon colour, preceding the putrefaction which followed, and destroyed the turneps ; I examined their roots, but could not discover any insect which had injured them, and therefore I cannot pronounce that it is the red-worm which destroyed this gentleman's turneps ; but I shall be very watchful with respect to this circumstance, upon every opportunity which may present itself.

" I have observed my lucerne to decay in its tops, soon after it has been up ; and upon examining the roots, I have found the red-worm, which had cut them off.

" This insect seems to be every where in Ireland called the red-worm, by some of the English writers who have spoken of an insect, which destroys the corn in the manner already mentioned ; which I think is undoubtedly the same : it is called a grub, by others the large maggot, and the rook-worm, because the rooks eat it ; but as none of the writers have given any other description of it than the name by which they respectively call it, I shall endeavour to describe it.

" Red-worms are about half an inch long, and about one tenth of an inch in diameter ; they are jointed in their skins, and are of a very firm texture : they have many short legs, two small black specks, which appear to be their eyes ; and two small points springing from their heads, with which I believe they cut the corn, and which, in that work, I apprehend, act like forceps : and all that I have seen of this species, are of a bright chestnut colour. For this reason, I should conceive it would be more descriptive to call them the chestnut worms.

" When they are exposed to the air, by turning up the earth which is infested with them, they will very soon cover themselves again in the soil, which they are very capable of doing by the strength which their make gives them, although they appear to be a sluggish insect, and have not the advantage of a sliminess upon their skins, which the common large creeping worm has, which enables that inoffensive worm to penetrate the earth, and get under timber and stones with ease.

" The red-worm, immediately endeavouring to cover itself from the air, is certainly from natural instinct, as it will soon die, when exposed to the air ; as will appear by the experiment, Numb. 10, hereafter mentioned.

" These worms destroy wheat, barley, oats, and lucerne, while in an infant state, in the months of March, April and May. Late sown barley and oats, they will destroy as late as June. I have not yet experienced that they destroy any other crops.

" The mischief done by them is in dry weather. Rain sufficient to penetrate the ground makes them desist from destroying the corn ; and I suppose, every thing else which they at any time injure.

" They cut wheat off, just above the crown of the roots ; barley and oats in the same place, and also higher up, upon any part of the stem which is below the surface of the earth.

" These worms seem to abound more in ground which is lightly tilled, than in such as hath been well tilled ; but, in lay ground, they seem to be more numerous than any where else : and the fields upon my farm, in which I have found them, are wetter than other fields where they are not ; whether that circumstance contributes to their increase, I cannot say ; but the following experiments prove, that they will live longer in water than they can when exposed to the open air.

Experiments on Red-worms.

- "Numb. 1. I put ten red-worms into a wine-glass with common salt in it. They were all dead in four hours.
- "Numb. 2. Into a glass with brine in it I put ten red-worms. They were all dead in six hours.
- "Numb. 3. Into a glass with lime in it, which had been flaked for a long time, and exposed to the weather, I put the like number. They were all dead in forty-four hours.
- "Numb. 4. Into a glass with the above lime, and some water in it, I put the like number. They were dead in twenty hours.
- "Numb. 5. Into a glass with lime newly flaked, and when cold, I put the like number. They were dead in fourteen hours.
- "Numb. 6. Into lime-water, made with cold water, I put the like number. They were dead in ten hours.
- "Numb. 7. Into a glass with foot in it, I put the like number. They were dead in four hours.
- "Numb. 8. Into foot and water, I put the like number. They were dead in four hours.
- "Numb. 9. Into fair water, I put the like number. They were dead in fifty-two hours.
- "Numb. 10. Into a glass, without any thing in it, I put the like number. They were dead in thirty-two hours.

"By these experiments we see all the articles used will kill this insect in a short time, particularly the salt and foot. I thought it necessary to consider different articles, the better to suit different parts of the kingdom.

"Where lime can be conveniently had, and that it is used as a manure, I am apt to believe, from the experiments, that no injury can be sustained from these worms; but I am afraid a small quantity will not effectually destroy them; besides, I should fear, if it were not put on before the sowing of the corn, that it might singe the blades of the corn; for, from these experiments, it appears, that lime newly flaked, is more suddenly destructive to them than old lime, and therefore it is to be preferred.

"Where lime is used for no other purpose than to destroy this worm, I should conceive, that about eight barrels, regularly sown by hand on an acre of ground, might be sufficient: it must be first flaked and cold before a man can possibly cast it upon the ground with his hand, lime being a very strong caustic; and, even when it is cold, the man should have a thick glove upon his hand.

"Where salt shall be used to destroy this worm, it must always be sown upon the ground, before the intended crop; for, although corn will vegetate, and receive benefit from salt as a manure, when it is used antecedent to the sowing the corn, yet, if it be added after the corn is growing, it will certainly destroy it: therefore, it should never be used for this purpose, but before the corn is sown, or at least before it vegetates.

"I conceive that where salt is used for this purpose only, about four hundred and a half to an acre will answer the purpose, which is a trifle more than one ounce to every square yard.

"We see by the experiment, that foot kills this worm as soon as salt; and as in most places it is to be had at a much less price than salt, I think there can be no doubt about preferring of it; besides which, it may be safely used after the corn is up.

"I had some small parcels of barley under experiments, which these worms began to destroy; and in order to convey the foot as soon as possible to the roots of the plants, I mixed a little of it in water, and poured it on the plants with a garden watering-pot: the consequence was, that I did not lose one plant afterwards.

"It will hardly be imagined, that I mean that the same method is to be pursued upon a whole farm: no; the method I would recommend to the practice of the farmer is this, to spread or cast by hand, as he sows his corn, about six or eight barrels of foot on an acre, and let him be careful to choose a calm day for the work, otherwise the wind will carry away great part of it: and as what remains cannot be regularly disposed, let him be careful to do it early enough in the spring, that the rain may wash in the foot and convey it to the roots of the plants before the worm begins the mischief; if he does this, I am persuaded his crop will be preserved.

"We see by the experiments, that this worm will live

longer in water, by twenty hours, than when exposed to the open air; but at length, i. e. in fifty-two hours, they died in the water; perhaps this might be from the effect of drowning; but if so, I might have expected they would have been totally destroyed in my two fields in the winter of 1763 and 1764, by the immoderate rains which fell at that season for a long continuance, by which the land was often flooded. But they survived that winter, as appeared by the great loss I afterwards sustained, by their destroying my wheat; and therefore, whether water be an enemy to them or not, it seems not easy to determine: but if these which died in the glass of water were really drowned, yet, I think we may conclude, that water is necessary to their existence in the earth, and probably aids them in getting their food from it: and what seems to confirm this notion is, that when the land is wet, they do not touch the corn, but as soon as ever the land is dry, they begin their mischief. However, this speculation I must submit to the consideration of persons more capable of discussing it than I am.

"We see by the experiment, Numb. 10, that they cannot live in the open air; which seems to prove, that, where they abound in land, the oftener it is ploughed, particularly in the summer, when they cannot penetrate the ground so easily as when it is moist, they must be, by such ploughing, greatly diminished: besides which, the frequent ploughing gives the crows more opportunities of picking them up, in which, as I before said, they are very watchful.

"Frequent ploughing has been recommended by some writers as the only means of destroying this worm; and they have recommended the ploughs being stuck with nails, urging, that by those nails the worms are cut to pieces; others have recommended walnut-leaves being soaked in water, to sprinkle the land: and steeping feed-corn in various liquors, as infallible remedies: but such methods as these are founded upon mistaken principles; they only mislead the farmer, and must disappoint him.

"Worlidge recommends a strong lye made of fixed salts, but that would be impracticable. Mortimer recommends sea-water, for such lands as are near the sea-coast, which I believe would answer very well. He says he used foot once with success, but that it did not succeed with him afterwards. I am persuaded he did not use the foot early enough to have it washed into the ground by rain, or perhaps he used too small a quantity.

"I would not be thought to arrogate any merit to myself, on account of what I have here offered on this subject, since it appears that other persons have used the articles which I have recommended, against this common enemy; but many persons have been disappointed in their expectations from these remedies, which must have arisen from their either having used too small a quantity, or not having observed the necessary precautions; if those which I have recommended, shall be put in practice, and found to answer, I shall think myself amply rewarded."

REED, the name of an aquatic plant, infesting low pasture-lands.

The best method of destroying reeds, is by draining the land; for if the drains be cut deeper than their roots, it will take away their nourishment, and, consequently, destroy them. Ashes, or foot, will likewise kill them; and so will ploughing up the land, laying it in high ridges. They always indicate a good soil, for a bad one will not nourish them.

REEK. See the article STACK.

REEK-STAVEL, or REEK-STAFFOLD, a frame of wood placed on stones, or which the mow or stack is raised.

REMOLADE, is a compounded honey charge for horses. To prepare it,

Take three pints of lees of wine, half a pound of hog's grease; boil them together for half an hour till they be well incorporated one with another; add black honey, pitch, Burgundy pitch pounded, common turpentine, of each half a pound; stir these with the other over the fire, till they are melted and well mixt; then add bole-armenic, or bole of Blois, of each a quarter of a pound; take the vessel off the fire, and stir it for a quarter of an hour longer.

If the charge is not thick enough, it may be brought to a due

a due consistence with a little wheat flour; and if it be too thick, it may be thinned with wine or lees of wine.

If to this charge an ounce of quicksilver be added, it will be little inferior to the red honey charge, in removing old griefs of the shoulders, legs, swaying of the back, and such like infirmities.

You may first kill the quicksilver in a small quantity of turpentine, and then incorporate it by stirring it with the other ingredients.

A remolade for the hoof-bound:

Take a pound of Burgundy pitch; half a pound of common turpentine; a quarter of a pound of olive oil, and thicken it well with a sufficient quantity of wheat-flour; charge the whole foot of the horse with this remolade lukewarm, after you have applied the following poultice:

Take two parts of sheep's dung, and one part of hen's dung; boil them with water and salt to the thickness of paste; in another pot boil as many mallows as is proper to make a mash; then add a convenient quantity of linseed powdered, and boil it a little longer: afterwards pound them in a mortar with an eighth part of raw garlic, to a paste; incorporate this with the following poultice; adding a little oil of lilies, and make a poultice; to be applied very hot to the foot, and cover it with splents.

Renew the application five or six times, once in two days, ever observing to heat the following poultice, and to mix a little fresh with it.

A remolade to dissolve kernels in the glanders before they come to an hardness:

Reduce half a pound of linseed to fine flour, mix it with a quart of strong vinegar, and boil it over a clear, but gentle fire, stirring it continually till it begins to grow thick, and then add six ounces of oil of lilies.

Another remolade:

Mix half a pound of wheat-flour with white wine, to the consistence of gruel, and boil it over a gentle fire, stirring it without intermission till the whole is united; then having melted half a pound of Burgundy pitch, add half a pound of common turpentine, and incorporate all together: mix this with the gruel moderately hot; take the vessel off the fire, and add a pound of the oriental bole in powder, and make a charge.

This will bring down swellings in the legs occasioned by blows, &c. This is to be applied hot, and repeated till the swellings be alluaged.

Another cheap remolade for swellings in the legs, occasioned by blows:

Chafe the part hard with strong brandy, and then charge the whole leg with common honey: renew the application once a day for six or seven days, washing the horse in a river or pond twice every day. See SWELLED LEGS.

Or,

Take half a pint of good vinegar, mingled with half a pound of tallow, and an ounce of flour of brimstone; or a mixture of common bole, honey and water, for small swellings.

RENNET. See CHEESE.

REPLANTING. Mr. Marshall, in his Rural Economy of Norfolk, says "It will be doing justice to the Norfolk management to mention a practice, which at present prevails, of grubbing up old worn-out hedges, and planting new ones in their stead.

"In this case the old hedge is (or ought to be) thrown down in autumn, that the soil may be thoroughly soaked and tempered with the winter's rains and frosts: early in spring the foot of the bank should be formed, and, in due season, the layer put in, and the fence completed.

"By this means a disgraceful nuisance is removed, and a new straight hedge obtained; and this at a small additional expence. The roots alone, if the old hedge be full of large stubs, and loaded with stems, will pay for grubbing: I have known one let to grub upon these terms. I have also known sixpence a rod (of seven yards) besides the roots given; also, one shilling a rod and the small roots.

"The price of re-making, that is, scouring and banking up an old ditch, is nine-pence a rod and beer; so that the difference between re-making the old one and raising a new one is but three-pence a rod."

REY-grass, a hardy sort of grass, much esteemed among the farmers for that quality. It will grow on any land, and therefore produces crops where nothing else will. It thrives best of all on sour, clayey, and weeping grounds, and equally endures the severest droughts of summer, and frosts of winter, suffering no damage from either. It is the best of all winter foods for cattle, the shorter it is eaten the better, and it springs the earliest of any. There is no danger of overstocking it, for, if it be left to grow too much, the stalk becomes hard and sticky. It is best for horses and for sheep, and very much prevents the rotting of the latter. The best way of sowing it is with clover. The common quantity of seed is two bushels to an acre, but three bushels is much better; though in some lands, where the clover is likely to succeed very well, they sow eight pounds of clover seed and one bushel of rey seed to an acre, and this makes a crop that will last seven or eight years.

Some mow it as hay, and thresh it for the seed, which, about London, sells from half-a-crown-a bushel to three shillings. Four or five quarters of this seed will be sometimes produced from an acre of the grass. If at any time a field of this grass is found to grow thin, it is only necessary to strew on a bushel of this seed, and roll it with a wooden roller, and the plants rising from this addition will make the whole crop sufficiently thick. Rey-grass has this great advantage, that it kills weeds without any other sown plant: even thistles cannot grow among it. When the rey-grass is cut for hay before perfectly ripe, the hay is the better; but the seed will not grow so well. When the seed is newly thrashed, it must not be laid too thick, for it is very apt to heat and ferment, and the whole will be spoiled. *Mortimer's Husbandry*, vol. I. p. 60.

RIBS of a horse, should be circular and full, taking their compass from their very back-bone.

RICE, the name of a plant cultivated in many parts of the East, in South Carolina, and also in Spain, Italy, and Piedmont.

The plant grows to the height of about two feet and a half, with a stalk not unlike that of wheat, but fuller of joints, and with leaves resembling those of a leek. It branches out into several stems, at the top of which the grains grow in clusters, and each of them is terminated with an arum or beard, and inclosed in a yellow rough husk. When stripped of this they appear to be of an oval shape, of a shining white colour, and almost transparent.

The following account of the culture of rice in China, is taken from M. Duhamel's Husbandry.

"1. To hasten the sprouting of the rice, it is put into baskets, and soaked for some days in a standing water.

"2. When their rice grounds are so soaked with water as to be quite like mud, they ploughed them with a buffalo yoked to a plough very simple in its make, having but one share, one handle, and no wheels.

"3. After a gentle rain, they break the clods with a kind of a large hurdle, drawn by a buffalo; the driver sitting upon it, to increase the weight.

"4. The ground is cleared of all stones, and whatever roots are in it are pulled up by a strong harrow with great iron teeth. This instrument is drawn by a buffalo, and a man guides it with the help of two handles, like those of a plough, upon which he leans hard. The earth is like mud, and partly covered with water during all this operation.

"5. The earth is afterwards smoothed with a harrow, which has several rows of teeth. A man guides this harrow by its two handles, whilst a buffalo draws it; and as fast as its teeth form little channels in the ground, the water runs in, and fills them up.

"6. When the rice that was laid to soak has sprouted, the seed is known to be good; and it is then sown by hand, very

very thick, and as equally as possible. Only part of the ground is sown in this manner, to furnish plants for the rest.

"The day after it has been sown the points of the plants appear above the surface of the water: for the ground is overflowed all this time with just enough water to cover it.

"7. When the plants have acquired a little strength, they are sprinkled with lime-water, to destroy the insects and some of the weeds that would hurt them. For this purpose a small basket is fastened to the end of a long handle, and dipt in the lime-water, which runs through it, and is conveyed over the plants.

"The Chinese have a great veneration for the first inventor of this method, which answers to our custom of steeping wheat in lime-water, or manuring land with quicklime.

"8. Towards April, when the plants are grown strong enough to cover the whole field, and look very green and even, the greatest part of them is pulled up by handfuls, all the mud is carefully washed off their roots, and, being held all this time as even as possible with one another, they are planted in tufts, pretty far asunder, and in a quincunx form, in fields prepared on purpose for them. A serene day is chosen for this operation, which must be performed as quick as possible.

"This practice of the Chinese is, with respect to the common culture of rice, what the New husbandry is with respect to the common culture of wheat.

"9. The rice must be watered: which is always done in China, by overflowing it. To this end, the rice-grounds are always near a rivulet, pond, or great pool of water, from which they are separated only by a bank or causey.

"If the water was higher than the rice-ground, a trench cut through the causey would overflow it at once: but as it is generally lower, or on a level with the rice ground, the necessary quantity is conveyed in pales or buckets, which are worked chiefly by the help of ropes.

"10. Though a man cannot step in these rice grounds without being up to his knees, the Chinese weed them three times in a summer; and that with such care, that they pull up even the roots of every weed.

"11. When the rice is ripe, which is known by its turning yellow like wheat, it is cut down with a sickle, made into sheaves, and carried to a barn, where it is threshed with flails pretty much like ours: the straw is removed with pitch-forks and shovels, and the outer husk of the grain is taken off by beating it with great wooden pestles, or a kind of mallet, after which it is sifted and winnowed: and, lastly, to get off the under husk, the grain is put between two mill-stones, which are worked by a lever fastened to the upper one.

"The two most remarkable circumstances of this culture are, 1. The care which the Chinese take not to let their plants be too close together, lest they should rob one another of their food. 2. Their weeding their rice grounds three times in a summer, which answers the end of the hoeings recommended for the alleys between the beds of other grain, cultivated according to the New Husbandry. *Culture de Terres*, Tom II. p. 180.

RICK, a pile of corn, hay, straw, &c. regularly heaped up in the open air, and sheltered from wet. See STACK.

A practical farmer has given the following account of the benefits arising to the farmer from keeping his wheat-straw in ricks, to be used when occasion requires it.

"Experience will, they say, make a fool wise: I took the hint, and have ever since guarded against a misfortune of the like nature.

"I constantly, says he, every year make a rick of wheat-straw, unless it happens to be very short, when I keep my rick two years, instead of making a new one the second year.

"This may, and doubtless will, by some of your readers be thought an unnecessary expence: yet as I find it answer, I am determined to, continue the practice. I not only rick the straw, but I also slightly thatch the rick to keep out the weather; yet, after all, I save by it.

"As I keep a very regular account of my farming expences, I find that in the space of ten years I am a gainer of fifty-three pounds, by saving in this manner a rick of straw for thatching, besides what I saved by not threshing my wheat at an improper season. When I say I am a gainer of so much money in the time, I mean a clear

gain: after deducting the expences of making up the rick, thatching it, &c. my expences in thatching for the last ten years have been fifty-three pounds less than they were the ten preceding years; and this I can easily account for, and will, for the satisfaction of your readers, at least in part, do it.

"I now always do my thatching work at the most convenient season, being never in want of straw; and, for the same reason, as soon as any part of my thatching is deficient, I have it immediately repaired, which is a great saving.

"My thatching now lasts longer than it used to do, for I never thatch with short straw, having always, as I observed before, long straw to use; for in the years when the straw is long, I save the largest rick, which I have sometimes kept two or three years, till the wheat straw has been long again.

"In the space of the last ten years I had two accidents happened, which would have proved very expensive to me, if I could not have resorted to my straw rick.

"The first was, that one of my sons (a boy about ten years of age at the time) set fire to the thatch of a large barn by means of a squib. It burnt furiously for some time, and so far damaged the roof, that I was obliged to have it new thatched; for which purpose I made use of a part of my straw rick, and it was finished in a few days; whereas, if I had not had this rick, I must have bought short straw, for there was scarcely any other to be had, at a large price, and the thatching could not have been finished so soon: by which means I should have had a considerable quantity of barley, that was in the barn, damaged, for it rained very hard for a considerable time, in a few days after the thatch was repaired.

"The other accident was occasioned by a gust of wind which stripped off a good deal of thatch; but it was soon repaired, without any damage to the corn that was in the barns at the time.

"All this, perhaps, may not be enough to persuade your practical readers to rick their long straw. If this is the case, they must even continue their old practices: yet I hope I may be permitted to say one thing, which I know to be true; what I mean is this, that farmers, if they would attend to matters which they generally think beneath their consideration, would get more money than they do: profits arise from what appear to be trifles at first sight, and the merest trifle should be by a farmer attended to.

"A habit of industry, frugality, oeconomy, and perseverance is absolutely necessary to the occupier of land, if he does not mean soon to shift his quarters." *Museum Rusticum*, vol. III. p. 245.

RIDDLE, an oblong sort of sieve used to separate dust, and the seeds of plants from corn.

RIDE, a cluster of sprigs of hazel, or the underwood, shooting out of the same root.

RIDGE, a long piece of rising land between two furrows.

Mr. Tull observes, that the method of ploughing lands up into ridges is a particular kind of tillage, the chief use of which is the alteration it makes in the degree of heat and moisture. But the principal advantage this gentleman proposes from ridges is the draining wet hills, where the upper stratum is mould, and the second stratum clay. These ridges he observes should be ploughed across the hill, almost horizontally, that their parting furrows lying open, may each serve as a drain to the ridge next below it; for when the plough has made the bottom of these horizontal furrows a few inches deeper than the surface of the clay, the water will run to their ends very securely, without rising into the mould, provided no part of the furrows be lower than their ends. These ridges and their parting furrows must be made more or less oblique, according to the form and declivity of the hill; but the more horizontal they are, the sooner the rain-water will run off the lands: for in that case, it will run to the furrows, and reach them at right angles. Every one of these horizontal trenches receives all the water from the rills, or little gutters, which in these quagmire-hills run betwixt the mould and the clay; these are all cut off by the trenches, which receive the water at the upper sides, and carry it away, as the gutters of lead placed under the eaves of a house carry away the rain water. These ridges should be ploughed in pairs, without throwing any earth into the trenches; and at every time of ploughing, the pairs must be changed, so that the fur-

rows which had two ridges turned towards it one time, must have two turned from it the next. *See the article PLOUGHING.*

RIDGES, in a *Horse's Mouth*, are wrinkles or rifings of flesh in the roof of the mouth, running across from one side of the jaw to the other, with furrows between them.

RIDGELING, the male of any beast that has been half castrated.

RIDGIL LAMBS. *See the article SHEEP.*

RILLS, *artificial.* Mr. Marshall, in his *Rural Economy of Yorkshire*, vol. I. says, that, "the heights of the northern margin have neither springs nor rivulets (some very few instances excepted), nor any other natural waters than the brooks which wind at the bottom of the deep vallies that divide them, and the rivulets which generally run at the feet or the precipices that terminate them."

"Formerly these brooks and rivulets were the only resources which the villages that are scattered on these heights had for water, both for the use of cattle and for domestic purposes."

"In process of time wells were sunk; but they are of such a depth as to make the labour of raising the water little less than that of fetching it from a moderate distance."

"This kind of natural necessity has led to an expedient, which, though not new in principle, is perhaps entirely so in simplicity of execution, and might be practised with great advantage in many similar situations."

"The moreland mountains rise with generally an easy ascent, from the beds of the rivulets last mentioned, to a height much exceeding that of the hills to be watered, frequently abounding with springs almost to their highest swells."

"These springs are collected and conducted by a narrow channel down the slope of the mountain sides, and along the face of the precipice, until the summit be gained; the waters being thence conveyed to the place or places desired."

"In planning an artificial rill, a level and some little knowledge of the country are the requisite guides. The surveyor begins at the place to which water is required to be brought; and ascertains the lowest part of the brink of the precipice from which water can be conducted. The face of the precipice is traced in like manner; and, if necessary, the ascent of the moreland hills, until springs, or their natural rills, can be commanded."

"If his level bring him to the bottom of the steep soon enough to catch the rivulet which runs at its foot, the work is readily completed. If not, he goes above its highest bend; generally to the head or highest part of the valley (between the heights and the morelands) and winds along the side of the opposite swell to some more elevated source."

"If, when he arrives on the moreland hills (or by an observation from the top of the precipice) he find that nature does not furnish the requisite quantity of water high enough to give the necessary fall, the work is of course impracticable."

"In executing an artificial rill, opening a shallow channel, of a width proportioned to the quantity of water to be conducted, is the main operation. In making stagnant pools we have found that much art is necessary to make them retentive; but in forming the bed of a rill no such art is requisite. It is the nature of running waters to render the surface on which they run firm and retentive. Sand is, I believe, the chief material used in forming the channels of these rills; and this only in places where an open rock or other porous stratum is crossed."

"Much however depends on the quantity of fall and the quantity of water. If the fall be but little, and the quantity of water at the source be such as not to admit of much waste, great care is requisite in forming the bed of the rill."

"The fall is therefore regulated in a great degree by the quality of the ground. On good ground the channel is nearly level. Over faulty ground the water runs with a current for the double purpose of getting quickly over it, and rendering its channel more retentive."

"The principal enemies of artificial rills are leaves in autumn and snows in winter. To remove the obstructions which these not unfrequently cause, and to repair such breaches as time will always make in the works of art, a superintendent is necessary to every artificial rill."

"The rill of Kirbymoorside is, I believe, the largest,

and was the first which was brought upon these heights. This rill was brought to the village of Gillimore and Fadmore near forty years ago; and has been extended to Kirby about thirty years, by Joseph Ford; a self-taught engineer, of great ingenuity and some judgment; a man to whom the country owes much. Since the introduction of this, several others have been raised; and some few unsuccessful attempts have been made: the channel was in one instance (that of Newton) extended a considerable way before the impracticability of completing it at a moderate expence was discovered; a piece of misconduct which nothing but a want of accuracy in the use of the level can lead to. The miscarriage in this case was not owing to a want of elevation in the source, but to a depression of the channel at the foot of the steep; the head of the valley (if such it may be called) being lower than the top of the precipice at the given point. This shews the necessity of tracing the entire channel with sufficient accuracy before any other expence is incurred."

"In the case of Kirby, the channel is raised some feet by a bridge-like mould of earth thrown across the crown of the valley."

"The same mould serves the purpose of conducting another rill across the same difficult pass; from whence the Kirby-rill takes an eastward, the rill of Wellburn (applied principally to the watering of pasture grounds) a westward direction."

"The first cost of Kirby-rill was not altogether one hundred pounds. The distance about ten miles, watering (besides the town of Kirby) two villages and a line of cultivated waterless upland country about four miles in length. Besides the first cost, which was raised by subscription, a superintendant has ten pounds a-year for keeping it in repair and free from obstructions; which yearly salary is paid by the voluntary contribution of the persons benefited; each being rated agreeably to the estimated benefit received." *See DRINKING-POOLS and PONDS.*

RING-BONE, a hard swelling on the lower part of the pastern of a horse, and generally reaches half round the fore-part. It has its name from the resemblance to a ring.

It often arises from strains, &c. and when behind, from putting young horses too early upon their haunches; for in that attitude a horse throws his whole weight as much, if not more, upon his pasterns, than on his hocks."

When it appears distinctly round the pastern, and does not run downwards towards the coronet, so as to affect the coffin-joint, it is easily cured; but if it takes its origin from some strain or defect in the joint originally, or if a callosity is found under the round ligament that covers that joint, the cure is generally dubious, and sometimes impracticable; as it is apt to turn to a quittor, and in the end to form an ulcer upon the hoof."

The ring-bones that appear on colts and young horses will often insensibly wear off of themselves, without the help of any application; but when the substance remains, there needs no other remedy besides blistering, unless when by long continuance it is grown to an obstinate hardness, and then it may require both blistering and firing."

To fire a ring-bone successfully, let the operation be performed with a thinner instrument than the common one, and let the lines or razes be made not above a quarter of an inch distant, crossing them obliquely, somewhat like a chain; apply a mild blister over all, and when quite dried up, the rupture plaster; and then turn the horse to grass for some time. *Barthol's Farriery*, p. 264.

RIPPLING of Flax, the operation of taking off the seed from the flax by drawing it through a ripple or large comb. *See the article FLAX.*

RISING, yeast, or barm.

RIVER, a current, or stream of fresh water flowing in a bed or channel, from its source into the sea.

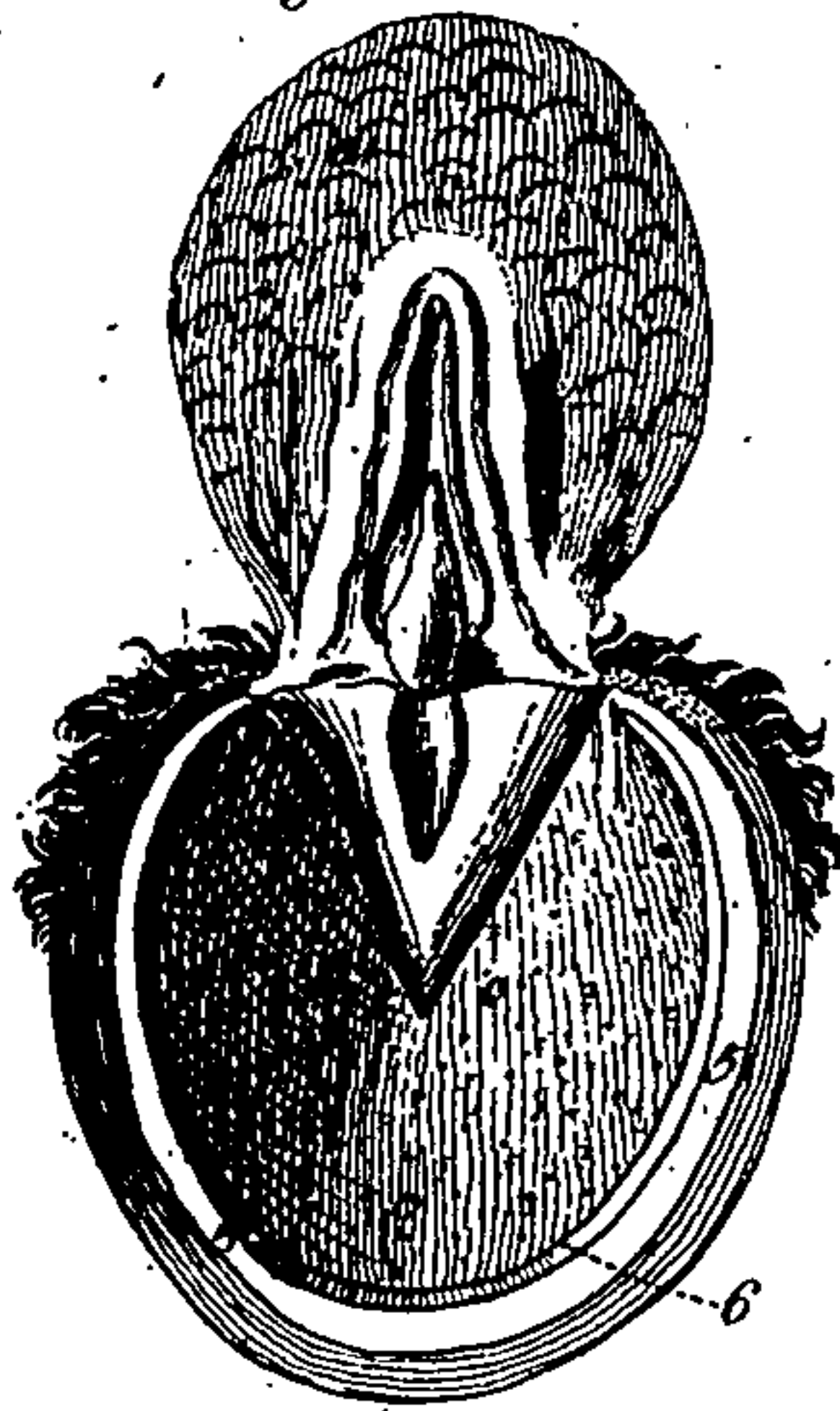
RIVULET, a little river or small stream of water.

ROAD-HORSES. A road horse is he, which in general performs the most laborious work; and frequently enjoys the least accurate attention of any in the kingdom. Under this description comes the greater part of all the horses in constant use, as it includes carriage-horses of every kind, roadsters and hacks, whether of gentlemen, tradesmen, or travellers; all which constitute an infinity, as well in the metropolis as every part of the country. Road horses of every denomination are, from their constant hard work, entitled to a proportionable degree of care and attention with the best horses in the kingdom; and should

Fig. 1.



Fig. 2.



The new half Moon Shoe. Fig. 4.



The Nail for the Shoe.



Fig. 5. Spiky-Roller.

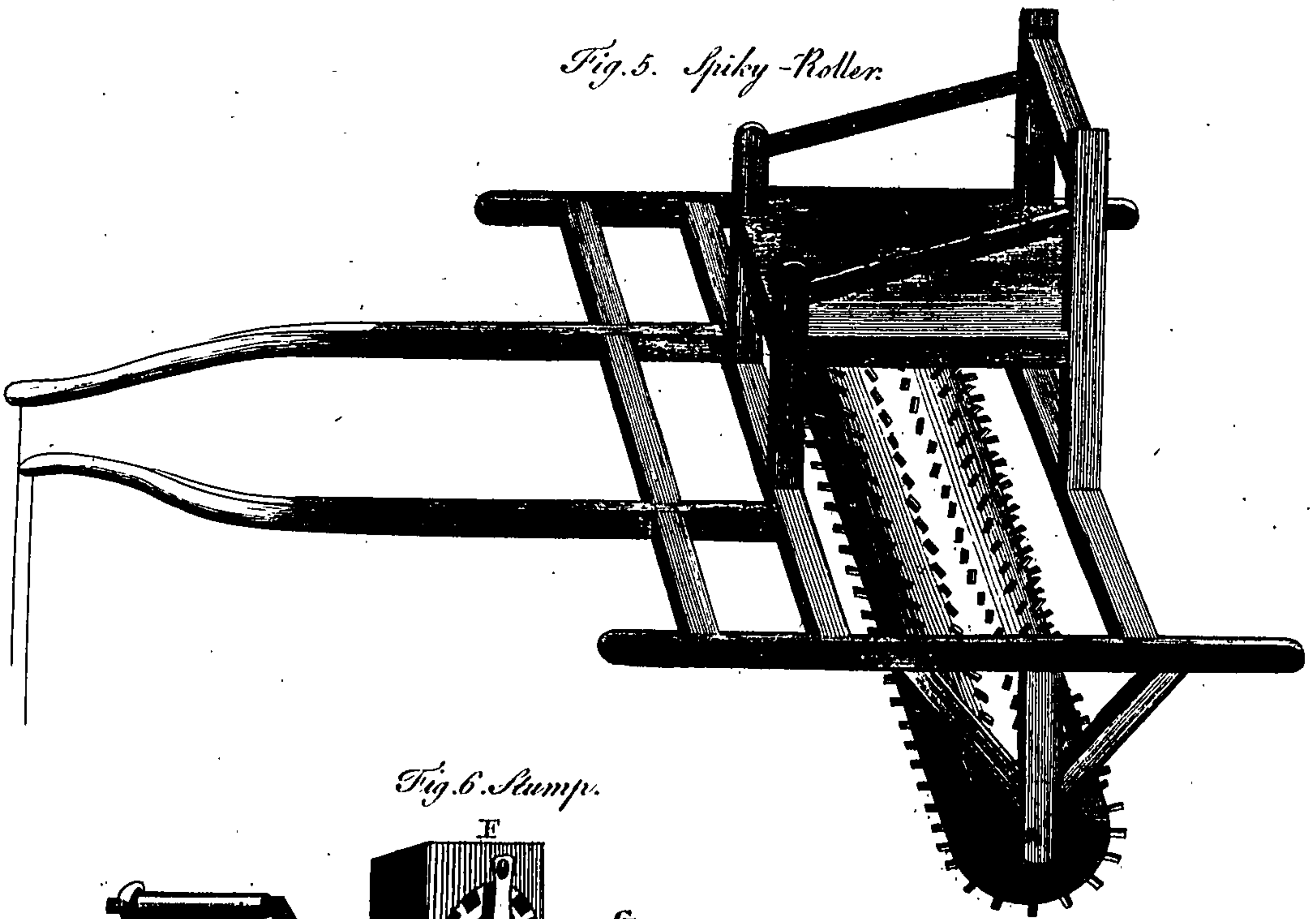


Fig. 6. Stump.

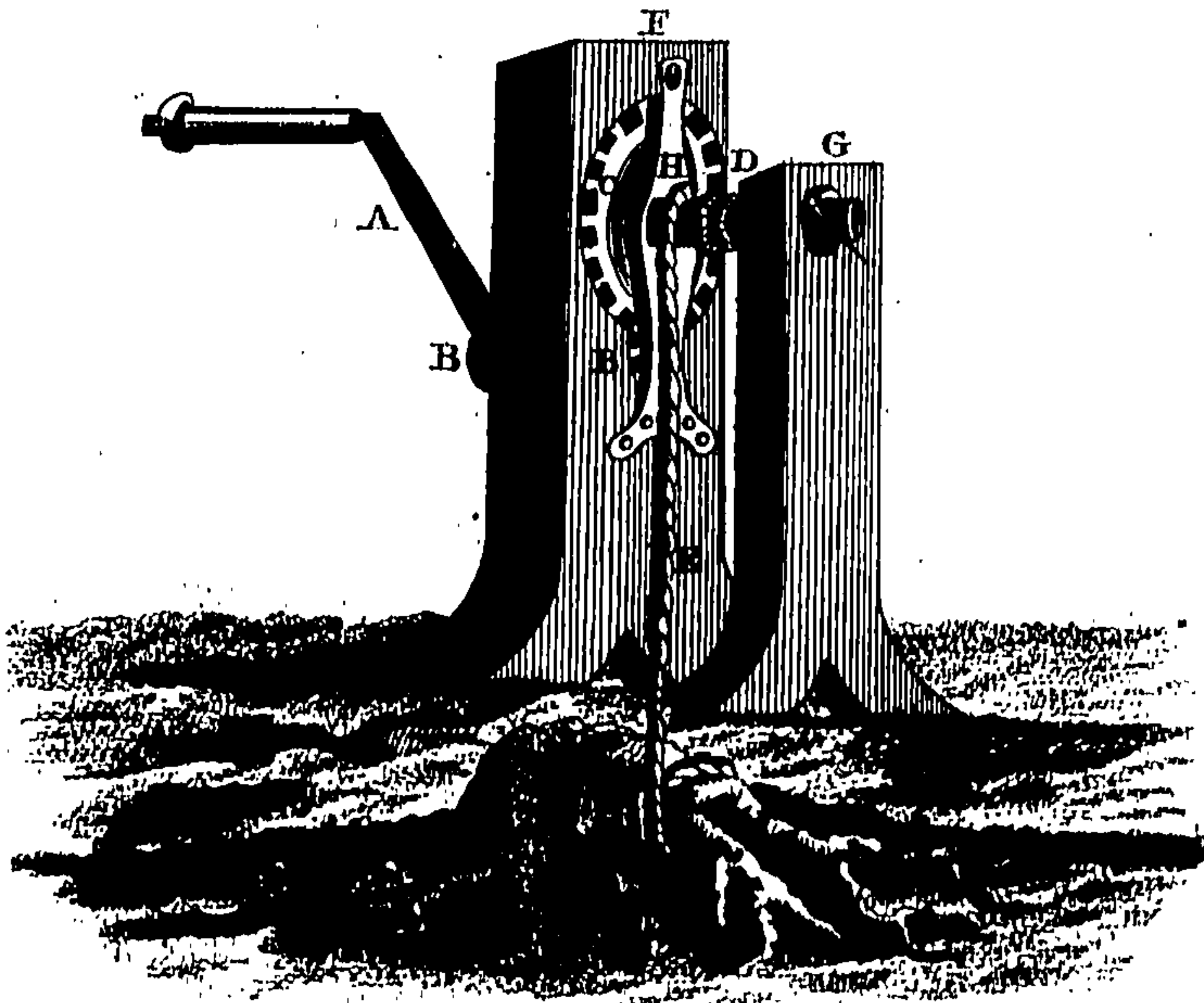
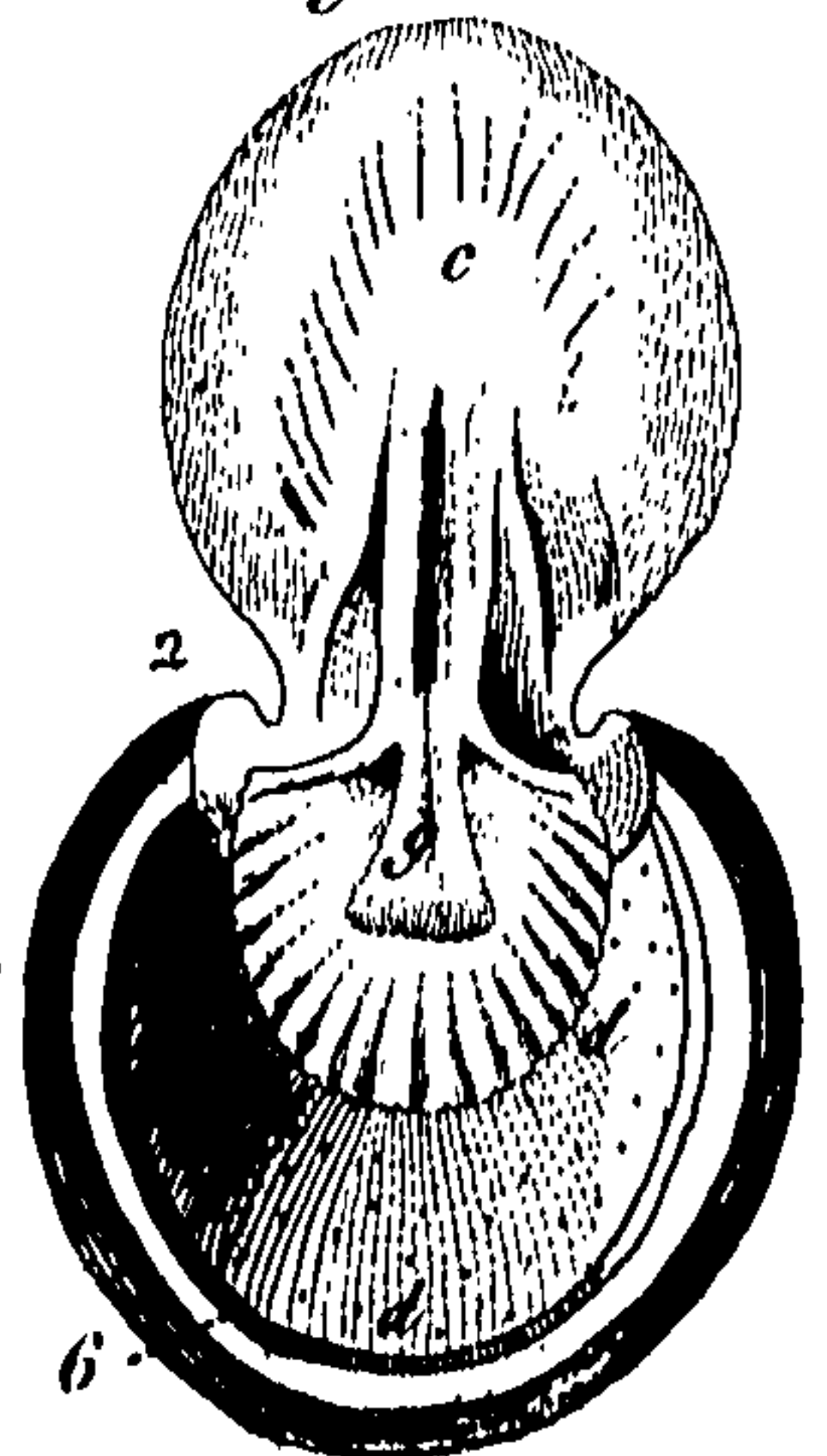


Fig. 3.



undergo, the useful minutiae of stable discipline that so clearly contributes to the preservation of health, in horses of a superior description: those which have incessant journeying, or travelling post, must be supplied, at least, with a peck of corn a day. Large and strong carriage-horses, in perpetual work, require considerably more, or become emaciated by loss of flesh in frequent perspiration. These rules are offered as a kind of general standard.

ROAN, a roan horse is one of a bay sorrel, or black colour, with grey or white spots interspersed very thick: when this party-coloured coat is accompanied with a black head, and black extremities, he is called a roan with a blackmoor's head; and if the same mixture is predominant upon a deep sorrel, it is called claret roan.

ROD, a measure in length, consisting of sixteen feet and a half.

RODDEN CRIBS. Mr. Marshall in his Rural Economy of the Vale of Gloucester, says, "these are a kind of large basket, made of the topwood of willow pollards; an utensil common to this country and to Lincolnshire, though situated on the opposite sides of the island: but they are alike grassland countries, wherein cattle are fattened on hay. They are about six feet diameter. The height of the basket-work is two feet and a half; of the stakes three feet and a half; their heads rising about a foot above the rim of the basket. The width between the stakes twelve to fourteen inches. The size, that of large hedge stakes. The size of the rods vary from that of a hedge stake, down to a well-sized edder.

"In making these hay baskets, the stakes are first driven in a ring of the required size, firmly into the ground. Some of the larger rods are then wound in at the bottom, in the basket-work manner. Upon these the smaller rods are wound; the middle part of the work requiring the least strength, reserving the largest for the top. In the winding and due binding of these, the principal part of the art of withy crib making rests. Some makers warm these thick rods in burning straw; others wind them cold; one man drawing them in with a rope; while another beats them at the stake with a wooden beetle, until they acquire a degree of suppleness. They are mostly made by men, who go about the country; and who by practice, make them very completely; winding in the top rods so firmly and so regularly, that it is difficult to know which has been the last put in.

In use, the cattle lay their necks between the tops of the stakes. Each being thus kept in its place, the master cattle are, in a degree, prevented from running round and driving away the underlings. The closeness of these cribs prevents a waste of hay, either by the wind or by the cattle.

On the whole, they are useful, simple, cheap; and, if well made will last several years.

ROLLER. See DRILL ROLLER

ROLLER, a large piece of wood turning on its axis, and drawn over the surface of the ground to break the small clods, and render it smooth and even.

The plain roller does not seem to have that attention paid to it which is due to its merit. It is seldom used on a fallow, except to burst clods, and seldom used after sowing, except to smooth the surface for the scythe. Perhaps rolling when damp is not prejudicial, provided the soil be afterwards harrowed. Rolling not only bursts some of the clods, but fixes others, and prevents them from rolling under the harrow. Applied to fallows, the plain roller is the grand arcanum of Agriculture, which makes light land stiff, and stiff land light. One essential crush by a plain roller is worth a dozen partial indentures by a spiky one; but where the clods bear a heavy plain one, the spiky roller is worth its weight in gold. *Marshall's Minutes of Agriculture.*

Spiky ROLLER. See SPIKY ROLLER.

ROLLING, the operation of drawing a roller over the surface of the ground.

"Rolling, as well as ploughing and harrowing, says Mr. Clarke, if admitted in the culture of fallow lands, would, I presume, much facilitate eradicating of weeds, and promote the prolific capacity; for it often happens, that after land has been ploughed and worked with the great harrow, &c. there still are grass and weeds remaining, that will the next ploughing cause the furrows to be ropy, and then much labour and time is required to make it to the mind of the judicious husbandman, which rolling it in the following order will be found to elude.

"Thus, when the land has been once ploughed, bracked, and harrowed, immediately give it a double rolling with a stone cylinder about four feet long and three feet radius, which with its furniture, is a roller about one ton weight: the pressure of such roller; when there is little moisture in the land, fixes it so much, that no weeds nor grass can vegetate; next, in about a month after, put in manure by another ploughing, viz. dung or compost, whereof dung is the major part; but lime is at this time very improper, as it resists putrefaction: then give the land a stroke with the great harrow, and roll it as before: this puts the manure, soil, and juices in contact; by which, together with the vivifying heat of the sun, (that must be greater on rolled land than on loose, rough, unsteady particles of earth, because it thereby becomes quiescent, and the surface acquires a kind of polish) fermentation and putrefaction must be ardently already excited.

"That these are salubrious and most powerful agents in the fertilizing of land, by loosening the composts, and setting at liberty the more subtle parts of the manure and soil, and generating that sort of air which is found so necessary to animal as well as vegetable life, none conversant in these matters can make the least doubt.

"Now indeed may a quantity of quick-lime be applied to great advantage, by being spread on the surface; for the weeds that are harrowed up, will not only soon be dissolved by it, and converted into nourishment for vegetables, but the very principle of vegetation, which is going off in exhalations by the effervescence within, is by it absorbed and retained for the nutrition of the crop, which it will communicate when it is ploughed in; and that may be done about fourteen or twenty days after, sooner or later, as the weather answers, or the experimenter sees it necessary: and if it is a soil fit to grow turneps, and the season proper, the seed may be sown immediately, either in the drill or common way; but the drill, on many accounts, in sowing turneps, deserves precedence; or, if it is to be winter corn, one ploughing more, which is the third only, makes it in fine order for the seed.

"The utility of rolling does not end here neither; for to roll wheat, rye, barley, &c. with a roller about twice the length, and half the weight of the one above described, may be advantageous, as it presses down the soil that has been raised by the frosts, about the minute ramification of the attracting ducts, and augments the quantity of mould upon them by breaking the little lumps of soil; which, indeed, were very serviceable in winter by affording shelter, but in spring will still be of greater use, by such immixtion in filling up the fissures, and preventing in a great measure the ill effects droughts have on light soils, by retaining and filtering rain-water; whereby the soil imbibes whatever is nutritive; what is superfluous of the simple fluid only escapes.

"These are some of the many advantages rolling produces in agriculture; notwithstanding which, it amounts to more than mere conjecture, that in general rolling corn may do more damage than it can do good, if such as the following cautions be not carefully attended to, viz. never to roll corn but in dry fresh weather; by no means use heavy rollers; nor roll too early, i. e. before the blades be pretty strong, for the wounds that the blades may receive, the roots, being then tender, will be unable ever to recover; nor too late, i. e. when the stalks are hardened and grown to any height, for the roller will break them, which injury hardly can be repaired, and the crop is thereby hurt; that none but light lands are proper to be rolled, and those which have been manured that or the preceding year with only dung: in short, none but rich, light soils, in general, can be improved by rolling: for in poor lands it opposes the most active primogeneous agents, and undoes all that has been done for the crop by ploughing, &c.

"Thus the soil, the condition, the growth of the corn, the weather, and the weight of the roller, are all to be most scrupulously regarded: when all coincide, the advantages of rolling will be great; but when they do not, the disadvantages may be insuperable.

"Rolling then is neither the least critical, nor most insignificant piece of the husbandman's profession; therefore ought not to be performed at random and without circumspection." *Museum Rusticum, vol. IV. p. 5.*

Rolling is also of use to land in grass, by pressing down mole-hills, &c. It also makes the grass taller, and grow thicker.

There

There is a sort of land, which, when clover is sown upon it, throws out the young plants after a frost. Rolling in the beginning of winter, and immediately after the frost is gone, will, in some measure, prevent this. The first rolling hinders the frost from penetrating so deep as it would otherwise do; and the second makes the land firm, after having been loosened by the change from frost to open weather.

Mr. Marshall, in his *Rural Economy of Norfolk*, makes the following observation on rolling. "Very little general matter falls under this head. One circumstance, however, requires to be mentioned.

"The roller, notwithstanding the lightness of the soil, and its proneness to be injured by dry weather, is never used in Norfolk for the purpose of compression. I never saw one used by a farmer either upon fallow or upon a lay; not even upon the first year of a clover-lay, to smooth the surface for the scythe.

"The only uses to which I have seen a roller put, in this district, are that of smoothing the surface before sowing, to prevent the seed from running down too low, and that of smoothing it afterwards as a preparation for the scythe: and even this operation is performed with a roller not more perhaps than seven or eight inches in diameter; a circumstance which, I confess, I am no way able to account for: nevertheless, it would be rashness to condemn an established practice, unless I could, from my own experience, or from adequate observation on the experience of others, prove it to be ineligible."

ROOD, a quantity of land equal to forty square poles or perches, that is, a quarter of an acre.

ROOK, a well-known bird, resembling a crow; but feeds on grain, insects, &c.

Great care should be taken to guard against these mischievous birds at the time when the wheat is just shooting up; for they perceive it shooting much sooner than the farmer can, and are led by the shoot to pick it up. They must therefore be carefully kept off the ground about a week or ten days after this season; for at the end of that time the blade will be grown up, and the grain so exhausted of its substance, that they will not give themselves any trouble about stealing it. They never molest the wheat which is sown about Michaelmas; because so much grain of the late harvest then lies scattered about the fields, that they find it much easier to pick up that, than to search for corn under-ground in new-sown lands. They do most harm when the snow is first going off from the green wheat towards the end of winter; for having been pinched for food during that season, they then greedily pluck up the young plants, in order to come at the remainder of the seeds still adhering to their roots; and are greatly assisted in this by the loose state of the earth at that time.

Among the many contrivances to frighten them away, such as feathers stuck up, the limbs of rooks scattered about the ground, dead rooks hung on sticks, the gun, a boy to halloo, and throw his hat, or to toss a dead rook up in the air, Mr. Tull says he found this last to be the most effectual. They will immediately quit their usual places of abode, if the earth is turned up around the trees, in which they have built their nests; and will not return to them till the grass is grown again; as has been experienced in the repairing of Fountain-court in the Temple: Mr. Lisle assures us, that the taking down of their nests, with their young ones in them, and burning under the trees they were built in, will effectually make all the old ones desert that place. However, it has been doubted, and perhaps with reason, whether they do not, upon the whole, compensate pretty fully for the mischief they do to corn, by destroying vast quantities of grubs, worms, and other pernicious insects, in the spring, as crows are also of service in the neighbourhood of populous towns, by devouring a great deal of carrion.

It is a common proverbial saying of the countrymen, that at whatsoever farm a colony of rooks plant themselves, and make a rookery, it is a sign of prosperity to the occupier of that land; and that, on the contrary, their deserting it, betides misfortunes and poverty; for both which remarks, Mr. Lisle accounts very rationally, by observing, that where a man is a good husbandman to his land, and improves it, the worms, which are a great food to these creatures, especially at certain times of the year, multiply, and grow to a much greater bulk and fatness, than in a poor neglected soil: the strength of land being as discernible by the large size of worms, as from the growth of plants; and that the grubs or maggots of the beetle kind in parti-

cular, on which the rooks feed greatly, as is apparent from their following the plough, in order to pick them up, not only grow fattest and largest in rich well-tilled ground; but that the beetles themselves, while in their state of flies, always choose to lay their eggs in such lands as will best nourish and provide for their young. The contrary to this soon happens under a bad husbandman.

Mr. Marshall, in his *Rural Economy of Norfolk*, vol. I. says, that "the method of frightening rooks, in practice there, especially when they take to patches of corn which are lodged before harvest, is simply to stick up a tall bough in the part infested; if a gun be fired near the place, before the bough be set up, this simple expedient seldom fails of being effectual.

"If rooks make an attack after seed-time, or when they take generally to the crop before harvest, a boy is set to scare them; they being seldom attempted to be shot at in Norfolk; where a notion prevails, and is perhaps well-founded, that rooks are essentially useful to the farmer, in picking up worms and grubs; especially the grub of the cock-chaffer, which, it is believed, is frequently injurious to the meadows and marshes of that country."

ROOKERY, a nursery of rooks, or place where they build their nests.

ROOP, hoarseness.

ROOT, the lower part of a plant, by which it adheres to the earth, and by which it draws its nourishment, and transmits the juices to the other parts. For the method of clearing lands from the roots, *see the article GRUBBING*.

The roots of plants are of use to them principally in two respects, viz. to give the plants stability in the ground, that they may not be displaced, or blown down by high winds, or other accidents. Another important use of roots, is their spreading in the ground, and from thence collecting food for the whole plant. Plants are in part fed or nourished from the air, fine vapours, &c. that enter at their leaves and branches, but principally by what enters at their roots; for which reason the husbandman takes infinite pains to prepare the land by tillage and manure, whereby it is opened, pulverized, and made easily penetrable for the roots to spread in it, and collect the aliment or vegetable nourishment.

Roots may be divided into two sorts, viz. perpendicular roots, which penetrate deep in the ground, and run down usually single and perpendicularly, as carrots, parsneps, the perpendicular roots of trees, &c. which are also called tap roots. Those that divide near the surface of the ground, and spread in it, in various directions, are called horizontal roots, fibrous roots, and if very small, capillary roots. The tap roots have also fibrous roots, issuing from their sides, all round the tap root; and these lateral roots are longest near the surface of the ground, and gradually shorter as the tap-roots descend deeper.

The surfaces of the roots are spongy and porous, particularly of the small or fibrous roots, and at these pores the vegetable food enters, and is distributed to all parts of the plant. The large roots are close, and have few pores on their surfaces; by which it appears, that they are chiefly intended for the support and stability of the plant, and the fibrous roots for collecting the nourishment for the plant, and large roots.

The branches of roots are formed, with their extreme ends, pointing from the stem of the plant; and hence it appears, that roots once formed, do not afterwards encrease, or extend further longitudinally; they lengthen at their ends, but not at their intermediate parts: for if they did, the branches being left behind, would be drawn back, with their ends pointing towards the stem: but they are constantly found in a contrary position, with their ends pointing in a direction from the stem. If a root is cut, it extends no farther in length, as before observed, but new roots are formed near the cut end of the old root; two or more new or young roots are formed in the room of the former old one. Hence the fibrous roots of plants are multiplied by cutting them with a spade or hoe: and this is often a great benefit to the plant. The pores of the fibrous root are the mouths by which the whole plant is fed, and the more they are multiplied, the more nourishment they collect for it.

Thus a plant that naturally extends its roots to a considerable distance, is in danger of being killed by transplanting, unless it is also furnished with fibrous roots, which must be carried with it to the new ground; or new ones must be formed, to make the plant thrive. Hence it is, that

that plants, which have long straggling roots are removed with difficulty ; but plants of the same kind, and age, and that grow in the same ground, are transplanted with safety and success, if they have been previously dug round with a spade, whereby their fibrous roots have been cut and multiplied, so that they rise with a ball of earth adhering to them.

There is a communication between the roots of a plant, and when some of them are well nourished, the others are benefited thereby. If some of the roots of a plant are laid in dry earth or sand, and others in water, they will furnish the dry roots with water sufficient to keep them, and the earth about them, moist, so long as they have a supply of water : for this reason deep rooting plants are little affected by drought ; the tap roots finding moisture below, send up some of it to the roots near the surface : for which reason lucern and saintfoin flourish in such dry hot weather, by which common grass, and other fibrous rooted plants, that do not descend deep, are scorched and burnt up.

As roots communicate moisture to each other, they therewith communicate also nourishment : for it is found by experience, that drilled plants, well hoed, one side of a row only, are better nourished than sown plants standing at equal distances ; or upon an equal surface of ground with the drilled, and not hoed.

The attentive farmer will discover many other particulars concerning roots : whereof the knowledge is useful in the common culture, and in hoeing necessary.

ROSIL, or *Rosills*, land neither light nor heavy, being a medium between sand and clay.

ROT, a disease incident to sheep, arising frequently from wet seasons, and too moist pasture.

" But the rot in sheep, says an ingenious and practical writer, does not always either proceed from moisture alone, or the nature of the soil alone ; for all moist grounds do not cause the rot in sheep, and there are some lands which rot sheep in wet years only.

" The rot, in fact, arises from a certain putrefaction, both in the air, and in the grass or herbs that usually grow in such moist years : these, together with their moist food, corrupt their livers, and bring on the disease.

" It is indeed very difficult to cure this disorder, unless it is attempted before the liver is too much wasted : where there is a convenience of doing it, the best remedy is, an immediate removal to salt marshes ; but this is far from being in every farmer's power : I shall endeavour therefore, from my own former experience, to supply the deficiency.

" In such cases as these, a prevention of the evil is to be recommended to the practice of every rational farmer.

" Some grounds naturally yield a soft, spongy grass, which is, more than any other, subject to breed the rot in sheep ; I would therefore advise, that other cattle be fed in these grounds, and the sheep kept in the driest, hardest, and healthiest pastures.

" I have known land that has kept sheep in health for many successive years, yet afterwards, when the months of May and June have proved wet, a firm and frothy grass has suddenly sprung up, which, together with the bad air that must of course follow, has caused a rot in the sheep that were then on it : the evil was observed in time, the sheep were removed to a dry and almost barren heath, and in the succeeding winter they were foddered with good, dry, sweet hay, and a great loss was prevented : this happened to an old friend of mine, since dead.

" This unwholesome grass is most apt to grow in cold land, and in the summer time ; and it is a general opinion, and well founded on experience, that if the summer does not rot sheep, the winter will not, the power of the winter alone not being strong enough to begin a rot.

" A very sensible writer, whose book I have just turned to, I mean Mr. Lisle, says that broom is very good for the rot ; and indeed I have often experienced it ; for in a farm I occupied some years ago there were several broom-fields, and I have often observed that such of my sheep as were part of the year fed in them were never infected with the rot, whilst others in my possession had it to a great degree. I profited however by experience, for I took care thenceforward that all my sheep should, by turns, enjoy the advantages to be derived from their feeding on the young shoots of the broom.

" As to what Mr. Lisle says, on the authority of Mr. Ray, that the marsh-trefoil will cure the rot, I cannot from experience corroborate it : I have heard its efficacy in this disorder often mentioned, but never yet heard any particular

fact related so circumstantially as to induce me to depend on its effects.

" That salt is good, I agree with the above gentleman and Mr. Boyle ; and this gives me an opportunity of communicating a receipt which I know to be a good one.

" When you perceive, by the colour of your sheep's eyes, that the rot has taken them, drive your flock into a barn, a covered fold, or some such convenient place : around this place let there be wooden troughs, like mangers, in which you should feed your sheep with good, dry, clean oats, for forty-eight hours : then have ready some bay salt finely powdered and seared, of which you are to sprinkle a little among the oats, increasing the quantity till it disgusts the sheep, and you perceive they fall off their appetites : afterwards, for the two following days give them again clean oats ; and then mix your salt with them as before, continuing this process till their eyes have recovered their natural colour, when you will find them perfectly cured ; and to be convinced, it will only be necessary to kill one or two of the flock.

" To this I shall add a receipt for the rot in sheep, which was communicated to me by a friend, a man of credit and veracity, who says he has often tried it with success :

" Steep some regulus of antimony in ale ; adding thereto some grains of paradise and a little sugar to sweeten it. Of this infusion somewhat less than a gill is to be given to every one of your affected sheep : they are to have two or three doses, according as they are more or less affected by the distemper, allowing two days intermission between each dose.

" This is said, as I have already observed, to be a cure almost certain.

" I just now took notice, that when rain falls in the months of May and June, it is apt to cause the rot in sheep : it will be necessary to add, that folding them in the above months increases the disorder ; for after having been deprived of their liberty during the whole night, they bite the noxious grass the more greedily in the morning, having less ceremony in their choice of herbs than if they were not folded. This is a matter of some consequence, therefore worthy of being attended to.

" One thing more I must, on the authority of Mr. Lisle, communicate to your readers, viz. an observation of a Leicestershire farmer ; that sheep, when first touched with the rot, will thrive mightily in fattening for ten weeks ; but if they are not disposed of when they are come up to a pitch, they will, in seven or eight days time, fall away to nothing but skin and bone. The same farmer observed, that he had often had them die in the height of their pitch, in half an hour's time, with twenty-seven pound of tallow in their bellies." *Museum Rusticum*, vol. I. p. 434.

To this account we shall add a receipt communicated to Mr. Mills by a gentleman of Lincolnshire.

" Steep a handful of rue in a pail of water all night, and at morning put in as much salt as will make it bear an egg. Give each sheep half a pint of this liquor, and repeat it thrice, every other morning.

" A farmer who kept four hundred sheep tried this receipt in the last general rot (about five years ago), and did not lose any, though his neighbours lost almost all theirs. For the sake of the experiment, he set apart about twenty, and did not give them this drink. Many of these were rotten." *Mill's Husbandry*, vol. III. p. 416.

Buck-bean, or marsh-trefoil, is also excellent in this distemper. See the article BUCK-BEAN.

ROUGHINGS, latter-grass, aftermaths.

ROUP, the name of a filthy disease in poultry, consisting of a boil or swelling upon the rump, and is known by the staring, or turning back of the feathers.

The roup, if not soon remedied, will corrupt the whole body of the fowl ; to prevent which the feathers should be plucked away, the swelling laid open, the matter pressed out ; after which the part is to be washed with brine, or salt and water.

ROWEL, a kind of issue made in horses for the cure of various disorders, as inward strains, hard swellings, &c.

The operation is performed in the following manner :

A little slit being made through the skin, about a hand-breadth below the part aggrieved, big enough to put a swan's quill in, the skin is raised from the flesh, the end of the quill put in, and the skin blown from the flesh upwards, and all over the shoulder; then, the hole being stopped with the finger, the part blown is beat with a hazle-stick, and the wind spread with the hand all over, and then let go; this done, a skain of horse-hair, or red farset-net, half the thickness of the little finger, is put in a rowelling-needle, seven or eight inches long, and the needle is put into the hole, and drawn through again, six or seven inches higher; then the needle is drawn out, and the two ends of the rowel tied together, anointing it every day, as well before the putting it in, with sweet butter and hog's grease, and drawing it backwards and forwards in the skin, to make the putrid matter discharge itself more plentifully.

Others disliking these rowels, as making too large a fore and scar, use the French rowel, which is a round piece of stiff leather, with a hole in the midst, laying it flat between the flesh and the skin, the hole in the rowel just against that in the skin, sewing it with a needle and thread drawn through the hole and the skin, cleaning it once in two or three days, and then anointing it afresh.

"The general and absurd reasoning of farriers, says Mr. Bartlet, on the effects and use of rowelling, makes the following observations the more necessary, as it is too notorious how impertinently they talk on this subject: for in short, with them a rowel is to draw off all the bad and corrupt humours from the blood, by a sort of magic.

"It is necessary to observe that the matter generally discharged by a rowel is nothing more than an ouzing from the extremities of the vessels divided in the making of it; in fact then, it is blood, which loses its colour, by being sliced out of the vessels, the warmth of the part, and its confinement.

"If this is granted, it will evidently appear, that the good effects ensuing this operation, must be owing to a gradual depletion, or emptying of the vessels in general; by which means the surcharge or load on a particular part, is taken off and removed; and impurities or bad juices (generally called humours) run off with the good, in proportion to their quantity in the blood.

"To imagine particular humours are thus separately, and alone discharged from the blood, through these orifices, is an opinion but too generally received, though a very absurd one; and must be very pernicious in its consequences, from the bad effects it may have in practice; as must the same reasoning also in regard to purging.

"Thus to lean hide-bound horses, and those of a dry hot constitution, the discharge, by depriving the constitution of so much blood, and fluids, is daily exhausting the strength of the animal; and may be productive of bad consequences, by defrauding the constitution of a necessary fluid.

"But in disorders from fulness, attended with acrimony, or sharpness of the juices, and with defluxions on the eyes, lungs, or any part of consequence; the gradual discharge brought on by these means, will contribute to lessen the fulness on the parts affected, and give the vessels an opportunity of recovering their tone, while evacuating and alterative medicines are doing their office.

"It may be necessary however to observe, that there is a wonderful communication between the vessels of the cellular membrane under the skin, which remarkably appears, by inflating those of sheep, calves, &c. by the butchers: hence probably it is that some disorders of this integument, are so apparently relieved by issues, or rowels, without our having any recourse to that general depletion of the vessels we have just observed, to account for it; and hence also may be deduced their utility, sometimes in draining off any extravasated fluids, which may lodge between the interstices of the muscles, after violent strains of the shoulder; also in discharging such vicious, or sharp fluids, as are thrown on the membranes, and occasion those flying pains and lamenesses, which we find are often removed by this local remedy. *Bartlet's Farriery, p. 220.*

ROWEN, or Rowet, winter-grass.

ROWTY, over-rank, too strong.

RUBBING-POST. Mr. Marshall, in his *Rural Economy of Norfolk, vol. II.* says, "it is an excellent custom of the Norfolk farmer to erect *rubbing-posts* in the different parts of the inclosure he is feeding or teathing; they keep the stock from the fences, and furnish them no doubt with an agreeable, and perhaps a salutary, amusement.

"Some I see draw the crown of a tree, with the lower

part of the boughs left on, into the middle of the clove: this is less trouble than putting down a post, is easily rolled out of the way of the plough, and seems to be still more agreeable to the cattle."

RUDDLE, a sort of red earth, of a lax texture, and very easily reduced to powder. It is found in several parts of England, especially in Derbyshire; and is much used in marking sheep.

RULES for buying horses. What has been treated of under the name of draught-horse, concerning buying, shape, usage, &c. being confined, in a manner, wholly to those employed for plough and cart, these rules are more general and comprehensive; and many things under this head are of great use, and therefore must be particularized: as,

"Election; which is the end for which a man buys, and is a thing only shut up in his breast.

"Breed; which must be either taken from faithful report, a man's own knowledge, or from some known and certain characters, by which one strain, or one country, is distinguished from another.

"As the Neapolitan horse is known by his hawk nose, the Spanish by his small limbs, the Barbary by his fine head and deep hoof, the Dutch by the roughness of his legs, and the English by his general strong knitting together: and so of divers others.

"The colour; and though there are none exempt from goodness, yet some are accounted better than others, as the dapple grey for beauty; the brown bay for service; the black, with silver hair, for courage, and the liard, and true mixt roan, for countenance: as for the sorrel, the black without white, and the unchangeable iron-grey, they are reckoned choleric; the bright-bay, fleabitten; the black with white marks are sanguinists; the black, white, yellow, dun, kite-glu'd, and the pye-bald, are phlegmatic; and the chefnut, the mouse-dun, the red bay, and the blue grey, are melancholy.

"For pace in general, with either trot, amble, rack, or gallop; it must be referred to the end for which a horse is bought, particularly if it be for the war, running, hunting, or for a man's own pleasure, the trot is most tolerable; and this motion is known by a cross moving of the horse's limbs, as when the fore-leg, or near hinder-leg, or the near fore-leg and the fore hinder-leg, move and go forward in one instant; and in this motion, the nearer the horse takes his limbs from the ground, the opener, the evenner, and the shorter is his pace; for to take up his feet slovenly, shews stumbling and lameness; to tread narrow or close, shews interfering or falling; to step uneven, indicates toil, and weariness; and to tread strong, shews over-reaching.

"Ambling; which is chose for ease, great men's seats, or long travel, is a motion contrary to trotting; for now both the feet of one side must move equally together, that is, the far fore-leg and the far hinder-leg, and the near fore-leg and the near hinder-leg; and this motion must be just, smooth, large and nimble, for to tread false takes away all ease, to tread short rids no ground, to tread rough shews rolling, and to tread slow shews a false pace, (which never continues), as also lameness.

"Racking; a pace required for buck-hunting, galloping on the highway, post hackney, or the like; and it is the same motion as ambling, only it is a swifter time, and a shorter tread; and though it rids not so much ground, yet it is a little easier.

"Galloping is the last, and must be joined to all the other paces; and this every trotting and racking horse naturally does, but the ambler is a little unapt to it, because the motions are both one, so that being put to a greater swiftness or pace than formerly he had been acquainted with, he manages his legs confusedly and disorderly, but being trained gently, and made to understand the motion, he will as well undertake this as any trotting horse whatever. Now in a good gallop, you must observe first, that the horse that takes up his feet nimbly from the ground, but does not raise them high, that neither rolls nor beats himself, that stretches out his fore-legs, follows nimbly with the others, and neither cuts under his knee, (which is called the swift cut) nor crosses, nor claps one foot on another, and ever leads with his fore-foot, and not with the near; such an one is said ever to gallop comely and true, and he is fittest for speed, or any swift employment; but if he gallops round, and raises his fore-feet, he is then said to gallop strongly, and not swiftly, and is fittest for the great saddle, the wars, and strong encounters; if he gallops slow,

slow, yet sure, he will serve for the high road : but if he labours his feet confusedly, and gallops painfully, then the buyer may conclude, he is good for no galloping service ; besides, it betrays some hidden lameness in him.

“ His nature ; which must be referred to the end for which a horse is bought, ever observing, that the biggest are fittest for strong occasions and great burdens, strong draughts, and double carriage : the middle size for pleasure and general employments ; and the least for ease, sweet walks, and summer hacknics. But to be yet something more particular as to the rule of choice, it is contained in the discovery of natural deformities, accidental outward forrances, or inward hidden mischiefs, which are so many and so infinite, that it is very tedious, though exceeding necessary, to explain them. Wherefore you are, upon this occasion, to observe how a horse stands to view, that is, seeing him stark-naked before you, and placing yourself before his face, take a strict view of his countenance, and the cheerfulness thereof, that being an excellent glass wherein to discern his goodness and perfection.

“ On ordering him out, let no one be the last in the stable but yourself ; you should also, if possible, be the first in, lest the owner, or some of his quick emissaries, take an opportunity to fig him ; a practice common among dealers, in order to make the tail shew as if carried very high, when, in reality, the day after he will in appearance be five pounds worse.

“ His ears ; which if they are small, thin, short, pricked, and moving, or if they be long, be well set on, and well carried, it is a mark of beauty, goodness, and mettle ; but if they are thick, laved, or lolling, wide set, and unmoving, then they are signs of dullness, doggedness, and ill nature.

“ His face ; which, if wan, his forehead swelling outward, no mark or feather in his face set high as above his eyes, or at the top of his eyes ; if he has a white star, or white ratch of an indifferent size, and placed even, or a white snip on his nose or lip, they are all marks of beauty and goodness : but if his face be flat, cloudy, or scouling, his forehead flat as a trencher, which is called mare-faced, for the mark in his forehead stands low, as under his eyes : if his star or ratch stand awry, or in an ill posture, or instead of a snip, his nose be raw or unhairly, or his face generally bald, they all denote deformity.

“ The proper time to examine his eyes, is in a dark stable, with a candle, or rather in the day-time when he is led from the stall ; cause the man who leads him to stop at the stable-door, just as his head peeps out, and all his body still within. Never look at the eye full ; but let your observations be oblique. If the white of the eye appears reddish at the bottom, or of a colour like a withered leaf, I would not advise you to purchase him. A moon-eyed horse is known by his weeping, and by keeping his eyes almost shut at the beginning of the distemper : as the moon changes, he gradually recovers his sight ; and in a fortnight or three weeks sees as well as before he had the disorder. Dealers, when they have such a horse to sell, at the time of his weeping, always tell you that he has got a bit of straw or hay in his eye, or that he has received some blow ; they also take care to wipe away the humour, to prevent its being seen ; but a man should trust only himself in buying of horses, and above all be very exact in examining the eyes. In this he must have regard to time and place where he makes the examination. Bad eyes may appear good in winter, when snow is upon the ground ; and often good ones appear bad, according to the position of the horse. Never examine a horse's eyes by the side of a white wall, where the dealers always choose to shew one that is moon-eyed.

“ The moon-eyed horse has always one eye bigger than the other, and above his lids you may generally discover wrinkles or circles.

“ If you observe a fleshy excrescence that proceeds from the corner of the eye, and covers a part of the pupil, and is in shape almost like the beard of an oyster, though seemingly a matter of no great consequence, yet it is what I call a whitlow in the eye, and if suffered to grow, it draws away a part of the nourishment of the eye, and sometimes occasions a total privation of sight.

“ His eyes ; which, if round, big, black, shining, starting or staring from his head ; if the black of the eye fills the pit, or outward circumference, that in the moving, very little, if any, of the white appears, they are all signs of beauty and goodness. But if his eyes are uneven, and of a wrinkled proportion, or if they be small, which in horsemanship is called pig-eyed, both are uncomely signs of

weakness : if they be red and fiery, beware of moon-eyes, which is next door to blindness ; if white and walled, it betrays a weak, slight, and unnecessary starting, or finding of baggards : if with white specks, take heed of the pearl, pin, and web : if they water or appear bloody, it indicates bruises : and if any matter, it shews old age, and over-riding, festering, rheums, or violent strains ; if they look dead or hollow, or much sunk, beware of blindness at the best : if the black does not fill the pit, but that the white is always appearing, or if in the moving the white and black be seen in equal quantity, it is a sign of weakness, and a dogged disposition in him.

“ Cheeks and chaps ; upon the handling whereof, if you find the bones lean and thin, the space wide between them, and the thropple or windpipe as big as a man can gripe, and the void place without spots or kernels, and the jaws generally so great that the neck seems to couch within them, they are excellent signs of great wind, courage, and soundness of heart and body ; but if the chaps are fat and thick, the place between them closed up with gross substance, and the thropple little, they all are signs of short wind and much inward foulness ; if the void place appears full of knots and kernels, beware of the strangles and glanders, the former of which may be easily discovered by a swelling between the two nether jaw-bones, which discharges a white matter. This disorder usually appears about three, four, or five years old ; there is no young horse but what is subject to it either perfectly or imperfectly ; there is also a disorder which is called the bastard-strangles, which appears sometimes like, and some different from the true strangles. The bastard-strangles are what proves that the horse has not thrown off his true strangles, but that some foul humours are still left behind ; this disorder may come at four, five, six, or seven years of age. A continual languor at work, and seemingly perpetually weary, without any visible ailment, is a certain sign that he is not clear of this disorder, which sometimes will affect the foot, the leg, the ham, the haunch, the shoulders, the breast, or the eye, and without care in this latter case, may corrupt the pupil of the eye, as the small-pox does in men.

“ Feel if he has any flat glands fastened to the nether jaws, which give him pain when you press him, and remember they indicate the glanders.

“ There is also another disorder, much like the strangles, which is called morfoundering, and appears by a running at the nose, but the swelling under the jaw is less. If his jaws be so straight that his neck swells above them, if it be no more than natural, it is only a sign of short wind and purfiness, or grossness ; but if the swelling is long, and close by his chaps, like a whetstone, then take care of the viverris, or some natural imposthume.

“ His nostrils ; which, if open, dry, wide, and large, so as upon any straining the internal redness is discovered, and if his muzzle be small, his mouth deep, and his lips equally meeting, then all are good signs of wind, health, and courage ; but if his nostrils are straight, his wind is but little ; or if his muzzle is gross, his spirit is dull ; if his mouth be shallow, he will never carry a bitt well ; and if his upper lip will not reach his nether, old age or infirmity have marked him out for carrion : if his nose be moist and dropping, when it is clear water, it is a cold ; if foul water, then beware of the glanders.

“ His breast ; look down from his head thereto, and see if it is broad, out-swelling, and adorned with many features, for that shews strength and durance ; whereas the little breast is uncomely, and denotes weakness ; the narrow breast is apt to stumble, fall, and interfere before ; that which is hidden inwards, and wants the beauty and division of many features, indicates a weak-armed heart, and a breast that is unwilling, and not fit for any violent toil or strong labour.

“ In shewing a horse, a dealer or jockey will generally place him with his fore foot on a higher ground than his hind ones, in order that the shoulder may appear further in his back, and make him higher in sight than he really is ; but be sure to cause him to be led on level ground, and see that his shoulders lie well into his back ; for an upright shouldered horse carries his weight too forward, which is disagreeable, and unsafe to the rider. Have his fore legs stand even, and you will then have it in your power to judge of his shoulders. If you do not observe this, the dealer will contrive that this near leg stands before the other, as the shoulders in that position appear to lay further in the back. If his knees stand nearly close, and his toes quite in

in a line, not turning in, nor yet turning out, be assured he will not cut : if he takes his legs up a moderate height, and neither clambers, nor yet goes too near the ground, he will most likely answer your purpose.

" His thighs ; look down from his elbow to his knees, and see that his fore-thighs are ruff-grown, well hardened within, sinewed, fleshy, and out-swelling, they being good signs of strength ; whereas the contrary betokens weakness, and are unnatural.

" His knees ; which, you are to see, if they carry a proportion, be clean, sinewy, and close knit, for then they are good and comely, but if one be bigger and rounder than the other, the horse has received some mischief ; if gross, he is gouty ; if seared or hair-broken, it is a true mark of a stumbling ~~mate~~, and a perpetual faller.

" His legs ; which look down to from his knees to his pasterns, and if they are found to be lean, flat, and sinewy, and the inward bow of the knee without seams or hair-broken, it shews a good shape and soundness ; but if there are hard knots on the inside of the legs they are spleints, if on the outside they are screws or excretions ; if scabs be under his knee on the inside, it is the swift cut, and he will badly endure galloping : but if above his pasterns, on the inside, scabs are found, it shews interfering : again, if the scabs be generally over his legs, it is extreme foul-keeping, or else a spice of the mange : if his legs be fat, round, and fleshy, he will never endure labour : and if seams, scabs, and hair-brokenness, be found on the inward bow of his knees, it shews a malander, which is a cancerous ulcer.

" Circled feet are very easy to be known : they are when you see little excrescences round the hoof, which enclose the foot, and appear like so many small circles. Dealers, who have such horses, never fail to rasp round their hoofs, in order to make them smooth ; and to conceal the rasping, when they are to shew them for sale, they black the hoof all over, for without that, one may easily perceive what has been done, and seeing the mark of the rasp, is a proof that the horse is subject to this accident. As to the cause, it proceeds from the remains of an old distemper, or from having been foundered ; and the disease being cured, without care being taken of the feet, whereupon the circulation of the blood not being regularly made, especially round the crown, between the hair and the horn, the part loses its nourishment, and contracts or enlarges itself in proportion as the horse is worked. If these circles were only on the surface, the jockies method of rasping them down would then be good for nothing ; but they form themselves also within the feet, as well as without, and consequently press on the sensible part, and make a horse limp with ever so little labour. One may justly compare a horse in this situation, to a man that has corns on his feet, and yet is obliged to walk a long way in shoes that are too tight and stubborn : a horse therefore is worth a great deal less on this account.

" After having well examined the feet, stand about three paces from his shoulders, and look carefully that he is not bow-legged, which proceeds from two different causes ; first, from nature, when a horse has been got by a worn-out stallion : and secondly, from his having been worked too young ; neither in the one case nor the other is the horse of any value, because he never can be sure footed ; it is also a disagreeable sight if the knees point forwards, and his legs turn in under him, so that the knees come much further out than the feet : it is also called a bow-legged horse, and such an one ought to be rejected for any service whatsoever, as he never can stand firm on his legs ; and how handsome soever he may otherways be, he should on no account be used for a stallion, because all his progeny will have the same deformity.

" Pastern and pastern-joints ; the first of which must be short, strong and upright standing ; the second, clear, and well knit together, for if they are swelled or big, beware of sinew-strains, and gourdings : and if the other be long, weak, or bending, the limbs will hardly be able to carry the body without tiring.

" The hoof ; which should generally be black, smooth, tough, rather a little long than round, deep, hollow, and full of sounding, for white hoofs are tender, and carry the shoe ill : a rough gross-seamed hoof discovers old age, or over-heating : a brittle one will carry no shoe at all, and an extraordinary round one is bad for foul ways and deep hunting ; a flat one that is pumiced, shews foundering ; and a hoof that is empty and hollow sounding betokens a decayed

inward part, through some dry wound or founder. Then as for the crown of the hoof, if the hair lies smooth and close, and the flesh flat and even, the hoof is perfect ; but if the hair be staring, the skin scabbed, and the flesh rising, you may expect a ring-bone, crown-scab, or quitter-bone.

" You are to consider the setting on of his crest, head, and mane. As for his head, stand by his side, and see that it does not stand too high nor too low, but in a direct line : that his neck be small at the setting on of his head, and long, growing deeper to the shoulders, with an high, strong and thin mane, long, soft, and somewhat curling, they being beautiful characters, whereas to have the head ill set on, is the greatest deformity : for if thick set, be assured it will cause him to toss up his nose for want of wind, which causes a horse to carry his head disagreeably high, and occasions a ticklish mouth. To have any bigness or swelling in the nape of the neck, shews the poll-evil, or beginning of a fistula : to have a short thick neck, like a bull, to have it falling at the withers, to have a low, weak, a thick or falling crest, shews both the want of strength and mettle : to have much hair on the mane, denotes intolerable dullness : to have it thin, shews fury ; and to be without any, or shed, shews the worm in the mane, the itch, or else plain manginess.

" In the next place, you are to consider his back, ribs, belly, and stones. First view his chine, that it be broad, even, and strait ; that the ribs are well compassed, and bending outward ; that the fillets be upright, strong and short, and not above a handful between his last rib and the hucklebone : his belly should be well laid down, yet laid within his ribs, and his stones well trussed to his body, which are all good marks of health and perfection ; be careful in observing that he has no swelling in his testicles, a disorder that proceeds either from some strain in working, or from the horse's having continued too long in the stable, or from putting one leg over any bar, and being checked by the halter, or from any other accident that confines a horse, makes him kick or sling, and bruise his cods, and there is no other way of knowing this distemper, but by some outward swelling upon the part. To have his chine narrow, he will never well carry a saddle without wounding : and to have it bending or saddle-backed, shews weakness : to have his ribs flat, there will be no liberty for wind ; to have his fillets hanging, long, or weak, he will never clamber a hill, nor carry a burden ; and to have his belly clung up or gaunt, or his stones dangling down, loose or aside, are both signs of sickness, tenderness, foundering of the body, and unfit for labour.

" You must view his buttocks, that they are round, plump, full, and in an even level with his body, or if long, that they be well raised behind, and spread forth at the setting on of the tail, which is comely and beautiful, whereas the narrow-pin buttock, the hog or swine rump, and the falling and downlet buttocks, are full of deformity, and shew both an injury in nature, and they are neither fit nor becoming for pad, foot-cloth, or pillion. The horse that is deep in his girthing-place, is generally of great strength.

" His hinder thighs, or gaskins ; which observe that they be well let down, even to the middle joint, brawny, full and swelling, which is a very good sign of strength and goodness, whereas the lank, slender thighs shew the contrary.

" View his cambrels ; from the thigh-bone to the hock it should be pretty long, but short from the hock to the pastern ; have an eye to the joint behind, and if it be but skin and bones, veins and sinews, or rather somewhat bending than too straight, it is then perfect, and as it ought to be ; but if it has chaps or sores on the inward bow or bending, then it is a sclander : if the joint is swelled generally all over, then it betokens a blow or bruise : if the swelling be particular, as in the pit or hollow part, or on the inside, and the vein full and proud, and that it be soft, it is a blood-spavin ; if hard, a bone-spavin : but if the swelling be just behind, before the knuckle, then you may know it is a curb.

" His hinder legs ; which, see if they be lean, clean, flat, and sinewy, then all is well, but if fat, they will not endure labour : if swelled, the grease is melted in them : if the horse be scabbed above the pasterns, he has the scratches : if chapped under his pasterns, he has reins, and none of these are noisome.

" There is also a defect which is more common in the hind than the fore-legs, though the latter are not quite ex-

empt from it; and it is called the rat's tail, and is thus known: When you see from the hind part of the fetlock, up along the nerves, a kind of line or channel that separates the hair to both sides, this is a rat's tail; and in summer there appears a kind of small dry scab along this channel; and in winter there issues out a humidity like the water from the legs. A horse may work notwithstanding this disorder, for it seldom lames him; it sometimes occasions a stiffness in his legs, and makes them trot like foxes, without bending their joints. The hind-legs should be lean, clean, flat, and sinewy; for if fat, they will not bear labour; if swelled, the grease is molten into them; if scabbed above the pasterns, it is the scratches, and if he hath chops under his pasterns, he hath what is generally called the reins. If he has a good buttock, his tail cannot stand ill, but it will be broad, high, flat, and couched a little inward.

Having with care examined the horse, let him be run in hand a gentle trot; by this you will soon perceive if he is lame or not. Make the man lead him by the end of the bridle, as in this case you cannot be deceived by the man's being too near him. The far fore-leg and near hind-leg, or the near fore-leg, and far hind-leg, should move and go forward at one and the same time; and in this motion, the nearer the horse taketh his limbs from the ground, the opener, the evenner, and the shorter is his pace.

If he takes up his feet slovenly, it shews stumbling or lameness; to tread narrow, or cross, shews interfering, or failing; to step uneven, shews weariness, and if he treads long, you may be apprehensive he forges; by which I mean, that when he walks or trots, he strikes the toes of his hind feet against the corners of his shoes before, which occasions a clattering noise as you ride; and this proceeds generally from the weakness of his fore legs, he not having strength in them to raise them up sufficiently quick to make way for the hind ones. A horse of this kind is not near so serviceable as the horse exempt from it, and the dealers, to get rid of him, will make abundance of pretences: if he has been just shod, they will say the farrier has put him on too long shoes; if his shoes are old, they will tell you he is just come off a long journey, and is much fatigued; you must not therefore be over credulous to any thing a jockey or dealer affirms, for what they say in this manner is too often with intent to deceive; and it is very certain that a horse who forges can never be sure-footed, any more than one who has tottering or bow legs.

On his being mounted, see him walk. Observe his mouth that he pulls fair, not too high, nor bearing down: then stand behind him, and see if he goes narrower before than behind, as every horse that goes well on his legs goes in that manner. Take notice that he brushes not by going too close; a certain sign of his cutting, and tiring in travelling. Have nothing to do with that horse who throws his legs confusedly about, and crosses them before: this you may observe by standing exactly before or behind him, as he is going along. In his trot he should point his fore legs well, without clambering, nor yet as if he were afraid: and that he throws well in his hind-legs, which will enable him to support his trot, and shoot his fore-parts forwards.

In his canter, observe he does not fret, but goes cool in this pace; and in his gallop he should take his feet nimbly from the ground, and not raise them too high, but that he stretcheth out his fore-legs, and follows nimbly with his hind ones, and that he cutteth not under his knee, (which is called the swift or speedy cut) that he crosses not, nor claps one foot on another, and ever leadeth with his far fore-foot, and not with the near one. If he gallops round, and raises his fore-feet, he may be said to gallop strongly, but not swiftly; and if he labours his feet confusedly, and seems to gallop painfully, it shews some hidden lameness; for in all his paces, you should particularly observe that his limbs are free, without the least stiffness.

After he has been well exercised in those different paces, it is your time to examine for an infirmity, not easily discovered, and that is, what I call tottering legs: you cannot perceive it till after a horse has galloped for some time, and then, by letting him rest a little, you will see his legs tremble under him, which is the disorder I mean: how handsome soever the legs of such a horse may be, he never can stand well on them; you are therefore not to mind what the jockey says when he talks of the beauty of the limbs, for if you oblige him to gallop the horse, or fatigue him pretty much, (which is commonly done in order to

try the creature's bottom) you will in all likelihood discover this defect, unless you suffer the groom to gallop him to the stable door and put him up in a moment, which he will certainly endeavour to do, if he is conscious of it, while the master has another horse ready to shew you, in order to take off your attention from what he is afraid you should see.

RUNCHEs, charlock when dry and withered.

RUNNEL, pollard wood.

RUNET, the acid juice found in the stomachs of calves, that have fed on nothing but milk, and are killed before the digestion is perfect. It also signifies a liquor made by steeping the stomach of a calf in hot water. The latter is the runnet used in making cheese, &c.

RUNNING-THRUSH, or **FRUSH**, is an imposthume that sometimes gathers in a horse's frog; or a scabby and ulcerous disposition, which sometimes causes it to fall off.

When this discharge is natural, the feet should be kept clean, but no drying washes should be made use of, it being thought as unsafe to repel some of these discharges as to cure some sweaty feet.

When an imposthume, or gathering appears, the safest way is to pare out the hard part of the frog, or whatever appears rotten; and wash the bottom of the foot two or three times a day with old chamber-lye; this is the safest and best way of treating them. But when a horse has been neglected, and there is a strong flux to the part, it is apt to degenerate into a canker; to prevent which, use the following:

Take spirit of wine and vinegar, of each two ounces; tincture of myrrh and aloes, one ounce; *Ægyptiacum* half an ounce; mix together.

Bathe the thrush with this, wherever there appears a more than ordinary moisture, and lay over the ulcer a little tow dipped in the same. The purges and diuretics recommended in the grease, should be given at this time, to prevent the inconveniences that the drying up these discharges frequently occasion. See the article **CANKER**. *Bartlett's Farriery*, p. 312.

RUNT, a name given to small black cattle brought out of Wales and Scotland.

RUNT, is also an epithet applied to several species of pigeons: as the Leghorn, Spanish, and Friesland runt, &c.

The Leghorn runt is a stately large pigeon, seven inches or better in the legs, close feathered and fast-fleshed, extremely broad-breasted, and very short in the back. He carries his tail, when he walks, somewhat turned up like a duck's, his neck is longer than any other pigeon's, and he carries it bending like a goose or swan. He is goose-headed, and his eye lies hollow in his head, with a thin skin round it, like that of the Dutch tumbler. His beak is very short for so large a bird, and has a small wattle on it, and the upper chap falls a little over. It is a very valuable pigeon, but is tender, and requires care.

The Spanish runt is the longest-bodied of all the pigeons; it is short legged and loose-feathered, and does not walk so upright as the Leghorn runt. These are of a great variety of colours, but are apt to have accidents in sitting, from their sitting too heavy, and often breaking their eggs.

The Friesland runt is a large pigeon, and has all its feathers reversed, or looking as if placed the wrong way.

The Roman runt is a pigeon of the same general make with the common kind, but so large and heavy that it can hardly fly.

The Smyrna runt is middle-sized, and is feather-footed, and to such a degree sometimes is to look as if there were wings upon the feet; the feathers of these are sometimes four or five inches long, and often pull the eggs and young out of the nests. The common runt is the common blue pigeon kept for the table, and known to every body. *Moore's Columbarian*.

RUPTURE, a preternatural eruption of the guts or caul.

In regard to ruptures, though they are generally divided into particular classes, we shall only observe, that by violent efforts of the horse, or other accidents, the guts or caul may be forced between the muscles of the belly at the navel, and through the rings of the muscles into the scrotum or cod. The swellings are generally about the size of a man's fist, sometimes much larger, descending to the very

hock; they are frequently soft, and yield to the pressure of the hand, when they will return into the cavity of the belly with a rumbling noise; and in most the vacuity may be felt, through which they passed.

On their first appearance, endeavours should be made to return them by the hand; but if the swelling should be hard and painful, in order to relieve the stricture, and relax the parts through which the gut or caul has passed, let a large quantity of blood be immediately taken away, and the part fomented twice or thrice a day, applying over it a poultice made with oatmeal, oil and vinegar, which should be continued till the swelling grows soft and easier, or the gut is returned. In the mean time it would be proper to throw up emollient oily clysters twice a day, and to let the horse's chief diet be boiled barley, scaled malt, or bran.

Should the swelling afterwards return, we apprehend the restraining applications usually recommended on these occasions, will avail little, without a suspensory bandage; so that an ingenious mechanic in that art is chiefly to be relied on, for any future assistance; though it has been observed, that with moderate feeding and gentle exercise, some horses have continued to be very useful under this complaint. *Bartlett's Farriery, p. 334.*

RUSH, the name of a well-known plant, too common in wet lands.

Rushes always intimate a good soil, and may be destroyed by lime, even after it has been slaked, by sea-coal ashes, and by draining the land.

Rushes thrive most in land that is too wet and cold for most other plants. Ashes and other warm manures of various kinds, laid on plentifully, will keep down the rushes for a time; but to eradicate them perfectly it is necessary also to well drain the land.

RUST, a distemper incident to corn, and generally called mildew. *See the article MILDREW.*

RYE, a species of corn greatly cultivated in the northern parts of England.

Mr. Miller is of opinion, that all the rye sown in England is of the same species, though distinguished by farmers into two varieties, of winter, and spring rye, as he has not been able, by the most sedulous experience, to find any difference.

The winter rye, which is the largest grain, is what the generality of farmers cultivate. It is usually sown in autumn, or at the same time as wheat; and in many of our northern counties, as well as in Wales, they are often mixed and sown together; though as Mr. Miller rightly observes, this must be very bad husbandry, because the rye will always ripen sooner than the wheat; so that if the latter be suffered to stand till fully ripe, the grain of the former will shed, nor can this be practised where the people are not accustomed to eat rye-bread; for though some account it good when mixed, it is so very clammy that few who have been used to wheaten bread will ever relish it.

Rye is generally sown on poor, lime-stone, dry, gravelly, or sandy soils, where wheat will not thrive, and in such places it does very well. The ground should be dry when it is sown: for if much rain falls even after the sowing, before the rye is come up, it often rots in the earth. It indeed rises in a much shorter time than wheat.

When sown upon light land, it ripens much earlier than a cold stiff ground, and by continuing to sow it in such a soil during two or three years, it will be forwarded so much as to ripen a month earlier than that which has been long raised upon strong cold ground. For this reason, those who are obliged to sow rye toward spring, generally provide themselves with this early seed. A little sprinkling of dung or mud, though it be but half the quantity commonly used for other corn land, will, if laid upon the rye ground, greatly advance the crop. The usual allowance is two bushels of seed to a statute acre, or, if it be new broke up ground, or land subject to worms, about a peck more: and the produce commonly is about twenty bushels upon an acre.

In the summer of the year 1699, which was uncommonly dry, Mr. Mortimer reckoned ninety grains a piece in several ears of rye.

The small rye may be sown in the spring, about the same time as oats, and usually ripens as soon as the other sort: but if the season prove wet, it is apt to run much to straw, and the grain is generally lighter than the other. The chief use of this sort is to re-sow land where the autumnal crop has failed.

This corn is ripe when its straw turns yellow, its ear hangs, and its grain is hard. It is not very apt to shed: and therefore, if it be weedy (though this ought never to be the case with any corn) it should be let lie upon the ground, or gavel, as some call it, a week or ten days after it is cut, if the weeds do not dry sooner, before it be bound up; for otherwise those weeds will give in the barn, make the rye not thrash well, and render it musty. But as this grain will grow in the ear sooner than any other, if it be wet, particular care must be taken, especially if rain comes on, to turn it at least once in two or three days, and lay the ears upon the stubble as high above the ground as can be. This will help to preserve it from hurtful moisture: but if it be cut in perfectly dry weather, and without weeds, it may be housed as it is reaped.

The general use of rye is for bread, either alone, or mixed with wheat, in which it is called messin corn. It also yields a strong spirit when distilled: and, if sowed only for dressing of land, is of vast service to the ground where it is ploughed-in green and succulent. The truly worthy and reverend Dr. Elliot informs us, that he has not only been told, but knows by his own observation, that if rye be sowed successively every year upon the same land, both the crop and the land will be greatly improved; insomuch that some grounds which would yield but five bushels to the acre at first, have, in time, afforded a crop of fifteen bushels to the acre, without the charge of dung or any other manure. But it should be remembered that the land sown by Dr. Elliot was newly broke up.

This plant is likewise sown in autumn to great advantage, purposely for green feed for cattle, particularly for ewes and lambs in the spring, before there is plenty of grass. When this is intended, the rye should be sown early, that it may have strength to furnish early fodder. In this light, it supplies the want of turnips where they have failed, or where their season is over: so that in such cases, it is very good husbandry to sow the land with rye, especially where there are flocks of sheep which cannot be well supported without green food early in the spring. The farmer who has many sheep would consider, that turnips are always a very precarious crop: and therefore he should, besides sowing some places with cole-seed, in order to have green fodder, sow rye in others, to guard against accidents. If some of the ground sowed late with turnips, which have failed, be sown in the autumn with rye, he will find it turn to good account. To have green fodder for cattle in April, which is the scarcest time of all the year, some split the ridges of their wheat stubble, and sow them with rye, allowing about a bushel to an acre, which they harrow in, and feed about April, or when they want it; and in May they plough it up for a fallow.

Mr. Marshall, in his Rural Economy of Yorkshire, says that "the only species of rye cultivated in these kingdoms is the *secale cereale* of Linnæus; of which two varieties are cultivated in this district.

"Black rye, formerly the only sort, and white rye, or Dantzick rye, introduced into this country about half a century ago, and is now the almost only sort which is cultivated.

"Before the use of lime was prevalent, much rye was grown on the lighter lands upon the margin of the Vale; and in the Morelands scarcely any other crops than rye and oats were attempted. Now, rye is principally confined to the Moreland-dales; and even there the alteration of soils by lime has been such, that wheat is become the more prevalent crop.

"Nevertheless, on light sandy Moreland soils rye is generally more profitable than wheat; and the bread, which is made from a mixture of the two grains, is here esteemed more wholesome to persons in general, than that which is made from wheat alone."

RYE-GRASS. *See GRASS.*

S.

SADDLE-GALL; when a horse's back is hurt or fretted by the saddle, it may be cured by bathing the part with urine, or warm wine: and sometimes when the sore is large, with the second water strewing over it the powder of an old rope, or flax, and eating away the proud flesh with vitriol or colcothar.

SAFFRON, a genus of plants with narrow grass-like leaves, which have a white line running along the middle: the stalk is short and undivided, and bears on the top a purplish blue flower, deeply cut into segments: in the middle of the flower arises, among the stamina, a whitish pistil, divided at the top into three chives or fleshy filaments, the lower part of which is slender and pale coloured, the upper broader, of a deep orange red, and very finely indented about the sides: these filaments, carefully picked, and pressed together into cakes, are the saffron of the shops. The plant is perennial, and flowers in autumn.

As saffron grows at present most plentifully in Cambridgeshire, and has grown formerly in several other counties in England, the method of culture does not, I believe, vary much in any of them; and therefore I judge it sufficient to set down here the observations which I employed proper persons, in different seasons, to make, in the years 1723, 1724, 1725, and 1728, up and down all that large tract of ground that lies between the Saffron-Walden and Cambridge, in a circle of about ten miles diameter.

In that county saffron has most been cultivated; and therefore it may reasonably be expected, that the inhabitants thereof are more thoroughly acquainted with it than they are any where else.

I shall begin with the choice and preparation of the ground: the greatest part of the tract already mentioned is an open level country, with few inclosures; and the custom there is, as in most other places, to crop two years, and let the land lie fallow the third. Saffron is always planted upon fallow ground; and, all other things being alike, they prefer that which has borne barley the year before.

The saffron grounds are seldom above three acres, or less than one; and in choosing, the principal thing they have regard to is, that they be well exposed, the soil not poor, nor a very stiff clay, but temperate dry mould, such as commonly lies upon chalk, and is of an hazle-colour; though, if every thing else answers, the colour of the mould is pretty much neglected.

The ground being made choice of about Lady-day or the beginning of April, it must carefully be ploughed, the furrows being drawn much closer together and deeper, if the soil will allow it, than it is done for any kind of corn; and, accordingly, the charge is greater.

About five weeks after, during any time in the month of May, they lay between twenty and thirty loads of dung upon each acre; and, having spread it with great care, they plough it in as before; the shortest rotten dung is the best; and the farmers, who have the convenience of making it, spare no pains to make it good, being sure of a proportionable price for it. About Midsummer they plough a third time, and between every sixteen feet and a half or pole in breadth, they leave a broad furrow or trench, which serves both as a boundary to the several parcels, when there are several proprietors to one inclosure, and to throw the weeds in at the proper season.

To this head likewise belongs the fencing of the grounds, because most commonly, though not always, that is done before they plant. The fences consist of what they call dead hedges, or hurdles to keep out not only cattle of all sorts, but especially hares, which would otherwise feed on the saffron leaves during the winter.

About the weather we need only observe, that the hottest summers are certainly the best: and therewith, if there be gentle showers from time to time, they can hard-

ly miss of a plentiful crop, if the extreme cold, snow, or rain of the foregoing winter have not prejudiced the heads.

The next general part of the culture of saffron, is planting or setting the roots: the only instrument used for which is a narrow spade, commonly termed a spit-shovel.

The time of planting is commonly in July, a little sooner or later, according as the weather answers. The method is this: one man with his spit-shovel raises between three and four inches of earth, and throws it before him about six or more inches: two persons, generally women, following with heads, place them in the farthest edge of the trench he makes, at three inches distance from each other, or thereabouts: as soon as the digger or spitter has gone once the breadth of the ridge he begins again at the other side, and digging, as before, covers the roots last set, and makes the same room for the setters to place a new row, at the same distance from the first as they are from one another: thus they go on till a whole ridge, containing commonly one rod, is planted; and the only nicety in digging is, to leave some part of the first stratum of earth untouched, to lie under the roots; and, in setting, to place the roots directly upon their bottom.

What sort of roots are to be preferred, shall be shewn under the fourth head; but it must be observed in this place, that formerly, when roots were very dear, they did not plant them so thick as they do now, and that they have always some regard to the size of the roots, placing the largest at a greater distance than the smaller ones.

The quantity of roots, planted in an acre, is generally about sixteen quarters, or one hundred and twenty-eight bushels; which, according to the distances left between them as before assigned, and supposing all to be an inch in diameter one with another, ought to amount to three hundred and ninety-two thousand and forty in number.

From the time that the roots are planted, till about the beginning of September, or sometimes later, there is no more labour about them; but as they then begin to spire, and are ready to shew themselves above ground, which is known by digging a few out of the earth, the ground must be carefully pared with a sharp hoc, and the weeds, &c. raked into the furrows, otherwise they would hinder the growth of the plants.

In some time after appear the saffron flowers; and this leads us to the third branch of our present method. The flowers are gathered as well before as after they are full blown; and the most proper time for this is early in the morning. The owners of the saffron get together a sufficient number of hands, who place themselves in different parts of the field, pull off the whole flowers, and throw handful by handful into a basket, and so continue till all the flowers are gathered, which happens commonly about ten or eleven o'clock. Having then carried home all they have got, they immediately spread them upon a large table, and fall to picking out the filamenta styli, or chives, and together with them a pretty long proportion of the stylus itself, or string to which they are joined; the rest of the flower they throw away as useless. The next morning they return into the field again, whether it be wet or dry weather; and so on daily, even on Sundays, till the whole crop be gathered.

The chives being all picked out of the flowers, the next labour about them is to dry them on the kiln. The kiln is built upon a thick plank, that it may be removed from place to place, supported by four short legs: the outside of eight pieces of wood about three inches thick, in form of a quadrangular frame, about twelve inches square at the bottom of the inside, and twenty-two inches at top; which is likewise equal to the perpendicular height

hock; they are frequently soft, and yield to the pressure of the hand, when they will return into the cavity of the belly with a rumbling noise; and in most the vacuity may be felt, through which they passed.

On their first appearance, endeavours should be made to return them by the hand; but if the swelling should be hard and painful, in order to relieve the stricture, and relax the parts through which the gut or caul has passed, let a large quantity of blood be immediately taken away, and the part fomented twice or thrice a day, applying over it a poultice made with oatmeal, oil and vinegar, which should be continued till the swelling grows soft and easier, or the gut is returned. In the mean time it would be proper to throw up emollient oily clysters twice a day, and to let the horse's chief diet be boiled barley, scaled malt, or bran.

Should the swelling afterwards return, we apprehend the restraining applications usually recommended on these occasions, will avail little, without a suspensory bandage; so that an ingenious mechanic in that art is chiefly to be relied on, for any future assistance; though it has been observed, that with moderate feeding and gentle exercise, some horses have continued to be very useful under this complaint. *Bartlett's Farriery*, p. 334.

RUSH, the name of a well-known plant, too common in wet lands.

Rushes always intimate a good soil, and may be destroyed by lime, even after it has been flaked, by sea-coal ashes, and by draining the land.

Rushes thrive most in land that is too wet and cold for most other plants. Ashes and other warm manures of various kinds, laid on plentifully, will keep down the rushes for a time; but to eradicate them perfectly it is necessary also to well drain the land.

RUST, a distemper incident to corn, and generally called mildew. See the article MILDEW.

RYE, a species of corn greatly cultivated in the northern parts of England.

Mr. Miller is of opinion, that all the rye sown in England is of the same species, though distinguished by farmers into two varieties, of winter, and spring rye, as he has not been able, by the most sedulous experience, to find any difference.

The winter rye, which is the largest grain, is what the generality of farmers cultivate. It is usually sown in autumn, or at the same time as wheat; and in many of our northern counties, as well as in Wales, they are often mixed and sown together; though as Mr. Miller rightly observes, this must be very bad husbandry, because the rye will always ripen sooner than the wheat; so that if the latter be suffered to stand till fully ripe, the grain of the former will shed, nor can this be practised where the people are not accustomed to eat rye-bread; for though some account it good when mixed, it is so very clammy that few who have been used to wheaten bread will ever relish it.

Rye is generally sown on poor, lime-stone, dry, gravelly, or sandy soils, where wheat will not thrive, and in such places it does very well. The ground should be dry when it is sown: for if much rain falls even after the sowing, before the rye is come up, it often rots in the earth. It indeed rises in a much shorter time than wheat.

When sown upon light land, it ripens much earlier than a cold stiff ground, and by continuing to sow it in such a soil during two or three years, it will be forwarded so much as to ripen a month earlier than that which has been long raised upon strong cold ground. For this reason, those who are obliged to sow rye toward spring, generally provide themselves with this early seed. A little sprinkling of dung or mud, though it be but half the quantity commonly used for other corn land, will, if laid upon the rye ground, greatly advance the crop. The usual allowance is two bushels of seed to a statute acre, or, if it be new broke up ground, or land subject to worms, about a peck more: and the produce commonly is about twenty bushels upon an acre.

In the summer of the year 1699, which was uncommonly dry, Mr. Mortimer reckoned ninety grains a peck in several ears of rye.

The small rye may be sown in the spring, about the same time as oats, and usually ripens as soon as the other sort: but if the season prove wet, it is apt to run much to straw, and the grain is generally lighter than the other. The chief use of this sort is to re-sow land where the autumnal crop has failed.

This corn is ripe when its straw turns yellow, its ear hangs, and its grain is hard. It is not very apt to shed: and therefore, if it be weedy (though this ought never to be the case with any corn) it should be let lie upon the ground, or gavel, as some call it, a week or ten days after it is cut, if the weeds do not dry sooner, before it be bound up; for otherwise those weeds will give in the barn, make the rye not thrash well, and render it musty. But as this grain will grow in the ear sooner than any other, if it be wet, particular care must be taken, especially if rain comes on, to turn it at least once in two or three days, and lay the ears upon the stubble as high above the ground as can be. This will help to preserve it from hurtful moisture: but if it be cut in perfectly dry weather, and without weeds, it may be housed as it is reaped.

The general use of rye is for bread, either alone, or mixed with wheat, in which it is called messin corn. It also yields a strong spirit when distilled: and, if sowed only for dressing of land, is of vast service to the ground where it is ploughed-in green and succulent. The truly worthy and reverend Dr. Elliot informs us, that he has not only been told, but knows by his own observation, that if rye be sowed successively every year upon the same land, both the crop and the land will be greatly improved; insomuch that some grounds which would yield but five bushels to the acre at first, have, in time, afforded a crop of fifteen bushels to the acre, without the charge of dung or any other manure. But it should be remembered that the land sown by Dr. Elliot was newly broke up.

This plant is likewise sown in autumn to great advantage, purposely for green feed for cattle, particularly for ewes and lambs in the spring, before there is plenty of grass. When this is intended, the rye should be sown early, that it may have strength to furnish early fodder. In this light, it supplies the want of turnips where they have failed, or where their season is over: so that in such cases, it is very good husbandry to sow the land with rye, especially where there are flocks of sheep which cannot be well supported without green food early in the spring. The farmer who has many sheep would consider, that turnips are always a very precarious crop: and therefore he should, besides sowing some places with cole-seed, in order to have green fodder, sow rye in others, to guard against accidents. If some of the ground sowed late with turnips, which have failed, be sown in the autumn with rye, he will find it turn to good account. To have green fodder for cattle in April, which is the scarcest time of all the year, some split the ridges of their wheat stubble, and sow them with rye, allowing about a bushel to an acre, which they harrow in, and feed about April, or when they want it; and in May they plough it up for a fallow.

Mr. Marshall, in his Rural Economy of Yorkshire, says that "the only species of rye cultivated in these kingdoms is the *secale cereale* of Linnæus; of which two varieties are cultivated in this district.

"Black rye, formerly the only sort, and white rye, or Dantzick rye, introduced into this country about half a century ago, and is now the almost only sort which is cultivated.

"Before the use of lime was prevalent, much rye was grown on the lighter lands upon the margin of the Vale; and in the Morelands scarcely any other crops than rye and oats were attempted. Now, rye is principally confined to the Moreland-dales; and even there the alteration of soils by lime has been such, that wheat is become the more prevalent crop.

"Nevertheless, on light sandy Moreland soils rye is generally more profitable than wheat; and the bread, which is made from a mixture of the two grains, is here esteemed more wholesome to persons in general, than that which is made from wheat alone."

RYE-GRASS. See GRASS.

S.

SADDLE-GALL; when a horse's back is hurt or fretted by the saddle, it may be cured by bathing the part with urine, or warm wine: and sometimes when the sore is large, with the second water strewing over it the powder of an old rope, or flax, and eating away the proud flesh with vitriol or colcothar.

SAFFRON, a genus of plants with narrow grass-like leaves, which have a white line running along the middle: the stalk is short and undivided, and bears on the top a purplish blue flower, deeply cut into segments: in the middle of the flower arises, among the stamina, a whitish pistil, divided at the top into three chives or fleshy filaments, the lower part of which is slender and pale coloured, the upper broader, of a deep orange red, and very finely indented about the sides: these filaments, carefully picked, and pressed together into cakes, are the saffron of the shops. The plant is perennial, and flowers in autumn.

As saffron grows at present most plentifully in Cambridgeshire, and has grown formerly in several other counties in England, the method of culture does not, I believe, vary much in any of them; and therefore I judge it sufficient to set down here the observations which I employed proper persons, in different seasons, to make, in the years 1723, 1724, 1725, and 1728, up and down all that large tract of ground that lies between the Saffron-Walden and Cambridge, in a circle of about ten miles diameter.

In that county saffron has most been cultivated; and therefore it may reasonably be expected, that the inhabitants thereof are more thoroughly acquainted with it than they are any where else.

I shall begin with the choice and preparation of the ground: the greatest part of the tract already mentioned is an open level country, with few inclosures; and the custom there is, as in most other places, to crop two years, and let the land lie fallow the third. Saffron is always planted upon fallow ground; and, all other things being alike, they prefer that which has borne barley the year before.

The saffron grounds are seldom above three acres, or less than one; and in choosing, the principal thing they have regard to is, that they be well exposed, the soil not poor, nor a very stiff clay, but temperate dry mould, such as commonly lies upon chalk, and is of an hazle-colour; though, if every thing else answers, the colour of the mould is pretty much neglected.

The ground being made choice of about Lady-day or the beginning of April, it must carefully be ploughed, the furrows being drawn much closer together and deeper, if the soil will allow it, than it is done for any kind of corn; and, accordingly, the charge is greater.

About five weeks after, during any time in the month of May, they lay between twenty and thirty loads of dung upon each acre; and, having spread it with great care, they plough it in as before; the shortest rotten dung is the best; and the farmers, who have the convenience of making it, spare no pains to make it good, being sure of a proportionable price for it. About Midsummer they plough a third time, and between every sixteen feet and a half or pole in breadth, they leave a broad furrow or trench, which serves both as a boundary to the several parcels, when there are several proprietors to one inclosure, and to throw the weeds in at the proper season.

To this head likewise belongs the fencing of the grounds, because most commonly, though not always, that is done before they plant. The fences consist of what they call dead hedges, or hurdles to keep out not only cattle of all sorts, but especially hares, which would otherwise feed on the saffron leaves during the winter.

About the weather we need only observe, that the hottest summers are certainly the best: and therewith, if there be gentle showers from time to time, they can hard-

ly miss of a plentiful crop, if the extreme cold, snow, or rain of the foregoing winter have not prejudiced the heads.

The next general part of the culture of saffron, is planting or setting the roots: the only instrument used for which is a narrow spade, commonly termed a spit-shovel.

The time of planting is commonly in July, a little sooner or later, according as the weather answers. The method is this: one man with his spit-shovel raises between three and four inches of earth, and throws it before him about six or more inches: two persons, generally women, following with heads, place them in the farthest edge of the trench he makes, at three inches distance from each other, or thereabouts: as soon as the digger or spitter has gone once the breadth of the ridge he begins again at the other side, and digging, as before, covers the roots last set, and makes the same room for the setters to place a new row, at the same distance from the first as they are from one another: thus they go on till a whole ridge, containing commonly one rod, is planted; and the only nicety in digging is, to leave some part of the first stratum of earth untouched, to lie under the roots; and, in setting, to place the roots directly upon their bottom.

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In some time after appear the saffron flowers; and this leads us to the third branch of our present method. The flowers are gathered as well before as after they are full blown; and the most proper time for this is early in the morning. The owners of the saffron get together a sufficient number of hands, who place themselves in different parts of the field, pull off the whole flowers, and throw handful by handful into a basket, and so continue till all the flowers are gathered, which happens commonly about ten or eleven o'clock. Having then carried home all they have got, they immediately spread them upon a large table, and fall to picking out the filamenta styli, or chives, and together with them a pretty long proportion of the stylus itself, or string to which they are joined; the rest of the flower they throw away as useless. The next morning they return into the field again, whether it be wet or dry weather; and so on daily, even on Sundays, till the whole crop be gathered.

The chives being all picked out of the flowers, the next labour about them is to dry them on the kiln. The kiln is built upon a thick plank, that it may be removed from place to place, supported by four short legs: the outside of eight pieces of wood about three inches thick, in form of a quadrangular frame, about twelve inches square at the bottom of the inside, and twenty-two inches at top; which is likewise equal to the perpendicular height

height of it. On the foreside is left a hole about eight inches square, and four inches above the plank, through which the fire is put in. Over all the rest laths are laid pretty thick, close to one another, and nailed to the frame already mentioned; and then are plastered over on both sides, as are also the planks at bottom very thick, to serve for an hearth. Over the mouth or widest part goes an hair-cloth, fixed to the sides of the kiln; and likewise to two rollers, or moveable pieces of wood, which are turned by wedges or screws, in order to stretch the cloth. Instead of the hair cloth, many people now use a net work, or iron wire, with which it is observed that the saffron dries sooner and with a less quantity of fuel: but the difficulty in preserving the saffron from burning makes the hair-cloth be preferred by the nicest judges in drying.

The kiln is placed in a light part of the house; and they begin by laying five or six sheets of white paper on the hair-cloth, upon which they spread the wet saffron between two and three inches thick: this they cover with other sheets of paper, and over these they lay a coarse blanket five or six times doubled; or instead thereof a canvas pillow filled with straw; and, after the fire has been lighted for some time, the whole is covered with a board, having a large weight upon it.

At first they give it a pretty strong heat, to make the chives sweat, as their expression is; and in this, if they do not use a great deal of care, they are in danger of scorching, and so of spoiling all that is on the kiln.

When it has been thus dried about an hour, they take off the board, blanket, and upper papers, and take the saffron off from that which lies next it; raising at the same time the edges of the cake with a knife: then, laying on the paper again, they slide in another board between the hair-cloth and under papers, and turn both papers and saffron upside down: afterwards covering them, as above.

The same heat is continued for an hour longer; then they look to the cake again, free it from the papers, and turn it: then they cover it, and lay on the weight, as before. If nothing happens amiss during these first two hours, they reckon the danger to be over: for they have nothing more to do, but to keep a gentle fire, and to turn their cakes every half hour, till thoroughly dry: for the doing which, as it ought, there are required full twenty-four hours.

In drying the layer of plump chives, they use nothing more, but towards the latter end of the crop, when these come to be smaller, they sprinkle the cake with a little small beer, to make it sweat as it ought: and they begin now to think, that using two linen cloths next the cake, instead of two innermost papers, may be of some advantage in drying: but this practice is followed as yet but by few.

Their fire may be made of any kind of fuel: but that which smokes the least is best; and charcoal, for that reason, is preferred to any other.

What quantity of saffron a first crop will produce, is very uncertain; sometimes five or six pounds of wet chives are got from one crop; sometimes not above one or two, and sometimes not enough to make it worth while to gather and dry it. But this is always to be observed, that about five pounds of wet saffron go to make one pound of dry, for the first three weeks of the crop; and six pounds during the last week; and now the heads are planted very thick, two pounds of dried saffron may at a medium be allowed to an acre for the first crop, and twenty-four pounds for the two remaining; the third being considerably larger than the second.

In order to obtain these, there is only a repetition to be made every year of the labour of hoeing, gathering, picking, and drying, in the same manner as before set down, without the addition of any thing new; except that they let the cattle into the field, after the leaves are decayed, to feed upon the weeds: or, perhaps, mow them for the same use.

About the Midsummer after the third crop is gathered, the roots must all be taken up and transplanted: the management requisite for which is the fourth thing to be treated of. To take up the saffron heads, or break up the ground, as the term is, they sometimes plough it, sometimes use a forked kind of hoe, called a pattock, and then the ground is harrowed once or twice over; during all which time of ploughing or digging, and harrowing, fifteen or more people will find work enough to follow and gather the heads, as they are turned up.

They are next to be carried to the house in sacks, and there cleaned and raised: this labour consists in cleaning the roots thoroughly from the earth, and from the remains of old roots, old involucra, and excrescences; and thus they become fit to be planted in new ground immediately, or to be kept for some time without danger of spoiling.

The quantity of roots taken up, in proportion to those which were planted, is uncertain; but, at a medium, it may be said, that, allowing for all the accidents which happen to them in the ground, and in breaking up from each acre, may be had twenty-four quarters of clean roots, all fit to be planted.

The owners are sure to choose for their own use the largest, plumpest, and fattest roots; but do least of all approve the longest pointed ones, which they call spickets, or spickards, for very small round or flat roots are sometimes observed to flower. This is the whole culture of saffron in the county above-mentioned; and we have only now to consider the charges and profits which may be supposed, one year with another, to attend that branch of agriculture; and of these I have drawn up the following computation for one acre of ground, according to the price of labour in this county.

	l.	s.	d.
Rent for three years	3	0	0
Ploughing for three years	0	18	0
Dunging	3	12	0
Hedging	1	16	0
Spitting and setting the heads	1	12	0
Weeding or paring the ground	1	4	0
Gathering and picking the flowers	6	10	0
Drying the flowers	1	6	0
Instruments of labour for three years, with the kiln, about	0	10	0
Plowing the ground once; and harrowing twice	0	12	0
Gathering the saffron heads	1	0	0
Raising the heads	1	12	0
Total charge	23	12	0

This calculation is made upon supposition, that an acre of ground yields twenty-six pounds of net saffron in three years; which I stated only as a mean quantity between the greatest and the least; and therefore the price of saffron must be judged accordingly, which I think cannot be done better than by fixing it at thirty shillings per pound; since, in plentiful years, it is sold at twenty, and is sometimes worth three or four pounds: at this rate, twenty-six pounds of saffron are worth thirty-nine pounds: and the net profits of an acre of ground, producing saffron; will, in three years, amount to fifteen pounds thirteen shillings, or about five pounds four shillings yearly.

This, I say, may be reckoned the net profit of an acre of saffron, supposing that all the labourers were to be hired for ready money: but, as the planter and family do a considerable part of the work themselves, some of this expence is saved: that is, by planting saffron, he may not only reasonably expect clear about five pounds yearly per acre, but also to maintain himself and family for some part of each year: and it is upon this supposition only, that the result of other computations can be said to have any tolerable degree of exactness; but the calculations themselves are undoubtedly very inaccurate.

I have said nothing here concerning the charge in buying, or profits in selling the saffron heads; because in many large tracts of ground, these must at length balance one another, while the quantity of ground planted yearly continues the same; which has been pretty much the case for several years past. *Philosophical Transactions, Numb. 405.*

SAGE-CHEESE. See CHEESE and DAIRY.

SAINTFOIN, or **SAINFOIN**, the name given by the French, and continued by us to a species of plant, frequently used for the food of cattle, either fresh or dried; it is called holy-hay, or wholesome hay, from its excellent nutritive quality. The stalks of the plant are commonly about two feet long, but they grow sometimes to five or six feet, and it has tufts of red flowers of three, four or five inches in length.

This plant will make a forty times greater increase in poor ground than the common turf; and this is owing

to its having a long perpendicular root, of that kind, called tap roots, which sinks to a great depth to attract its nourishment. The length of this root is scarce to be credited by any but those who have seen it; it is frequently drawn out of the ground to the length of twelve or fourteen feet, but is said to be often thirty feet or more in length.

The farmers have a general opinion, that this plant never succeeds well in any land, where there is not an under stratum of stone, or chalk, or some other hard matter, to stop its running; but that otherwise it spends itself in root, and comes to nothing above ground. This is an error too gross to need much refutation. It is certain, that the roots being to plants what the stomach and guts are to animals, the more and larger roots any plant has, the more nourishment it receives, and the better it thrives.

Saintfoin always succeeds where its roots run deep, and the best crops of all are produced upon lands where there is no hard underfoil to obstruct their passage. An underfoil of clay may kill the plants, by retaining the water, and chilling and rotting their roots.

The long root of saintfoin has, near the surface, many horizontal roots issuing from it, which extend themselves every way; there are of the same kind all the way down, as the roots go, but they grow shorter and shorter all the way. Any dry land may be made to produce this valuable and useful plant, though it be ever so poor, but the richest and best land will produce the best crops of it. The best way of sowing it is by drilling; but the earth must be very well prepared, and the seed well ordered, or else very little of it will grow. The heads of these feeds are so large, and their necks so weak, that, if they be much more than half an inch deep, they are not able to rise through the incumbent mould; and, if they are not covered, they will be malted, as the farmers express it; that is, it will send out its roots while it lies above-ground, and be killed by the air; and whether the farmer plants bad seed that will not grow, or good seed that is buried or malted, the event will be the same. The ground will be understocked with plants. A bushel of seed to an acre of land is full twenty seeds to each square of foot land; but, as there are some difference in the largeness of the seeds, there is no absolute certainty as to this calculation. The worst seasons for planting are the beginning of winter, and the drought of summer; the best is the beginning of the spring; and it is also strongest when planted alone, and is not sown together with corn, as is the practice of some farmers. If barley, oats, or any other corn, sown with the saintfoin, happens to be lodged afterwards, it kills the young saintfoin. If it be planted with any other corn, it is best done by drilling in the horse-hoeing way; in this case it is not much liable to be killed by the lodging of the corn, as the drilled corn seldom falls at all, and, when it does, never falls so low as the sown corn.

The quantity of seed to be drilled upon an acre of land will depend wholly upon the goodness of it; for there is some seed of which not one in ten will strike, whereas in good seed not one in twenty will fail. The method of knowing the goodness, is, by sowing a certain number of the seeds, and seeing how many plants are produced by them. The external signs of the seeds being good are, that the husk is of a bright colour, and the kernel plump, of a light grey or blue colour, and sometimes of a shining black. The seed may be good, though the husk be black, as that is owing sometimes to the letting it receive the wet in the field, not to its being half rotted in the heap.

If the kernel be cut across, and appear greenish and fresh, it is a certain sign that it is good. If it be of a yellowish colour, and friable, and looks thin and pitted, they are bad signs. The quantity of seeds allowed to an acre in the drill way is much less than that by sowing, and it is to be computed according to the number of plants that are to be allowed in that space, allowing for the common casualties. It is not necessary to be exact in this calculation, or to say whether two, three, or four hundred plants are to be allowed to a square perch; neither is it possible to know before hand the precise number of plants that may live out of those that come up; for sometimes the grub takes them when they have only the two first leaves, and the crop is greatly diminished by this means. Four gallons of good seed to an acre of land will cover it with plants, when judiciously managed.

Single plants of saintfoin make the greatest crops; but

the farmers, in general, plant them so close, that they starve one another. The single plants always run the deepest, and those which do so will always draw most nourishment. The plants which stand crowded starve one another, and often die after a few years: but the single ones grow to a vast bigness, and are every year better and better.

The best way to calculate how many plants are to be allowed to a perch, is to compute how much hay each single large plant will produce; for, if kept single, and well cultivated, they will all be large ones. Without culture, these plants never arrive at a fourth part of the size that they do with it. The hay of a large single cultivated plant will weigh more than half a pound, a hundred and twelve plants upon a square perch, weighing but a quarter of a pound a piece, one with another, amount to two tons to an acre. If saintfoin be planted on some sorts of land early in the spring and hoed, it will sometimes produce a crop the following summer; in a garden the seed sown in February will yield plants of two feet high that will flower in the month of June following: and, though March be frosty, the young plants seldom suffer by it. This shews, that this plant is naturally a quick grower; but the farmers usually plant it on poor or cold land, and give it too little culture, which make it backward, and slow of growth with them. The poor land, usually allotted to this plant, also makes it generally yield but one crop a year, but on a rich land it will yield two very good crops annually, with a moderate share of culture and management.

The farmer who expects to make a profit of this plant must not expect a good crop the first year. Nothing is so injurious to saintfoin as its standing too thick; if it be sown so thick as to cover the ground the first summer, the plants will starve one another for ever after; but, if the owner will be content to place them so thinly as to have but a small crop the first year, they will increase prodigiously, and every succeeding crop will be better and better. When saintfoin is well hoed, it will grow as much in a fortnight as it would otherwise do in six weeks; and this quick growing is of advantage to it every way, not only making the plants large, but of better nourishment to the cattle, whether they are eaten green or made into hay.

The proper distance to drill this plant for the horse-hoeing husbandry is at double rows with eight inch partitions between them, and thirty inch intervals between every two and two. These intervals need only be hoed alternately, leaving every other interval for making the hay on. This method of hoeing is of vast advantage, and poor land by means of it will always produce two crops a year. The land is always to be perfectly cleared of grass before the sowing the saintfoin, and the lumps of earth carefully broken. But no harrowing is to be allowed after it is drilled, for that would bury it; and, it is not proper to roll it at all, unless for the sake of barley, when they are sown together; and when that is done, it should be with a light roller, and in dry weather. This should be done lengthwise of the rows, and as soon as it is drilled; if it be not done at this time, it is best to stay three weeks before it be done, that the necks of the young saintfoin may not be broken.

No cattle are to be suffered to come in the first winter upon the saintfoin, after the corn is out among which it was sown. Their feet would injure it by treading the ground hard, as much as their mouths by cropping it, and it would never come to good. Sheep should not be suffered to come at it, even the following summer and winter. One acre of drilled saintfoin, considering the difference of the quantity and goodness of the crop, is worth two acres of sown saintfoin on the same land, though the expence of drilling be twenty time more than that of sowing. The first winter is the time to lay on manure after the corn is reaped off. Peat-ashes, or the like, are very proper, and a small quantity of them will do, as there are at this time no other plants to partake of the benefit, but the young crop has it all; and the young plants, being thus made strong at first, will continue so, and be long the better for it.

It is observed, however, that in the drilling and horse-hoeing-way there is no necessity for any manure at all. Some farmers sow eight or ten bushels of the seed of saintfoin to an acre, along with their corn, with intent that it should kill all the other weeds; but the consequence is,

that the plants stand close, and starve one another, and are no bigger than where the plant grows wild on the hills in Calabria, where it is so small and seemingly despicable a plant, that it seems a wonder that any body should be tempted to think of cultivating it: yet, when rightly managed, it seems capable of being as useful a plant as any in the world. Where these plants stand so thick, they draw out all the nourishment from the ground, in a few years, and so die, though manured ever so carefully. Six or seven years seems their greatest duration; whereas, when the seed is drilled in, and the plants are horse-hoed, they will be as strong and vigorous as ever at thirty years standing.

Some people who have turned their thoughts to husbandry, have been of opinion, that the cytissus would succeed better with us than the saintfoin; it is probable enough that it would grow well; but the labour of sheering it would, with us, where the pay of servants is so dear, run away with the greatest part of the profits of the crop.

Lucern is another thing which many have thought of introducing among us in the place of saintfoin, but it requires so much care to suit it with a proper soil, that, whatever are the profits of it, it never can be so general as saintfoin. *Tull's Horse-hoeing Husbandry.*

Saintfoin, says Mr. Duhamel, deserves the farmer's utmost attention, as one of the most profitable plants he can cultivate. It will do on almost any land; and though it succeeds best in good soils, yet it will grow even on dry barren spots, where scarce any other grass can live; provided its roots be not chilled by a cold clay, or other substance which retains water: and it has this farther advantage, that it may be mowed at different degrees of ripeness, with nearly the same profit.

1. It may be mowed before it is in bloom, for it is then admirable food for horned cattle; and when cut thus early, it yields a second crop, which makes ample amends for what was lost by not letting the first come to its full worth. This early cutting is likewise attended with another benefit, which is, that it purges cattle, in the beginning of the summer, and thereby frees them from disorders occasioned by the winter's cold, or dry food.

2. If the weather be rainy, the saintfoin may be left standing till it is in bloom; when it still is excellent fodder for cows. But care must be taken in making it into hay, that the flowers do not drop off, as they are very apt to do: for cattle are so fond of these flowers, that they often induce them to eat the rest of the plant.

3. If the rain continues, the saintfoin may be left standing till some of its seeds are formed, and the crop will then be the more plentiful; not only because it will have attained its full growth, but likewise because its leaves, being more substantial, diminish less in drying. It is not indeed then quite so sweet as before; but horses eat it readily, because they love to feel between their teeth the seeds, which now begin to be formed.

Mr. Tull says this fodder is so excellent, that horses need no oats when they are fed with it. He affirms that he kept a team of horses with it a whole year in good plight, without giving them any oats, though they were worked hard all the time. He adds, that he fattened sheep with it, in less time than others which were fed with corn. But the hay of this plant can never be so good as when it is cultivated with the horse-hoe: for in the common husbandry, it blossoms almost as soon as it is out of the ground.

If the season continues rainy, it may be more advisable to let the saintfoin remain standing, than to run the hazard of having it rot upon the ground: for then the seed will ripen, and nearly make up for the loss of the fodder; not only because it will fetch a good price, but also because two bushels of it will go as far in feeding of horses, as three bushels of oats; and cattle in general, as well as poultry, are extremely fond of it.

The first of these sorts of saintfoin hay, cut before the bloom, is Mr. Tull's virgin hay, which, he says, is the best beyond comparison, and has not its equal, in the world, except lucerne. He gives the next place to the second sort, cut whilst in bloom, and says that an acre of land well cultivated, may yield three tons of this blossomed hay: and he esteems the third sort, which he calls the full grown, many degrees inferior to either of the former; though it yields a greater crop, because it has grown to its full bulk, and shrinks but little in drying.

Even the saintfoin that has yielded its seed, may be cut down and dried; and when other fodder is scarce, this will be better food for horses and large cattle, than the coarse hay of flowered meadows, or any kind of straw.

The manner of making saintfoin hay is thus directed by Mr. Duhamel.

In a day or two after the saintfoin has been mowed, it will be dry on the upper side, if the weather be good. The swarths, or mowed rows, should then be turned, not singly, but two and two together: for by thus turning them in pairs, double the space of ground is left betwixt pair and pair, and this needs but one raking, whereas, if the swarths were turned singly, that is, all the same way, the ground would require as much raking again.

As soon as both sides of the swarths are a little dry, they should be made up into small cocks, the same day they are turned, if possible: for when the saintfoin is in cock, a less part of it will be exposed to the injuries of night, than when it lies scattered upon the field. The sun and dew would exhaust almost all its juices, in this last case, in less than a week's time.

These little cocks of saintfoin may be safely made into large ones, without waiting for their being so thoroughly dry as those of common hay ought to be before they are laid together; because common hay, by sinking down closer, excludes the air necessary for keeping it sweet; so that if the weather prevents it being frequently stirred and opened, it will heat, turn yellow, and be spoiled; whereas saintfoin, by admitting the air more freely, because its stalks are less flexible, will remain much longer without any danger of fermenting.

Saintfoin hay is never better than when it has been dried by the wind only, without the assistance of the sun. A little rain, or a mist, which will turn common hay, clover, and even lucerne, black, will do no hurt to saintfoin, which is not really spoiled till it rots upon the field.

If the weather threatens rain, and the saintfoin is not yet dry, it may be laid in cocks, without fear of its heating, provided a large basket, or bushy faggot, be set up in the middle of each cock, where it will serve for a vent-hole, through which the superfluous moisture of the hay will transpire.

As soon as all danger of heating is over, these cocks should be made into ricks, and thatched. That which is laid up quite dry, will come out of the rick of a green colour: that which has heated much in the rick, will look brown.

It requires some experience to know of what degree of ripeness it is best to cut the seeded saintfoin; because all its seeds do not ripen at the same time. Some ears blossom before others; every ear begins blossoming at its lower part, and continues to blow gradually upward, for many days; so that before the flower is gone off at the top, the seeds are almost filled at the bottom. By this means, if the cutting be deferred till the top seeds are quite ripe, the lower, which are the best, would shed, and be lost. The best time, therefore, to cut it, is when the greatest part of the seed is well filled, the first blown ripe, and the last blown beginning to be full. The unripe seeds will ripen after cutting, and be, in all respects, as good as those that were ripe before. Some, for want of observing this, have suffered their saintfoin seed to stand till all of it has shed, and been lost in cutting.

Saintfoin should never be cut in the heat of the day, while the sun shines out; for then much, even of the unripe seed, will shed in mowing. The right time for this work, is the morning or the evening, when the dew has rendered the plants supple.

If the weather is fine and clear, the saintfoin will soon dry sufficiently in the swarths, without turning them; but if any rain has fallen, and there is a necessity for turning them, it should be done very gently, while they are moist, and not two swarths together, as in the other hay made of saintfoin before it has seeded. If the swarths are turned with the handle of the rake, it is best to raise up the ear-sides first, and let the stub-side rest on the ground in turning: but if it is done with the teeth of the rake, let the stub-side be lifted up, and the ears rested on the earth.

If saintfoin be cocked at all, the sooner it is done the better; because, if the swarths are dry, much of the seed will be lost in separating them; the ears being entangled together. When moist, the seeds stick fast in the ear; but

but when dry, it drops out with the least touch or shaking.

There are two ways of threshing it: the one in the field, the other in the barn. The first cannot be done but in very fine weather, and while the sun shines in the middle of the day. The best manner of performing this, is to have a large sheet pegged down to the ground, for two men to thresh on with their flails, while two others bring them fresh supplies in a smaller sheet, and two more clear away the hay that has been threshed. The seed is emptied out of the larger sheet, and riddled through a large sieve, to separate it from the chaff and broken stalks; after which it is put into sacks, and carried into the barn to be winnowed. Care should be taken not to let the hay get wet, because it would then be spoiled.

A very important, and at the same time very difficult article, is the keeping of the seed that has been threshed in the field, without having been wetted. If it be winnowed immediately, and only a little of it laid amidst a great heap, or put into a sack, it will ferment to such a degree, in a few days, that the greatest part of it will lose its vegetative quality. During that fermentation, it will be very hot, and smell sour. Spreading it upon a barn floor, though but seven or eight inches thick, will answer no end, unless it be frequently and regularly turned both day and night, until the heating is over: but even this will not make its colour keep so bright as that which is well housed, well dried, and threshed in the winter. This last, laid up and unthreshed, will keep without any danger of spoiling, because it does not lie close enough to heat. The best way to preserve the seed threshed in the field is to lay a layer of straw upon a barn floor, and upon that a thin layer of seed, then another layer of straw, and another layer of seed, and so on alternately. By this means the seed mixing with the straw will be kept cool, and come out in the spring with as green a colour as when it was put in.

The following method is followed in cultivating saintfoin in the Isle of Thanet.

Though the lands in general here are very rich and fruitful, owing to the good tillage, and the quantity of manure they enjoy, yet at some distance from the sea, they have land which is very barren and thin by nature; nevertheless, even this indifferent land they farm to the greatest advantage. In these soils the farmers sow saintfoin or French grass with great success, having sometimes two loads of hay on an acre.

This grass thrives best in these parts, on a thin coat of earth with a chalky bottom; it pushes its long tap-root deep into the chalk, and extracts thence a nourishment, which is out of the reach almost of any other plant.

The land must always be exceedingly well prepared, before they attempt to put the seed in the ground; it has frequent plowings, and every the least appearance of a weed or root of grass is diligently picked off: grass in particular is a very great enemy to this plant; without the utmost care it soon chokes and destroys it. They sow this seed in April, either at the beginning, middle, or latter end of the month, according to the season: dry weather is best, provided it does not long continue: however, a little rain in these light soils does no great hurt. The quantity of seed they allow to an acre is five bushels; of course it is sown very thick. It does not lie any great length of time in the ground: when it is come up, they carefully hoe and weed it to keep down the roguery and grass: this puts the plants forward, and makes them so vigorous and strong, that they will of themselves keep down the grass, especially in these chalky bottoms, where grass does not thrive well, and is not apt to coat land with turf.

Saintfoin used formerly to hold good in these parts for twenty years together, but it does not now of late years last so long: this is probably owing to their want of care in choosing their seed, which surprises me, considering what good farmers they in general are. They get, it is true, when they can, the best seed the island affords: but it would certainly be a much better way were they now and then to procure some of a finer growth from France: for it was from that country, as far as I can understand, it first came hither, about the latter end of Charles the Second's reign; and I do not hear from the inhabitants that they ever remember the importing any more since.

The climate of France is more natural to it; of course the seed comes to greater perfection there, whilst, on the contrary, in England, that, as well as many other crops, is apt to degenerate after a certain number of years.

Where this crops takes, it is very advantageous to the farmer; it yields him for many years plenty of excellent fodder, and that upon land which would otherwise, perhaps, scarcely yield him any profit at all; and besides all this, when the saintfoin begins to fail, if proper care is taken, the land when broken up will be found greatly refreshed, and in a better condition to bear tillage and a succession of other crops.

The farmers here, when they intend breaking up a saintfoin lay, feed it the last three or four years: mowing it at this time, they think, hurts and exhausts the land too much; and besides, the dung and urine of the cattle are of great service.

They observe here, as well as in other places where saintfoin is cultivated, that after land has been once sown with it, it will not for some years, to any advantage, bear saintfoin again. *Museum Rusticum*, vol. I. p. 109.

The reader is obliged to Mr. Holdway, an old experienced farmer at Marlborough in Wiltshire, for the following account of cultivating saintfoin in that county:

"About one hundred years ago, says he, the culture of saintfoin was first introduced into Wiltshire, and was soon preferred to clover-grass: and there was indeed some reason for this preference, for it thrives much better, and yields a much larger increase on poor hungry soils, than clover can do.

"Another very good reason may be assigned why saintfoin was so well received. The sowing it at all was considered as a new husbandry, and the timorous farmers were very unwilling to hazard the trial of any new method on lands which would any other way yield them any considerable advantage: it was chiefly in corners of fields, of very little use to the farmer, that this pasture was first tried, and that on poor lands, as, should it not have succeeded, the only loss would have been the seed; yet many occupiers of land would not, at first hazard even this trifling loss.

"But the sentiments of these farmers were soon altered in this matter: clover wears out in a few years, whereas many, who sowed saintfoin on poor land, not worth above six shillings an acre, found their land so much improved as to be very speedily worth thirty shillings the acre, and at the end of twenty years it continued yet in good proof.

"In fact, it will thrive, and be a very considerable improvement, on the poorest, and seemingly on the barrenest land; but it must be remembered, that sheer and slight sands, and all clays and other cold and wet soils, are to be excepted: on rich lands the weeds soon destroy it. Besides, as it sends its roots very deep in search of nourishment, the longer it occupies land, the more good it does it; whereas this is far from being the case with shallow-rooting plants.

"A saintfoin lay may at any time be broke up, when it will be sure to yield several good crops of corn, and may afterwards again with good success be sown with saintfoin; and one principal reason why it thrives so well on poor lands must be the length of the roots by which it is enabled to resist the parching heat of the sun better than most other grasses are.

"One thing I must notify, which is, that I am by long experience convinced that the land cannot be made too fine for saintfoin; it thrives the better for it, and is the more certain to take.

"I have very often with good success, sown it with oats and barley in the manner clover is sown, the proportion much about equal to the grain it is sown with; for as the seed of saintfoin is much larger and lighter than clover seed, of course a larger quantity should be sown: it is much best for the plants to come up thick; the ground is thereby sooner stocked, and the weeds are easier kept under.

"Some in this county have sown it in rows with intervals, to afford a better opportunity of destroying the weeds; and I have heard that on the tolerable rich land, apt to produce weeds, it has done very well in this way; but as I never experienced it, I shall not enlarge on that head.

"It is best not to feed it the first year; but whether it is sown by itself, or with any other crop, it may be mowed the first year.

"It is much best, if a good crop is desired, and it is to continue any time to the land, to sow it in autumn by itself, the earlier the better; the proper season is from the beginning of August to the end of September; but if you mix it with other grain, let it be sown from the beginning of

February to the end of March ; the earlier in either season, the better.

" I have, I think, before observed, that the land cannot be made too fine for this plant ; and it should be well harrowed before sowing, and again harrowed afterwards to cover the seed.

" I must once more repeat, that it must not be fed the first year ; for the sweetness of the grass will cause the cattle to bite it too near the ground, which will greatly injure your crop : in fact, it is our practice not to let great cattle feed it till the third year, particularly in grounds that are inclinable to moisture : for the roots are tender, and much treading is very injurious to it.

" When the ground is well covered, suppose in the third year after sowing, if you intend to mow your faintfoin, it is best to lay it up by the middle of April at farthest : but it is better done three or four weeks sooner. The time for cutting it is when it begins to flower, as it is then fullest of sap : this will sometimes be about the middle of May, but often later, according as the spring is cold or warm.

" In feeding it, some necessary rules are to be observed. In the spring, turn in your great cattle, and you may be pretty certain the buds will not be cropped too near. Oxen thrive well on it, without the danger, at their first grazing, that is to be apprehended from clover, &c. yet even this danger chiefly arises from the negligence or ignorance of the hinds.

" In the autumn, and part of the winter, you may feed your sheep on it, which, if in health, will thereby be very suddenly fattened.

" Saintfoin hay is excellent food for horses, and they are uncommonly fond of it.

" If you turn in your cows in the spring in your faintfoin lay, you will find it will breed in them abundance of milk ; and all my acquaintance know that the butter made of it is excellent.

" When it is intended to save the seed of faintfoin, it is best to roll it in the spring, that the stones may be pressed down, and the scythe go close to the ground ; or else the best seeds, which grow on the lowermost joints, will be lost.

" When land is inclined to moisture, faintfoin may thrive very well on it till a wet winter comes ; but it is then a great chance if it is not destroyed.

" In this country it has long been the opinion of the ablest farmers, that it is best not to dung our faintfoin ; for the dung serves only to encourage weeds, and seldom reaches deep enough to give any supply of nourishment to the roots of the faintfoin.

" I have, if I mistake not, before observed, that the treading of great cattle, particularly in winter, is hurtful to this grass : I would therefore by no means advise the farmer to fodder his cattle on it, as the field will thereby be poached full of holes, in which the wet lodging, it is a chance but the roots of the faintfoin are rotted by it.

" I have often fed my sheep in winter with faintfoin hay ; but whenever I intended this, I always cut my faintfoin some little time before it flowered : it is very easy to observe when the flower cup is forming : the sheep will eat it very clean, and thrive well on it, provided it is not old and stinky.

" When I say that sheep in autumn will fatten very suddenly on faintfoin grass, it must be observed, that I did not mean the aftermath of such as had been mowed that season ; but the second growth, when the field had been for some time shut up after the great cattle had fed it in the spring. The aftermath is, it is true, good for sheep ; but, I think, not quite so good as the aftermath of natural grass ; at least, this I am certain of, that turn some sheep into a field where there is a mixture of natural grass and faintfoin, both of which have been mowed, they will to chuse eat up the first, before they touch the other with any degree of appetite.

" Saintfoin shoots very early in the spring, and to nip it in the bud is very injurious : I would therefore advise that the sheep be taken out about Christmas, soon after which time it often begins to grow.

" Some of our Wiltshire farmers have had a custom of sowing their faintfoin seed under furrow ; but I do not much approve of this practice, though they say in light land it cannot be buried." *Azusum Rusticum*, vol. I. p. 463.

The following method of cultivating faintfoin in Swit-

zerland was written by an experienced husbandman of that country.

" You have bought, you say, a little estate, at no great distance from the metropolis, and have thought of improving some of the lands by sowing faintfoin : you request me to let you know what are the methods in practice in this country relative to that grass, as when you left Switzerland to go to our uncle in London, you were too young to gain the necessary knowledge in farming. I shall oblige you with pleasure, and the rather, as I have had very good success myself in this particular article.

" The roots of faintfoin, says he, penetrate very deep into the earth, by which means they do not exhaust the surface so much as one would imagine, the vigour of the plant considered : the roots are perennial, and consist of a white woody substance within, covered by a black outward coat or bark : from the crown of the root proceed several leaves, and some branches about two feet long, which incline on all sides. Our fodder is furnished from these branches and leaves. Saintfoin is a very vigorous plant, and yields a most excellent fodder.

" It is not nice with respect to soil, but grows in almost any, if we except such as are clayey, very damp, and low, or stoney : the crop is in proportion to the goodness of the land, but the faintfoin that grows on poor land, though less in quantity, is most nourishing and heartening for cattle : the virtues of it seem concentrated, and the cattle thrive much better on it than on such as grows in greater quantities on rich mellow land.

" When we have it in our power to chuse our situation and soil for faintfoin, we ought to prefer a light land, gently sloping on the south-side of an eminence : here it prospers to admiration.

" This plant does not thrive in the shade : for this reason we should avoid having any trees in the fields that bear faintfoin : and it is subject to be sometimes chilled, by having snow lie too long on it in winter ; it should not therefore be sown on flat level land.

" To have a good crop, the land should be properly prepared, by having two or three good ploughings between harvest and barley feed-time : the stones must be very carefully picked off the field ; and it must be cleaned from all kinds of weeds, and other such trash.

" If it is likely that there will be a wet season, the spring is the best time for sowing faintfoin, as it will be much forwarder than that sown in autumn : but if the spring is too dry, the sowing will best be deferred till about August, as by that means the plants will have time to acquire strength in their roots, and make vigorous shoots in the spring.

" The farmers may take it for granted, that if the soil will admit of it, he cannot well plough his land too deep, or make it too fine : he will reap all the benefit of it in his succeeding crops.

" In Switzerland we sow it three times as thick as we do wheat : or which amounts to the same thing, we use the same weight of seed, the faintfoin seed being so much smaller as to make that difference.

" Good seed should be heavy, plump, bright, and of a yellowish red colour : if, on opening the pods, you find the seeds black and shrivelled, reject it as of no value : for it has been heated in the heap and will not grow : if it appears white and shrivelled, the plant was cut before the seed was ripe : from this you are to expect only starved, meagre, short-lived plants ; you must therefore by no means sow it. The pods inclosing good seed should be plump, large, and armed on one side with small prickles ; and they should also be of a deep brown colour : but it is best not to depend on the appearance of the pods, but open them, and examine the seed.

" The weather should be mild at the time of sowing the seed of faintfoin ; and it should be harrowed in, and not covered with above two inches of the earth at most : some sow it in the spring with oats : but this I by no means approve of ; it is much better sown alone, especially if you would have a strong vigorous plant, that shall last for years.

" In our very poor lands in Switzerland we sometimes pursue the following method :

" Immediately after harvest we give the land intended for faintfoin a good deep ploughing, laying it in high ridges ; in this manner it is left to be mellowed by the frost and snow ; we take advantage of the first hard frost to carry on our dung, and manure it well.

" When

"When the frost breaks in the spring, we spread the dung, and turn it in with the plough: we afterwards bestow at least two more ploughings on the land, not only to keep down the weeds, but to make the land as fine as possible: in autumn we sow wheat, and have reason to expect a tolerable good crop.

"When the wheat is got in, the land is again ploughed, and left to meliorate and pulverise by the winter frosts: early in the spring it is ploughed and laid level, the stones are all picked off, and the weeds cleared away: if rain is expected, it is now sown pretty thick with the saintfoin, otherwise the sowing is deferred till autumn. When poor land is managed in this manner, it will yield tolerable good crops of saintfoin for several years: it should not, however, be fed the first year, as the treading of the cattle will destroy the crown of the plant, and prevent its shooting the succeeding year: and sheep should never be turned in to feed on it, as they will crop it so close as to prevent its budding.

"Saintfoin comes up about a fortnight after sowing it, and if the weather is moist, something sooner. When the plants come up, they should be set out at a proper distance with a hoe that they may have room to spread. The young plants are very apt to be choked by weeds; they must on that account be kept very clear of weeds; till, by their branches, stalks, and leaves, they cover the land; after which there will be no danger of the weeds getting ahead.

"As saintfoin feed is often faulty, it will not be amiss to make a trial of it, by sowing some of it in a detached bed of a garden, counting the seeds before they are put into the ground: by this means it may easily be known how many of them fail, and the quantity of seed to be sown may be proportioned accordingly.

"Some have asserted, that saintfoin should not be mowed the first year: but this is an ideal precaution; for in Switzerland we think it rather does it good than harm to mow it in autumn; and experience every day convinces us we are right in our opinion. The first crop is not, it is true, very large, but the mowing causes the plants to branch, and gives strength to the roots.

"No cattle, as I said before, should be turned on saintfoin the first year: and indeed, it is best, if possible, always to mow it. We have three crops of green fodder or two of hay from it, in one season in this country.

"When we intend to save the saintfoin seed, we leave a part of it standing, and do not cut it till we observe, by the colour of the pods, which will then be of a deep brown, that the principal part of the seed is ripe: we then either gather the heads by hand, or reap them with a sickle, and lay them carefully on a cloth. The heads must be dried in layers three or four inches thick: if they were laid thicker, they would be apt to heat and spoil: when dry, we gently thresh them with sticks; flails would be too heavy; for if the seed is the least bruised, it does not come up. The stubble that remains after the heads are cut off may be mowed, and given either dry or green to the cattle; for though a little sticky, they will not refuse to eat it.

"I generally use my saintfoin green, foddering the cattle with it as soon as it is cut; and this I the rather do, because the making it into hay is such critical work: but when there is a likelihood of my being short of winter-fodder, I have no choice to make.

"The weather should be very fine when it is cut; for as it is full of sap, it requires great heat to dry it; and if it happens to rain, it takes more damage than common grass; and it is best not to cock it, as it is subject to heat in a very small space of time: if it is much wetted, it grows black, and loses all its sweetness.

"Even when saintfoin is seemingly quite dry, it is apt to heat in the stack; but this is easily prevented by spreading alternately a layer of good oat or barley straw, and another, of saintfoin; when it comes to be used all together, it makes an excellent winter fodder.

"Great care must be taken both in turning the swarths of saintfoin, and in loading it on the waggons, as a very little stirring will, when it is dry, shake off all the leaves; and this greatly lessens its value: for this reason I make my men turn the swarths with the handles of their forks, which is easily done; and I never cart it, but either early in a morning, or late in the evening, when it is somewhat moistened by the dews.

"Saintfoin is a very hardy plant, and bears, without being sensibly affected, the extremes of heat and cold; but

the bottom of the land where it is sown must not be wet, and there must be room for the roots to spread.

"A field of saintfoin on a good soil will last from sixteen to twenty years in prime, and even longer with care; for if, after seven or eight years, some well-rotted dung is laid on it, the future crops, as well as its duration, will be greatly increased. When it is sown on light land, marling it is of very great service.

"But if after all a piece of saintfoin falls off, our method is to plough it up in autumn as deep as possible; give it another ploughing in spring, sow it with oats, plough it again immediately after harvest, dung it, sow it with wheat; and when the wheat is off, plough it again, and giving it another ploughing, sow saintfoin in it about the end of August; and this in general succeeds as well as that which was first sown on the land.

"Before I conclude, I must give you a few cautions relative to this excellent fodder, which has of late so much improved this neighbourhood.

"It is so very sweet, and cattle are so fond of it, that without great care they are apt to eat too much of it; whence often proceeds a surfeit, and sometimes a corruption of the mass of blood, and cutaneous eruptions: they should at first have but a little at a time given them, that they may be by degrees habituated to it: by this management the danger vanishes.

"It is much more proper for slow draught horses than for such as are used for berlins, or for riding; for it is apt to make horses thick-winded, foggy, and somewhat sluggish: for farmers horses nothing can be better, or more nourishing; speed is not required in them.

"When saintfoin is intended to be made into hay for horses, it is best not to cut it till the seed is formed in the pod, as by that means the hay will be much more nourishing; and when the dried seed itself is plenty, nothing better can be given to the horses by way of corn; for I can assure you from experience, that one bushel of it will go as far as two of oats.

"When saintfoin is cut to be given green to cattle, it is best to mow it when it is in full bloom, as it is then most juicy, and fullest of sap, and it will consequently afford most nourishment to the cattle. The best way of managing it is to cut no more than will serve for the day; and by properly apportioning, or parcelling out the field, there will be, during the whole summer, some of it in order to cut for green fodder.

"If this green fodder is intended for sheep, it may with great propriety be cut just before it flowers: the stalks are then in a tender state and very nourishing, and good either for wethers or ewes. When it is to be made into hay for sheep the same rule should be observed.

"I have very little more to say on the subject of saintfoin, except that, as when a saintfoin lay is brought into tillage, it prepares land very well for wheat or rye, and bears good crops; there is seldom occasion among the good farmers to try how long it will continue in heart, as they generally break up these lays in turn, and find it advantageous so to do." *Museum Rusticum, vol. I. p. 37.*

Experiments on Saintfoin.

The following judicious series of experiments were communicated by a gentleman of distinguished rank and fortune in Yorkshire:

"From an entire conviction, (says this excellent husbandman), that it is the duty of every subject to contribute all in his power to the good of society, I have endeavoured, during several years that I have resided in the country, to promote and encourage the advancement of agriculture. To this end I have made variety of experiments, on different soils, to prove and ascertain the most beneficial methods of husbandry, or how to employ land to the most advantage.

"A great part of my estate, consisting of waste and uncultivated heath, which did not let for more than a shilling an acre, I judged it to be a matter of importance to try, if it was not possible, by culture, or by applying this ground to a different purpose, to increase the value of it. Happy would it be, could pleasure be made to coincide with profit! and it is certain, that whoever succeeds in the improvement of his own estate, may enjoy the inward satisfaction of rendering some service to his country: for the example of a landlord may be thought to have some weight with his tenants; and if, amidst a great number of experiments made for the sake of truth, some have proved

proved successful, one may expect that the farmer will at last adopt a method which he has for many years seen repeated with advantage: for however the common farmer may have been accused of an obstinate adherence to old customs, many instances might be produced of his quitting the paths of his ancestors in favour of modern improvements; but then he must be thoroughly satisfied, that the new way is indeed preferable to the old, not in theory only, but in practice, confirmed by actual experiments often repeated before his eyes. And can we justly blame the illiterate peasant for refusing to forsake a method he is well acquainted with, and can depend on for the support of himself and family, upon other terms? It is the province of the landlord to adopt a theory, and to try it by experiment; for if it fails, as is often the case, his ruin is by no means the consequence, and the loss is amply made up to him, by the secret pleasure always accompanying a good intention. But whatever service a gentleman may be of in encouraging researches of this nature, or by his influence in his own neighbourhood; yet ought his benevolence to extend farther, so as to be of use, if possible, to his country and mankind. It is the desire of communicating the little knowledge I may have gained from the experience of a few years, that has prompted me to address this letter to you, who are engaged in an useful and public undertaking: and you are at full liberty to make use of it, together with the detail of the experiments. They were begun without the least design of making them public, and may therefore be deficient in point of method and order: but they are strictly true.

"On the third of April, 1759, two acres of very sandy land (which had a hundred loads of red marle laid on it the year before, and had borne a good crop of oats in 1758) were drilled with faintfoin, on four feet ridges in double rows: eleven inch partitions, the intervals three feet one inch wide, and took four pecks and a half of seed. This was intended to be horse-hoed, as Tull directs: but the land was in such bad tilth, and abounded so with the natural grass, that, after once or twice attempting to destroy it, by ploughing the intervals, the horse-hoeing scheme was given up, and the faintfoin left to take its chance. However, a few plants remained thinly scattered in the rows (whether this thinness was owing to the badness of the seed, or to its being sown too deep, I know not, though I rather impute it to the latter cause, as, in sandy land, the shares of the drill are very apt to penetrate too far into the ground.) These remaining plants flourished exceedingly from the time of their being sown; many were in flower the following June, and afforded a tolerable crop, viz. about a load. The after-crop was very good. In 1760, these plants seemed to have arrived at their perfection, and the product was two waggon loads, or about two tons. In 1761, and 1762, this small close, having had some manure laid on it yearly, yielded nearly the same quantity of hay: and it is now let for forty shillings a year: a much higher rent than any land is let for in this neighbourhood, and four times the rent paid for it before the improvement."

The shares of the drill, as this gentleman, observes may be apt to penetrate too deep in light sandy land, unless the driller is careful to regulate the depth, by the chain fastened to the shafts, which should have some small links at one end of it, for that purpose. The shares may be also prevented from going too deep, by a foot, or small wheel, in the fore part of the drill plough; or by putting a triangular piece of wood in the trunk of the share, very thin at top, and gradually thicker downwards; this throws the seed at such a distance behind the share, that it falls into the channel made by the share, after it is almost filled by the dry earth, and then the seed lies shallow, or is not covered with much earth, though the channels are made deep by the shares.—But in whatever manner the seed is covered shallow, it should not be by making broad channels for the seed, as proposed below, because in that case the plants will come up in a broad row, which will not only obstruct the hoeing, but will also harbour weeds, which cannot be got out of a broad row as they may out of a narrow one; and for this reason the drill shares for all sorts of seeds should be made as thin, and the channels as narrow as is consistent with the necessary strength of the shares. For sowing wheat, faintfoin, and other seeds about that size, shares of an inch thick, or somewhat less, are sufficient; and for turneps, cab-bages, or seeds about that size, it is not necessary that the shares (so much of them as go in the ground) should be above half an inch in thickness, or very little more.

"N. B. This close of two acres was separated from another of twenty-seven acres, of so sandy and dry a nature, that, unless in a wet summer, the hay upon it was scarce ever worth mowing: and this experiment was made in order to determine what improvement the adjoining large close was capable of, and to experience whether or no the common opinion, that faintfoin is improper for all sandy and deep soils, be founded on truth, or only the result of prejudices: for the reason given for its disagreeing with this kind of soil, did not appear to me satisfactory; and great part of my estate consisting of such sandy land, it seemed a matter of importance, to know, whether the great advantage derived from faintfoin, on some soils, might not also be applicable to sandy soils.

"Encouraged by the flourishing condition of the faintfoin on this small close, I determined to extend the improvement to the larger one also, as soon as it could be brought into sufficiently fine order to be laid down with this grass. Accordingly, in the winter of 1759, twenty-five acres were ploughed with the five-coultered plough, as recommended by M. Duhamel, in his treatise on the cultivation of land, in order thereby to prepare the ground for turneps the ensuing summer; for I look upon this as one of the best methods of destroying the natural grass, and preparing the land for any of the artificial grasses; especially if the turneps are drilled in rows, and cultivated with the horse-hoe. The land was ploughed level in the spring of 1760, and into ridges of about five feet broad in June, and a single row of turneps was drilled on the middle of each ridge in July. It is to be observed, that the natural grass was far from being destroyed by these three ploughings; nor could it be entirely so by the subsequent hoeings of the turneps; so that it certainly was a great prejudice to the faintfoin. The same ground is now sown again with the same plant: but I would strongly recommend to those who are inclined to follow this method on such a soil as I have described, to continue the culture of turneps, with the horse-hoe two years instead of one: for by this means the natural grass, and weeds may probably be effectually destroyed. But to return to the experiment: the turneps succeeded as well as could be expected on such a soil, and without manure: they were eaten off by sheep, and Scotch cattle, foddered on the land.

"About four acres, on which the turneps were the first sown, were ploughed level, and afterwards, viz. in November, drilled with faintfoin in equally distant rows, one foot asunder. They took about a bushel to an acre. This was an uncommon, and may be thought an improper season for the sowing of faintfoin: but I chose to sow part of the field before winter, and part in the spring, part with faintfoin mixed with corn, and part with faintfoin alone; in order to see which method would succeed best, that I might make it my guide in other places more likely to yield good crops.

"Five or six acres of land were drilled in the beginning of April 1761, with faintfoin seed, in rows, at the same distance, and with the same proportion of seed as the four acres spoken of before: about three acres were sowed soon after with faintfoin and oats both drilled; and about twelve acres were drilled with faintfoin and barley; each in rows about a foot asunder. The whole of this field, which contained twenty-five acres, had been ploughed but once since the turneps; whereas two ploughings might have been better: but on account of eating them off with sheep and cattle, there was not any time for it.

"The three acres sowed with oats in rows a foot asunder, took four bushels and a half of seed, and produced a very good crop; by computation, five quarters to an acre: but the exact quantity, neither of the oats, nor of the barley, could be known, on account of its being mixed in the barn with corn that grew in other places. The twelve acres sowed with barley took seventeen bushels of seed, and produced a much greater crop than any land in the neighbourhood; though this was a great year for barley. All the farmers who observed this crop, allowed that they had never seen finer barley; and it may be said, without the least exaggeration, to have yielded above five quarters to an acre. I am convinced that this computation of five quarters to an acre is a very moderate one: not only from the number of sheaves, and the judgment of all who saw it, but likewise because I had no more than twenty-six acres and an half of land drilled with barley this year: and the whole produce when threshed, amounted to one hundred and twenty-eight quarters and two bushels; which is very near five quarters to an acre, taking one part with another: but these

twelve acres bore by much the greatest crop in proportion, and seven acres of the twenty-six were sown on beds five feet broad and horse-hoed, which never produces so large a crop.

"The summer of 1762 was remarkably dry, and bad for grass: many fields hereabouts, of ten acres, did not produce above a load or two of hay; but this of twenty-five acres produced twelve tons of good hay: which, considering that the saintfoin was not nearly arrived at its perfection, may be said to be considerable.

"It was now easy to see in what parts of the field the saintfoin had succeeded best.

"The four acres sowed before winter had the smallest number of plants of saintfoin of any; perhaps not more than one or two in ten yards: but this ground abounded so with natural grass, that this alone furnished a tolerable crop. The five acres sown in the spring, without corn, did not abound much less with natural grass, or more with saintfoin, than the preceding: but there being a great mixture of the seeds of rye grass with all the saintfoin sowed in the field, the rye grass appeared distinctly in tufts all along the rows; and, together with the natural grass, seemed completely to have covered the surface of the ground. The rows were much better stocked with saintfoin plants in the twelve acres sown with it and barley: but the rye-grass abounded here likewise.

"It is remarkable that the saintfoin flourishes best in those parts of the field where the land is most barren; the reason of which undoubtedly is, that, as scarce any natural grass or weeds arise to choke it there, its young and tender shoots have the benefit of the whole pasture, and its roots are not obstructed in their progress by the growth of other plants.

"Though the greatest part of this field is much understocked with saintfoin plants, yet it is in a very promising condition for a good crop of hay this year.

"I attribute the bad success of the saintfoin on the first four acres partly to its being sowed too late, whereby the plants could not acquire much strength before winter, which destroyed many of them; partly to some violent hurricanes of wind, which blew clouds of sand from one part of the field to another, and overwhelmed many plants; and partly to the shares going too deep, by which the seed was covered at least two inches. The bad condition of the five acres sowed alone in the spring, I believe to be owing, in some measure, to the causes already assigned, and also to the want of protection and shelter from drought, which corn would have afforded in that very dry soil. Barley does also help to stifle the natural grass, saintfoin's greatest enemy. The saintfoin which was drilled with barley, looked, as was before observed, by much the best: but, indeed, some precautions were used to sow the seed somewhat shallower on these twelve acres; and this may, in some degree, have contributed to its success.

"Upon the whole, from the experiments made in this field (and several others made since have strengthened my opinion on that head) I conclude, first, that saintfoin is very suitable to any sandy or deep soils provided they are dry, and that the natural grass and weeds can by any means be completely destroyed: secondly, that it is better to sow saintfoin in the spring, and with barley, than in the autumn, or spring alone; thirdly, that the seed should not be covered above an inch deep: but I believe half an inch the more proper depth. One foot may be a very proper distance for drilling the rows; and from a bushel to a bushel and an half, a proper allowance of seed for an acre of ground, provided the seed be good.

"I have tried the horse-hoeing of saintfoin sown on beds three or four feet broad; but though the plants do by that means certainly grow more vigorous, I do not think the crop so great; and when the stalks are strong and pipy, I have observed that cattle will not eat them.

"Saintfoin and other plants grow large when well nourished; for which reason, hoed saintfoin has larger stalks than the thick sown: but the large saintfoin is not harder than the small; on the contrary, the large is more succulent, and richer food than the small; the reason of this gentleman's cattle refusing to eat his large vigorous saintfoin, was, because it had stood too long before it was cut for them; and then it will grow hard and woody. It should be cut when in full sap, which is before it blows, or even before it begins to blossom, and then it is tender, full of rich juice, and very agreeable to cattle.

"The sowing in equally distant rows seems preferable, especially where a large extent of ground is to be sowed.

But my experience is very insufficient to decide this point absolutely. I could wish that gentlemen would make trials of the horse-hoeing of saintfoin in different soils and situations.

"Experiments carefully made, and often varied, by persons void of prejudice, may, in time, decide that important question in agriculture, viz. whether the common, or the horse-hoeing husbandry be, upon the whole, most advantageous to the English farmer.

"If saintfoin be drilled on a sandy soil, or on one that is in very fine order, the shares of the drill ought to be two inches thick, or they will grow too deep; and a small wooden roller should be fixed to, and follow the drill, instead of a harrow with teeth, which would bring too much earth upon the seed. Such a roller will lay the ground smooth, and fitter for mowing. A spring made of three pieces of ash, as described by M. Chateauvieux, is of great use, and may easily be added to Mr. Tull's drill plough. It may be fastened underneath the middle of the plank, by four screws, and made to press more or less on the roller, or harrow, which ever is made use of, by a wedge put in betwixt the spring and the hinder edge of the plank. If a harrow is used, iron teeth are much preferable to wooden ones.

"In the year 1757, I had a mind to try how much a soil naturally extremely bad, could be improved by art. Accordingly, I made choice of a piece of ground one acre and an half in extent, a barren sand, which produced only a few miserable weeds, and which the farmer who rented it did not think worth his while to cultivate. There happened to be a great quantity of red stony marle in an adjoining field, of which near three hundred loads were laid on this acre and an half. It was drilled with barley in 1758, and horse-hoed: but the crop proved a very bad one. In 1759, a load of lime, and about ten loads of dung were laid thereon, and it was drilled with turneps and horse-hoed: however, the crop still was but moderate; though a good deal better than could have been expected from such a soil. In 1760, it had turneps again, managed in the same manner as the former, but they were a great deal better. In 1761, it was drilled with oats, saintfoin, and rye-grass, mixed, in equally distant rows one foot asunder. It took two bushels and peck of oats, and two bushels of grass seeds. The oats were very good, and produced four quarters and four bushels. By continued horse-hoeing three years together, the land was got into perfectly fine order, the marle and sand were thoroughly incorporated, and the natural grass and weeds entirely destroyed: so that the saintfoin and rye grass grew and flourished exceedingly. In 1762, the summer being uncommonly dry, the produce was about half a load of hay; which was as much as one could expect the first year after sowing. It is very well stocked with plants, which now, in May 1763, seem as vigorous as in any of my other fields, though I have some which yield two tons of hay to an acre. This little piece of ground, which, before was not worth a shilling a year, is, by the labour and cost bestowed on it, now worth at least fifteen shillings an acre; which is a proof that, let land be ever so bad, it may be improved, and perhaps made equal to the best in the neighbourhood: but at the same time it must be confessed, that the expence is too great to be repeated at once on a large extent of ground. I calculate that three hundred loads of marle, dug and carried about three hundred yards, might cost about four-pence a load, or five pounds for three hundred loads, which has been the whole expence attending this acre and half: for the manure, ploughings, and horse-hoeings, were repaid by the crops of barley, oats, and turneps."

Mr. Duhamel has mentioned the following experiments relative to the culture of saintfoin:

In 1754, M. Eyma, near Bourdeaux, planted saintfoin, lucern, and clover, in rows eight feet asunder, with distances of sixteen inches between the plants in the rows, which yielded him an immense increase. The alleys were horse-hoed after each cutting.

In 1755, he planted a field, a little more than three roods square, with saintfoin, which he cultivated according to the rules of the New Husbandry; and this spot yielded him 10,000 pounds of dry hay. M. de Chateauvieux had 15,300 pounds of lucern, as we shall see, off somewhat more than an acre of ground, which he cut five times; but M. Eyma thinks that 14,445 pounds, Geneva weight, of saintfoin, which he had at another time, at one cutting, is a greater crop than M. de Chateauvieux's lucern; besides the after-crop, which indeed was but inconsiderable,

ble, on account of the dryness of the season. He says he cuts his saintfoin three times in good years, and that the two last cuttings produce nearly as much as the first: but he allows, that such years are not to be expected often.

Mr. Young observes, that many have a notion, that cutting saintfoin twice in a summer is an injury to it, and makes it bleed. But says, he has often cut his saintfoin twice; and three times, and once or twice he cut it four times in the season, without perceiving it was at all hurt by it. If cutting it often does it any damage, it must be by cutting it too young; but when it arrives to such maturity, as to come near blossoming, nature then points out the time to cut it, and it will then receive no more damage to cut it a second or third time, than cutting it at first.

M. Eyma doubts whether the preference be due to saintfoin or to lucern: but he is confident that either of them, properly cultivated, will produce surprising crops.

He thinks that one row of saintfoin, or lucern, planted in the middle of a bed three feet wide, will profit more by the different hoeings, and consequently produce more grass, than double or triple rows, though these last be planted on broader beds; because the single rows have the earth loosened on each side of them.

M. Diancourt sowed saintfoin, each plant of which in 1753, had a head of two feet diameter. They throve so well, that, in 1755, one plant, and that not the largest in the field, yielded twenty-three ounces of hay.

The following instructions were given by an ingenious gentleman in Lincolnshire:

"Mr. Tull says, that a deep soil is best for saintfoin. I believe every thing grows better, in a better soil: but by what I have seen of this plant, I shall always prefer for it a shallow soil, where there is a rock, or some hard substance, within six inches, or a foot, of the surface, to stop the roots of the plants, and make them spread horizontally. This has not only the good effects proposed in M. de Chateaufieux's manner of transplanting lucern, but, it is said, occasions its filling the ground with more shoots by their striking up from the knots of the roots. This fact I cannot verify: but certain it is, that, in such soils as I here speak of, a crop of saintfoin which at first appears very thin, will afterwards fill the ground perfectly well, and the plants of it will appear in much greater quantities than at first.

"I have several times broke off a root of saintfoin four or five inches within ground, and it always sprang up again. This is a small argument for the fact I mentioned.

"Saintfoin is much cultivated in Lincolnshire. The common allowance of seed is five bushels to an acre. A gentleman south of Lincoln advised me always to sow a small quantity of trefoil with it (about four pounds on an acre). The reason is, that in this exposed country, the young plants suffered more by the sun in summer, than by the frost in winter. Now the trefoil, coming to perfection the first year, and living only three, will be a shelter for the young plants, during the first year or two, and die off when the saintfoin wants its room. This system is well supported by practice: but rye grass should on no account be sowed with it; that being, when left for fodder, a great impoverisher of ground.

"Saintfoin is observed to get to perfection in three years, lasts good four or five, and then dwindles during four or five more. Its first crops are from one or two loads; its second stage, from three to four loads, and it dwindles down again to one.—Last summer, which was remarkably dry, did very well with this grass.

"I have sown saintfoin with barley, with wheat, without corn in the spring, and now" (this gentleman's letter is dated September 4th, 1763) "am sowing some more at this present writing; but can form no judgment as yet.

"Three years ago I drilled some, according to Mr. Tull's directions, in beds, with treble rows, and some at equi-distant rows. The horse-hoed beds were good, as far as they went: the others, drilled at a foot distance, gave so much room for weeds to come up, that the success was very moderate; which indeed would have been the case with the former, had not the horse-hoe cleared them. On the whole, as far as my small experience and observations reach, I would never chuse any one to drill his seed, but to sow it in the broad cast-way, on land very fine, with a good quantity of seed.

Mr. Marshall, in his Rural Economy of Gloucester, gives the following account of saintfoin on the Cotswold Hills: "The entire wolds are productive of this princely herb. The calcareous rubble, which has been mentioned as forming the subsoil, is in some places two or three feet deep; and the rock, below, mostly open. The roots have been traced, in stone quarters, to ten; some will say twenty feet. Here the saintfoin flourishes luxuriantly. But in other places the rock rises, in flat horizontal seams, too near the surface: there the saintfoin is weaker, and goes off sooner. It is said to have been cultivated upon these hills upwards of one hundred and fifty years.

"In the established practice, saintfoin is generally sown with barley after turneps.

"But it has lately been discovered, in one of those incidents of practice, to which every farmer ought to be attentive, that it is more eligible to sow it with oats after wheat: that is, when the soil is foul; even with couch-grass.

"Saintfoin, sown on a soil which is clean and in tilth, is liable, on the Cotswold Hills, to be choked with bents (bromus mollis) which, feeding before saintfoin is cut, annually encreases. The weaker plants of saintfoin are, by this means, smothered or kept under, and the quality of the hay proportionally injured.

"In laying down land, which had been inclosed from intermixed common field, and which was, of course, in various states as to tilth and foulness, it was observed, in more instances than one, that where the land happened to be foul, the bents were few, while that which was clean and fine, at the time of sowing, was, in a few years, over-run with them.

"This incident was caught at; not, however, by slovens, for the purpose of saving trouble or expence; but by men, whose activity and spirit, in matters of husbandry, are indisputable. Saintfoin has now been repeatedly sown, on a large scale, on a soil worn out and fouled by a succession of corn crops: and the event has been invariably what the incidents pointed out. The couch occupying the surface prevents the bents from gaining a footing; while the saintfoin, feeding in the subsoil, has little occasion for the surface.

"It has ever struck me, that saintfoin ought to be sown when the soil is poor; that is, out of heart as to manure; in order that it may be induced to strike downward, and feed below; as well as to prevent the grasses and weeds from luxuriating above, to its annoyance: but I had no conception of its being able to work its way in a bed of couch. The plants are, it seems, checked during the first two or three years; but, at length, the couch dwindling, or in its nature growing weak for want of the ground being stirred, the saintfoin gains full possession: and although it may be then thinner than saintfoin sown on a clean surface, this is thought to be no disadvantage to its productiveness. It is allowed, however, that the land, on breaking up saintfoin cultivated in this manner, is still foul. But even this circumstance has its attendant advantage, in this country; it affords an eligible turf for sodburning; and although this operation may not clean it thoroughly, it is to be remembered, that its foulness was caused by a succession of corn crops, previous to the sowing of the saintfoin; and that had it not been sown, the soil would have required a fallow to cleanse it.

"Nevertheless, upon the whole, it does not strike me as a practice to be universally recommended to the cultivators of saintfoin: circumstances vary in different districts; and the same judicious cultivator, who has struck out, and indeed may be said to have established, this novel practice, has found, that the bents may, in a clean soil, be overcome by handweeding, the first and second years; for although every bent may not be extirpated, the surface afterward become too stale for the seeds to strike in; and it appears to me more than probable, that the expence of handweeding is not equivalent to the loss of produce, by the new practice, in the crops of the three first years.

"My observations are the fuller on this subject, as it appears to me interesting; and, notwithstanding the practice, which has been struck out, may be in some respects objectionable, it has already been adopted, by some principal farmers; and will, probably, in a short time, become the prevailing practice of the Cotswold Hills.

"The time of sowing saintfoin, here, is the middle of March; or from that time to the latter end of the month.

"The quantity of seed is proportioned to the state of the soil.

foil. A foul foil requires more seed than one which is clean : from one bushel to three bushels an acre. The advocates for thin saintfoin think a bushel of seed sufficient ; provided the foil be clean.

" This is another interesting particular, in the cultivation of saintfoin. It is remarked by men of observation, that where the plants of saintfoin stand at some distance from each other, they grow taller, stronger, and afford more herbage, than where they stand thick upon the ground ; in which case, the plants are not only weaker ; but the crop is shorter and less productive. The strength of the plants may, perhaps, be the only cause of difference : a strong plant, in all probability, strikes deeper than a weak one ; by which means its pasture is proportionally enlarged.

" Price of saintfoin seed, three to six shillings a bushel, four shillings and sixpence a medium price. Chiefly raised in the neighbourhood.

" But if thin saintfoin be advantageous, why not set out the plants, and keep them clean the second year, with the hoe ? With this, and a small addition of handweeding when the bents run up to head, these troublesome weeds might, perhaps, be wholly overcome.

" It is invariably mown every year. If it be once suffered to be eaten with stock during the summer season, its productiveness is in a manner destroyed ; it is said that it will not, in this country, ever afterward rise to the scythe.

" It is a principle here laid down, by men, who seem to have paid singular attention to the culture of this plant, that it ought never to be eaten upon the ground when in a growing state. They have reduced their ideas to still greater accuracy ; they are clearly of opinion, that saintfoin cannot, on a par of seasons, be fed with safety in more than two months of the year : namely the months of October and November : in a mild December, it will frequently make a shoot ; which being crot is said to be nearly fatal to the plant. Pasturing in spring is observed to have a similar effect. Even mowing too early is considered as very prejudicial : and what appears extraordinary, (being contrary to the general nature of the plants) suffering the plants of saintfoin to mature their seed is believed to prolong their duration !

" It is well known, that cutting trees while in a state of growth, is injurious to their future progress ; being, it is understood, prejudicial to their roots, and cutting this strong, deep-rooting plant, in a similar state, may have a similar effect. If the injury be done to the root, and take place in the lower extremities of it, the damage, which follows, is easily conceived ; for whatever portion of the length of the root is destroyed, in such proportion will the pasturage of the plant be contracted ; and, until it has had sufficient time to re-extend its roots, in the same ratio will be its productiveness. These reflections are offered incidentally ; in order to excite a spirit of enquiry, which may lead to more accurate ideas concerning the nature of most useful plant.

" The expenditure of saintfoin hay is chiefly on turnep-sheep and horses. The produce one to two tons an acre.

" The expenditure of the aftergrass is principally on lambs, which are newly weaned : also on grown sheep, as well as on cattle ; but is seldom, I understand, eaten with horses.

" The duration of saintfoin on the Cotswold Hills is short. Seldom more than ten years : not even with the management abovementioned, on land which has never borne saintfoin before. This, however, may be difficult to ascertain. It has been cultivated on these hills, it seems, the major part of two centuries. It is not likely, however, that every patch should have been hit : the shortness of its duration must therefore be given to the nature of the soil, or subsoil.

" The general idea seems to be, that land ought not to be recrot with saintfoin, under twenty years. But, it is probable, that it cannot be cultivated, with success, after so short an interval. There is an instance of a piece of land on these hills being crot three times with saintfoin, within memory ; but the last crop was of little value : it went off in about three years. Therefore, notwithstanding what has been said above, the present proportion of saintfoin ley to the arable crops may be sufficient. In the present course of crops, each piece will come round for saintfoin in seventy years : and it appears doubtful whether, even after that interval of rest, the substrata will be sufficiently recharged to send up ten more crops, equal to those at least

which it afforded the first time. The food of saintfoin it then contained might have been some thousand years in forming."

SALLENDERS, a disease in horses, consisting in cracks in the bending of the hough, and occasions a lameness behind. This disease is cured in the same manner as the mallenders. See MALLENDERS.

SALT-MARSHES, pasture-lands lying near the sea, and sometimes overflowed by the sea-water.

" It has been observed, says an ingenious writer in the Museum Rusticum, that horses and black cattle thrive better, and get flesh and fat sooner, in salt marshes, than in fresh water meadows or upland pasture ; yet I do not remember ever to have heard any good reason assigned for it.

" Some will tell you that the air of the sea whets their appetites : that the pasture is rich and nourishing ; and that the herbs produced by the lands near the sea are more conducive to the health of herbaceous animals, than such as grow on upland pastures, whether natural or artificial.

" But may we not rather attribute the thriving of cattle on these marshes, to the saline particles with which the earth as well as its produce, is, when near the sea, strongly impregnated ? Perhaps even the dews have their portion of salt ; but of this I have made no experiment, therefore mention it only as a probable conjecture ; for as they fall soon after they are exhaled from the sea, without passing through the secretions necessary to separate their saline parts, why should not this be the case ?

" But to return to my first subject : I am fully of opinion, that the saline particles only, with which the grass is impregnated in the above-mentioned marshes, cause cattle to thrive in them in the manner they are known to do. These salts purge away the foul humours which the beasts have contracted, either by idleness, or by being overheated in labour ; by which means they are better disposed to be nourished by the aliment they receive.

" It may perhaps, be objected, that if the grass of these marshes is apt to purge cattle, this very purging, by being long continued, will be a means of preventing their growing fat. To this I answer, that the cattle take with their food every day nearly the same quantity of these purgative particles : but that the quantity of salt, which at their being first put into the marsh will have that effect, will cease producing it when they are, by custom, habituated to take a daily portion of it : this must be allowed, as we all know, that a few grains of rhubarb will operate as a cathartic to a person that is not accustomed to take it ; yet it is as well known that a man may take many grains daily, if he uses himself to it, without its being sensibly purgative to him.

" It is not convenient to every one to send their cattle to a salt marsh : would it not, therefore, be happy, if we could substitute a method that would nearly answer the same purpose ? I do not think this impossible : perhaps, if common salt water was to be laid in the fields for the horses to lick as often as they pleased, they would thrive much better : were I to say I know it would have that effect, it would be no presumption.

" Cattle are naturally fond of salt, and if left at their liberty, will take no more of it than what does them good. With this help, our fresh-water meadows, and upland natural artificial and pastures, would yield us a greater profit, and of course be worth more both to the land-owner and farmer.

" Some will not allow a thing to have merit, unless it is supported by what they call a proper authority ; and they do not allow the experiments of a particular person to be sufficient. To satisfy such I can assure you, that in the inland parts of Switzerland, when their horses and cattle have endured the hardships of a long and severe winter, they turn them in the spring loose into the mountains, laying salt here and there upon the rocks, for them to resort to when they please ; and of this they are so fond, that when the farmers went to catch their horses, they take some salt in their hats, as we do oats in a sieve, to allure them.

" Experience has long convinced them, that the salt thus laid in their way answers every good purpose : their cattle are more healthy in general than ours are in England ; and almost to this alone do they attribute it.

" In the province of Munster and Connaught, in Ireland, they very frequently lay salt on slates, for the benefit of their horses when at grass : this, they find, does the

cattle great service : and in this should we imitate them, and not be too proud to learn of them, because in Ireland agriculture is not in so flourishing a state as in England.

"Some few farmers have (to do them justice) practised this method in our own country ; but contenting themselves with the profit resulting from it, they have not propagated the knowledge of the many advantages they are sensible may be derived from this practice of giving salt to cattle.

"The farmers and horse-jockeys know well the use of salt ; they mix it often in their medicines, and find, by experience, that nothing proves so powerful a stomachic to horses, as a little salt thrown into their oats.

"I must farther observe, that the use of salt is very proper when cattle are turned into clover, lucerne, or coleseed to feed : it is well known, that, on these occasions, they are very apt, unless great care is taken, to be surfeited ; the salt would prevent this accident, and thereby greatly accelerate the fattening of the cattle, and make it much safer to the farmer.

"Salt has also been found to be of great service in fattening hogs, by causing them to drink more plentifully than otherwise they would."

Lucerne cut green and given to horses, has the same effect upon them as a salt marsh. The lucerne at first, and for several days, is in a great degree diuretic to them ; after which they thrive upon it surprisingly, and in a very short time they get in high order.

For the uses of salt in rendering hay more grateful to cattle, See the article BRINING of HAY-RICKS.

SAMPHIRE. A plant which grows on cultivated sea-mud.

SAND, a genus of fossils found in minute concretions, forming together a kind of powder, the genuine particles of which are all of a tendency to one determinate shape, and appear regular, though more or less complete concretions ; not to be dissolved or disunited by water, or formed into a coherent mass by means of it, but retaining the figure in it ; transparent, vitrifiable by extreme heat, and not dissoluble in, nor effervescing with acids.

These are subject to be variously blended and intermixed either with homogeneous, or heterogeneous particles, particularly with flakes of talc ; and according to these, and their different colours, are to be subdivided into several kinds, as red, white, &c.

Dr. Lister divides the English sands into two classes ; the first, sharp or rag sand, consisting of small transparent pebbles, naturally found on the mountains, and not calcinable : these he farther divides into fine and coarse, and subdivides each, according to the colours, into white, grey, reddish, brown, &c.

The second, soft or smooth, which he subdivides into that with flat particles broken from lime-stones, that with silver-like particles, and that with gold-like particles.

As to sand, its use is to make the clayey earth fertile, and fit to feed vegetables, &c. for earth alone, we find, is liable to coalesce, and gather into an hard coherent mass, as is apparent in clay : and earth thus embodied, and, as it were, glued together, is no ways disposed to nourish vegetables : but if with such earth, sand, &c. i. e. hard crystals, which are not dissolvable in water, and still retain their figures, be intermixed, they will keep the pores of the earth open, and the earth itself loose and incompact, and by that means give room for the juices to ascend, and for plants to be nourished thereby.

Thus a vegetable, planted either in sand alone, or in a fat glebe, or earth alone, receives no growth in increment at all, but is either starved or suffocated ; but mix the two, and the mass becomes fertile. In effect, by means of sand, the earth is rendered, in some manner, organical ; pores and interstices being hereby maintained, something analogous to vessels, by which the juices may be conveyed, prepared, digested, circulated, and at length excreted, and thrown off into the roots of plants.

Grounds that are sandy and gravelly, easily admit both of heat and moisture ; but then they are liable to these inconveniences, that they let them pass too soon, and so contract no ligature, or else retain it too long, especially where there is a clay bottom ; and by that means it either parches, or chills too much, and produces nothing but moss and cankerous infirmities : but if the sand happens to have a surface of good mould, and a bottom of gravel, or loose stone, though it do not hold the water, it may produce a forward sweet grass ; and, though it may be

subject to burn, yet it quickly recovers with the least rain.

Sea sand is accounted a very good compost for stiff ground ; for it effects the two things following, viz. it makes way for the tree of seed to root in stiff ground, and makes a fume to feed it.

Sand indeed is apt to push the plants, that grow upon it, early in the spring, and makes them germinate near a month sooner than those that grow upon clay, because the salts in the sand are at full liberty to be raised, and put into motion, upon the least approach of the warmth of the sun ; but then, as they are hasty, they are soon exhaled and lost.

It is remarkable that sand, though it appears a very hard, dense, and indissoluble body, yet is contained invisibly in the brine, or salt water of our salt springs ; and even on the shooting of the salt, after evaporation, there still remain the particles of it in the clear pellucid salt ; and this, though wholly soluble in water, yet when a brine, made by such a solution, is boiled, deposits as much of the sand as the common brine of the pits, or sea water.

Dr. Plot, who was very curious to know the true history of this singular effect, procured experiments to be made in the following manner : eight folds of fine holland, and as many of much finer cambric, were put together, and, a quantity of the brine of the Staffordshire salt pits being strained through this, there was nothing separated from it but a small quantity of black dust, which seemed to have fallen in by accident, and which was not at all like sand ; yet, on evaporating this brine, it was found to contain no less than one fourth part as much sand as salt ; the quantity of brine yielded a bushel of salt, yielding also a peck of sand.

Some have supposed from these, and the like observations, that the sand was generated during the time of the boiling the liquor, but the more careful examiners think otherwise ; it appearing to them, that the particles of this sand may be seen in the brine, by the help of a microscope, before the boiling, in form of rectangular oblong plates, some nearly square ; these were so small, as readily to pass the strainer with the water ; and appearing as numerous in it after, as before the straining, shew that they are no more to be kept, by such means, than the salt.

The pores of the finest strainers, examined by the microscope, appear twenty times bigger than these plates, or particles of the sand, and therefore it is not to be wondered at, that they let them through. There requires, therefore, no more to the formation of the sand, than the coalescing of several of these particles into one larger granule, and soon ; and this is very likely to be done by means of the evaporation of a part of the fluid which kept them separate, and of the motion given to them in boiling, which naturally and necessarily brought them into the spheres of their own mutual attractions, at a time when their attraction with the fluid they swam in, was also much diminished with its quantity. This attraction seems even evidently to increase between the particles, as the water becomes evaporated, and, when finally the salt is drawn from it, and it is examined, as it drops from the baskets, in which the salt is put to drain, it is seen to contain more numerous particles of this sandy matter than before ; and these are found to coalesce into yet larger concretions, by degrees, as the remainder of the fluid evaporates from them on the glass.

The particles of this stony matter, when once thus united, are no more to be separated by water, nor is the matter any longer soluble in that fluid. The common spar found in form of stalactites and incrustations on the roofs, walls, and floors of old caverns, shews that it was once dissolved in water, and by that means brought to those places, and made into those forms : and it should seem, that this sand, as it is called, was only this sort of spar, which is contained more or less in all water ; and which, on the evaporating of that water and separation of the salt, which might help in making the water a menstruum proper for the retaining it, shoots out into its own natural concretions ; for the figure of these thin plates is the true and natural thin parallelopiped or rhomboidal figure of the smaller concretions of that matter, and even of those pieces into which it falls on breaking. *Phil. Trans.* No. 145.

Common sand is a very good addition by way of manure to all sorts of clay lands ; it warms them, and makes them more open and loose. The best sand for the far-

mers use is that which is washed by rains from roads, or hills, or that which is taken from the beds of rivers; the common sand that is dug in pits never answers nearly so well. Sand mixed with dung is much better than laid on alone: and very fine manure is made by covering the bottom of sheep folds with several loads of sand every week, which are to be taken away, and laid on cold stiff lands, impregnated as they are with the dung and urine of the sheep.

Besides clay land there is another sort of ground very improveable by sand; this is that sort of black foggy land on which bushes and sedge grow naturally, and which they cut into turf, in some places. Six hundred loads of sand being laid upon an acre of this land, according to the Cheshire measure, which is near double the statute acre, meliorate it so much, that without ploughing, it will yield good crops of oats or tares, though before it would have produced scarce any thing. If after this crop is taken off, the land be well dunged, and laid down for grass, it will yield a large crop of sweet hay.

Once sanding this land will improve it for a vast number of years, that it will yield two crops of hay in the year, if there be weather to make it in. Some land in Cheshire has been, by this means, rendered of twelve times its former value to the owner. The bogs of Ireland, when drained, have been rendered very fruitful land, by mixing sand in this manner among the earth, of which they consist. Add to this, that in all these boggy lands, the burning them, or firing their own turf upon them, is also a great advantage. The common peat, or turf ashes, mixed with the sand for these purposes, add greatly to its virtue.

Sea sand, which is thrown up in creeks and other places, is by much the richest of all sand for manuring the earth, partly its saltness, and partly the fat and unctuous filth that is mixed among it, give it this great virtue. In the western parts of England, that lie upon the sea coasts, they make very great advantages of it. The fragments of sea shells also, which are always in great abundance in this sand, add to its virtues; and it is always the more esteemed by the farmers, the more of these fragments there are among it.

The sea sand used as manure in different parts of the kingdom is of three kinds: that about Plymouth, and some other of the southern coasts, is of a blue grey colour like ashes, which is probably owing to the shells of muscles, and other fish of that or the like colour, being broken and mixed upon it in great quantity. Westward, near the Land's-end, the sea sand is very white, and about the isles of Scilly it is very glittering, with small particles of talc; on the coasts of the North-sea the sand is yellowish, brown, or reddish, and contains so great a quantity of fragments of cockle shells, that it seems to be chiefly composed of them. That sea sand is accounted best, which is of a reddish colour: the next in value to this is the bluish, and the white is the worst of all.

Sea sand is best when taken up from under the water, or from sand banks, which are covered by every tide.

The small grained sand is the most sudden in its operation, and is therefore best for the tenant who is only to take three or four crops; but the coarse or large-grained sand is much better for the landlord, as the good it does lasts many years.

Where sand is dredged out of the sea, it is usually twice as dear as where it is taken from the sand banks.

When the land has been well manured with the large sand, they take four crops of corn from it, and then lay it down for pasture for six or seven years before they plough it again. The grass is so good, that they commonly mow it for hay the first year; it always abounds very much with the white-flowered clover. If the grass grows but short, it is the farmer's interest to feed his cattle upon it, and it will turn to as good account this way, being very sweet and rich, and making the cattle fat, and the cows yield a very large quantity of milk. *Mortimer's Husbandry. See CLAY.*

SAND-FLOOD, a terrible disaster incident to the lands of Suffolk, and some other parts of England, which are frequently covered with vast quantities of sand, rolling upon them like a deluge of water, from sandy hills in their neighbourhood.

Violent winds break through the turf that covers these hills, and then the sand, lying loose and naked, is soon carried down upon the plains, where it covers and buries the grass, and in a very little time eats through the light turf, and

mixing itself with the sand underneath, becomes one bed of this dry matter never to be covered with turf again. A large body of sand being thus got together, nothing stops its progress; but it, at every storm, rolls over more and more ground, so that in a few years it extends itself a vast way, especially where the ground, over which it passes, is of the same sandy nature, and only covered with a thin turf.

In some parts of Suffolk the ground encourages this change so greatly, that a bed of sand broke loose from a neighbouring hill, and covering only a few acres, perhaps eight or ten, will, before it has travelled four miles forward, which it does in a small course of years, deluge a thousand acres. It travels down hills faster than any way else, but will not be stopped by ascent, but will move up the steepest hill, only that it requires more time. The making of fences, in the common way, to keep it out, is in vain. It runs through the hedges, and flies over the tops of the banks; and when it reaches a village, in its course, will bury the cottages, unless preserved at more charge than they are worth. It will in a very little time beat up to the eaves of a house, of the low kind, that are usually built in a country village, and has often weight enough to break down walls in its passage.

The best way of stopping its progress is by hedges of furze, planted one over the other, as they become levelled; these, if well kept up, will by degrees, stop or divert the progress; and some who have tried this, with resolution, after they have had the sand raised twenty feet high, have found it stop its increase, and then, having manured this adventitious soil with dung, found it as good ground as that which made the surface before.

About Thetford, the villages were wholly destroyed by this about ninety years ago, and the branch of the river Ouse, called then Thetford river, so blocked up by it, that very small vessels only could go up it, where very large ones used before. The river has been of great service in stopping its progress into Norfolk, where otherwise its course would have carried it, and its vast spreading sideways, in proportion to its going forward, would have made it bury vast quantities of land in a few years.

The most probable conjecture, as to the cause of this strange sort of deluge in these parts of England, is, that this portion of the country of Suffolk lies east north east of a part of the great level of the fens, and is by this exposed to very impetuous winds which acquire more than ordinary force by their passing through so large a tract of country uninterrupted; the storms seem to be one great cause of the mischief, and the sandy nature of the soil the other. There are old stories, in the country, of suits at law commenced among the farmers, for grounds blown out of the owners possession; but the people who gain this sort of wandering land are the greatest sufferers. A little sand sprinkled by the winds over a tract of land, where there is a bed of sand under the turf, soon eats through that obstacle; and what was at first only a thin coat of sand, becomes then a deep plain of it, capable of being blown away to the depth of eight, ten, twenty, or more feet, and is carried over every thing in its progress before the winds, when once taken up by them. *Philosophical Transactions, N^o. 37.*

SAND-lands, or Sandy lands, a term used by our farmers to express such grounds as consist wholly of a pure-sheer sand.

This is of different colours, as white, blackish, reddish, or yellowish, and is very different in its nature, and in the size of its particles, some being harsher and some milder, and some very light, seeming only to be mere dust. The grey, black, and ash-coloured sand-lands are the worst of all, and generally are found on heaths and commons. Gravelly lands approach much to the nature of these, and those which consist of the largest stones, and are mixed with the hardest sands, are of all the most barren.

The properest plants for arable land, of this kind, are white oats, rye, buck wheat, and turneps. The natural produce, in weeds, is quick grass, sorrel, broom, furze, fern and heath.

The best manure for them is either marle, or such clay as will break with the frosts. Cow dung is also a good manure for these lands, and many use with success chalk, mud, and the half rotten straw from dung-hills.

When the farmer has a mind to raise corn on these lands, he must order them the same as they do the clays; but where they are over-run with broom, furze, and such sort of weeds, marle is to be laid on in great quantities. This is

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the practice in Staffordshire, and by it they rid themselves of these troublesome weeds, and procure good crops of corn, though at some expence.

The first sowing of this land is with buck-wheat, and for this they make three fallowings in winter and stir them in the May following; at this time they sow them, allowing one bushel of seed to an acre, which yields them sixty again. Then once plowing these lands after this crop is off, they are fit to sow rye on.

In Oxfordshire, they seldom give these lands more than two fallowing for wheat, except they are very much over-run with weeds; and they esteem the white and Lammas wheat the most agreeable for this sort of land, and then after a allow rath-ripe barley. They afterwards generally fallow them every other year, and reckon them unfit for beans and peas though they sometimes sow them with winter vetches. If they sow peas on them, they esteem the rath-ripe kinds the best.

In Herefordshire, they are much subject to moss growing upon their sandy lands, and they make a great improvement by burning it on the ground, and mixing the ashes with lime, which they plough in.

They generally sow them with rye after this manure, and that yields a very great increase upon them, and brings on a very good kind of grass, if they are laid down after a crop or two. *Mortimer's Husbandry.*

SAP, a juice furnished by the earth, and changed into the plant, consisting of fossil, saline, aerial, and other particles from putrefied animals, vegetables, &c.

This juice enters the plant in form of a fine and subtile water: which the nearer it is to the root, the more it retains of its proper nature; and, the farther from the root, the more action it has sustained, and the nearer it approaches to the nature of the vegetable.

Consequently when the juice enters the root, the bark whereof is furnished with excretory vessels, fitted to discharge the excrementitious part, it is earthy, watery, poor, acid, and scarce oleaginous at all.

In the trunk and branches it is further prepared, though it still continues acid; as we see by tapping or perforating of a tree in the month of February, when it distils a watery juice apparently acid.

The juice being here carried to the germs or buds is more concocted; and here having unfolded the leaves, these come to serve as lungs for the circulation and further preparation of the juice.

For these tender leaves, being exposed to the alternate action of heat and cold, moist nights, and hot scorching days are alternately expanded and contracted, and the more on account of their reticular texture.

By such means is the juice still further altered and digested as it is further in the petala or leaves of the flowers which transmit the juice, now brought to a further subtilty, to the stamina: these communicate it to the farina or dust in the apices, which is, as it were, the male seed of the plant, where having undergone a further maturation, it is shed into the pistil, which performs the office of an uterus or womb; and, thus having acquired its last perfection, it gives rise to a new fruit or plant.

The root or part whereby vegetables are connected to their matrix, and by which they receive their nutritious juice, consists of an infinite number of vasa absorbentia, which being dispersed through the interstices of the earth, attract or imbibe the juices of the same: consequently, every thing in the earth that is dissoluble in water, is liable to be imbibed: as air, salt, oil, fumes of minerals, metal, &c. and of these do plants really consist.

These juices are drawn from the earth very crude; but by the structure and fabric of the plant, and the various vessels they are strained through, become changed, further elaborated, secreted, and assimilated to the substance of the plant.

SCAB, a disease incident to sheep, chiefly occasioned by a tedious length of wet weather.

"I imagine, says Mr. Vesey, your readers will not be displeased if I should, with your assistance, communicate to them a remedy for this disorder, which I have several times tried, and almost always found to answer extremely well.

"Some men, whom I have known to breed and feed a great number of sheep, have been grossly mistaken in their comprehension of the nature of this distemper, which they rashly judged to be merely cutaneous; whereas, when a sheep has the scab, the blood is always more or less affected by it: therefore the outward applications, which are in gene-

ral alone resorted to for a cure, do for the most part more hurt than good, by driving in the eruption, and making it fix on the internals, thereby often occasioning the death of the animal.

"Now the true way to treat this disorder is, first to give the animal something inwardly to drive out the eruption; then comes, with propriety, the outward application, which completes the cure by killing the scab.

"When a farmer has any of his flock afflicted with the scab, let him attend to the directions which follow:

"Take a gallon of soft well or pond water, which divide into two equal parts: in one of these parts dissolve eight ounces of old hard soap; to which when it is dissolved, add two ounces of spirits of hartshorn, and seven ounces of common salt, with four ounces of roll brimstone, beat to a fine powder and sifted: then take the other part of the water, in which put two ounces of tobacco leaf, and one of white hellebore root: boil this second part till you have a strong infusion, after which strain it clear from the leaves and roots.

"When you have got thus far in the process, take that part of the water, first mentioned, and set it over the fire; let it boil for about half an hour, keeping it continually stirring with a wooden ladle during that time: in the mean time heat again the other part, in which the tobacco and hellebore were infused; and when it is hot, mix the two parts gradually together over the fire, keeping the mixture continually stirring till it is taken off the fire, which should be in about a quarter of an hour: when it is quite cold, let it be put into a stone bottle, in order to its being kept in a cool place for use.

"Then take four quarts of new ale or beer: put into it twelve ounces of common salt, two ounces of bay salt, and eight ounces of pounded nitre, together with twelve ounces of pounded roll brimstone: set them over a gentle fire, and when the ale boils, take off the scum; let it boil for about half an hour; after which set by till it is cold, and put it into a stone bottle for use.

"When you are so far prepared, take one quart of ale, set it on the fire: mix into it by degrees, three ounces of flour of brimstone: when it is just ready to boil, take it off the fire, and let it stand to cool; and when it is only blood-warm, give this quantity inwardly to three sheep, which is to be repeated every second day till they have had three doses. This will drive out the disorder, when the first mixture is to be rubbed on the distempered part: and two days afterwards the second, and so alternately for about eight or ten days, till the cure is affected: sometimes two rubbings will be sufficient.

"I must observe that all these mixtures will be best boiled in well glazed earthen or iron pots." *Museum Rusticum*, vol. II. p. 173.

"The two greatest enemies the sheep, says another ingenious gentleman, or at least their wool (which is the most valuable part of them) have, are the scab and fly. I believe they destroy more wool than all the other diseases incident to that animal.

"Mr. Vesey has given us an approved remedy for the scab, and at the same time enters somewhat into the nature of that distemper. For my own part, I have not presumption enough to look into first causes: secondary ones are all I aim at: I always took nature to be an instructor, and the surest guide; but if we will hobble out of the way ourselves, she is not to blame.

"I agree with Mr. Vesey, that in this, and every other distemper a sheep labours under, the blood is more or less affected and disturbed: which disturbance, if I am not mistaken, the faculty call a fever; therefore it must be always considered, that a fever is [no more than a struggle of nature to get rid of some enemy in the blood, by throwing it out by some of the outlets of the body, namely by sweat, urine, or stool; or upon the surface of the skin; and then she seems to say, I have thrown the distemper out to your view, and there destroy it by proper applications.

"It surely is no scab until it is thrown out upon the skin: and when it is thrown out, what avails it giving internal remedies, to do that which nature has done before? If it be out, there's your ailment; and I think, gentlemen, it is an axiom in physic, that when a distemper is once known, it is half cured: if it is only coming out, my advice would be, not to disturb nature, who is always acting for our good in a wiser and better manner than we can do ourselves: she sometimes indeed is too weak for her office, and sometimes too strong; in the one case she is to be properly

perly afflicted, and in the other, prudently restrained: and when we do more or less, the effects are generally fatal. I hope this will satisfy Mr. Vesey, that he is not altogether in the right any more than his neighbours.

"To cure an illness with a few medicines, is as commendable as to say a great deal in a few words. One great obstacle to Mr. Vesey's treatment of sheep with scab, is its being too compound, troublesome, and laborious, setting aside the expence; and, where there are a great number of sheep, hardly to be practised. I would have all remedies for the ailments of sheep be as simple as possible; and to be obtained and prepared with as little trouble; for certain I am, gentlemen, when it is otherwise, many will let their flocks go neglected, or at best leave them to a slovenly shepherd, who knows very little of the matter: and when clip-day comes, when the poor creatures are out of their wool, (if they had any on before) what a sight presents itself to view! most parts of their skins being one continued scab, and other parts eat quite through, and deep into the flesh, by the maggot: this I have seen at clip-day, and may speak it; but what must I alledge it was owing to? sorry am I to say, to the over credulity of the master, who thought he had a shepherd who knew every thing; but the event proved the contrary.

"You must not be surprised when I say, what will destroy the fly will also cure the scab, with little or no alterations: mercury is a mortal foe to both; and the remedy for the fly is as follows:

"Take of good corrosive sublimate half an ounce: dissolve it in two quarts of rain water: to which add a gill of spirits of turpentine: this is the whole of it, which must be used in the following manner:

"When the sheep is struck, the shepherd must make a circle round the maggots with some of the water, by dropping it out of a bottle: this prevents them getting away, for they will not come near the water: then he must shred or open the wool within the circle, and drop a few drops of the water amongst them, and rub them about with his finger, and there leave them, for they will all die presently.

"I speak this from my own certain knowledge, and many others in this part of the country (Isle of Ely) can do the same.

"To a quart of the above water I add a pint of the simple lime water of the London Dispensatory; and I declare it from experience, there is no more certain cure for the scab than it: I am sure it is the cleanest, the soonest prepared, and when so, the cheapest; which are inducements, I think, sufficient to have every countryman make use of it." *Museum Rusticum, vol. II. p. 369.*

SCAB, or ITCH, a distemper in horses, proceeding from their being over-heated, and corrupt blood; to cure which you must let him bleed and purge him: for this take of the root of wild cucumber, and reduce it to powder; infuse it in a pint and a half of white wine for three hours, and give it him to drink, and he will soon be well.

If the distemper appears outwardly, rub all the parts of the horse's-body that are affected with ointment, called *Ægyptiacum*, or *Unguentum Apostolorum*.

SCABBARD, is the skin that serves for a sheath or case to a horse's yard.

SCABBED HEELS in HORSES, a distemper called also the frush.

Sometimes the frush falls away by degrees, by reason of an eating scab which penetrates to the quick, and causes so great an itching that the horse cannot walk without halting; but these sores are not so dangerous as they are troublesome.

Before the horse grows lame, his feet will stink like old rotten cheese, so that you easily discover the nature of the grief, since you cannot possibly come into the stable without smelling it; and besides the horse will sometimes beat the ground with his feet, by reason of the intenseness of the itching.

To begin the cure, you must pare the frush as near as you can with a buttress, and having quenched a good quantity of unslaked lime in vinegar, and strained it, boil it, and throw it boiling hot upon the frush: after you have done this, apply a restraining charge of powder of unslaked lime, mixt with the second water, or the black restraining, made of foot, vinegar, and whites of eggs.

The following ointment, called the countess's ointment, is also very useful in these cases: in half a pint of aqua-vitæ boil a pound of honey in a clean glazed pot, over a gentle

fire, stirring it till the honey is thoroughly heated and incorporated with the aqua-vitæ; then add verdigris, Venetian borax, and gall, of each two ounces, searfed through a fine searse, with two ounces of white vitriol pounded.

Boil these all together over a small-coal fire, stirring them till they be well incorporated; and keep the ointment for use; this will cure in three or four applications; but the dressing must be kept on with splents.

If the disease return after the sore has been cleansed, then apply the following ointment, which is called the neat-herd's ointment:

Take burnt allum and borax in fine powder, of each two ounces; white vitriol and verdigris, of each four ounces, very finely powdered; put these into a very clean pot, with two pounds of honey, and boil them over a clear fire, stirring all well together, till they be well incorporated; when the ointment is cool, stir two ounces of strong aqua-fortis; keep it well covered for use, and stir it once a day, for the first six days.

This ointment will heal them, though the internal cause can hardly be removed; and besides the horse may be let bleed in the toe, from time to time.

For preservation, the frush ought to be paired often, and the place rubbed once or twice with the second water, which will waste away part of the corruption, and dry up the roots of the scabs so effectually, that they will not break forth again for a long time; then bathe the feet daily with the following water:

Boil allum and white vitriol, of each a pound and a half, in a gallon of water, till it be wasted to two quarts at least; when you perceive the itching to be gone, melt tar, or black pitch, upon the scabs, and keep the horse's feet well picked, and free from dust or any other filth that may dry them.

Or take of rectified spirits of wine, and the sharpest vinegar, each two ounces: tincture of myrrh and aloes, one ounce; of *Ægyptiac* ointment, half an ounce; mix them well together.

After washing the part with this mixture, dip a pledgit of tow into it, and secure it in the best manner you can.

During the use of this, it will be necessary to give a purge once in six or eight days, and in the intermediate days the diuretic medicines proposed for the grease; which see.

SCIATICA, or RHEUMATISM. A disorder horses are liable to: to cure which, take half an ounce of oil of turpentine, and two ounces of camphorated spirits of wine, with which rub the part well, and let the horse have rest for a fortnight, and the complaint will be removed.

SCOWRINGS for HORSES; are those gentle, wholesome, and natural medicines, which, not stirring up any great flux of humours, only keep the body clean from such as are apt to rise or grow, being every way as wholesome in health and sickness, and may most properly be termed preparatives or preparers of the body, to entertain stronger remedies.

There are several kind of them prescribed, but the most gentle and natural is grafs, which you should give him for fifteen days together, after which time it will fatten him.

The best grafs for this purpose, is that of a new-mown meadow, for that will rake his guts very well, and not fatten: but if you would have him fatten, you must put him into some other pasture, which has not been mown, next to this forage, i. e. only the blades of green corn, as wheat, rye, barley, &c. given him for seven days and no more, will cleanse and cool his body; the like also will the leaves of fallow, the elm, or green thistle, do.

A mash of malt, taken in a larger proportion than is directed under that head, mixed with a handful or more of beaten hemp-seed is also a gentle medicine in this case.

Other sorts of scowrings there are; particularly after sweat, take half an ounce of rosin, or jalap in powder; as much of cream of tartar powdered, as also of liquorice in powder; make them into balls with fresh butter, of about the bigness of a small walnut, and give him four or five at a time in a hornful of beer, one after another.

One of a stronger nature is to mix a handful or two of hempseed with oats, or take a handful of the powder of dried box-leaves, and as much of brimstone, and mix it amongst his provender; these two purge the head, stomach,

and entrails, will kill all kind of worms, and dry up phlegm.

Another prescription is, to take fallad-oil half a pint; a pint of new milk from the cow; brew it together, and give it him lukewarm; or else take a pint of muscadine, and half a pint of fallad oil, and give it him to drink; or the same quantity of oil and sack, mixed together, and give it lukewarm; this has much the same effect as the others, and is good for any manner of cold, stopping the wind-pipe; and if you add a quantity of sugarcandy thereto, it will be the better.

But for such horses, whose grease must necessarily be melted, as running, hunting-horses, and the like, first take twenty raisins of the sun, with the stones picked out of them, ten figs split round-wise, boil them in two quarts of running water, till the water be consumed and thickened: then take powder of liquorise, aniseed, and sugarcandy, finely searfed, and mix it with the raisins and figs, stamping and working them together till they become a stiff paste, then making round balls thereof, of a tolerable bigness, roll and cover them all over with fresh butter, and give as many of them to the horse as you shall think suits his strength, provided the day before you give him such exercise as will raise his grease, and that immediately before you give him the medicine, you also warm him thoroughly, that the humours being again stirred up, it may the more effectually work.

Another very good receipt to purge a horse from all grease, glut, or filthiness within his body, is to take three ounces of aniseed, six drams of cummin-seed, a dram and an half of cathamus, an ounce and two drams of fenugreek seed, an ounce and a half of brimstone, all which beat to a fine powder, and searfe them: then take a pint or two of fallad oil, a pound and a half of honey, and of white wine two quarts; and this with as much fine wheat flour as is sufficient: make all into a stiff paste, and knead and work it well, which you are to keep in a galley-pot, close covered, for your use.

Now when the horse has been hunted, and is at night or in the morning very thirsty, take a ball of it as big as a man's fist, and dissolve it in a gallon or two of cold water, and it will make the water look as white as milk; then give it him in the dark, lest the colour displease him; if he drinks it, then feed him; if he does not, let him fast till he takes it, which certainly he will do at twice or thrice offering, and when he has once taken it, he will refuse all other drink for it, and you cannot give him too much nor too often of it, if he has exercise.

SCRATCHES, a distemper incident to the heels of horses.

It has so much affinity with the grease, and is so often a concomitant of that disease, that the method of curing the scratches may be selected from that article.

The parts affected should be first covered with the linseed and turnep poultice, having a little common turpentine added to relax the vessels; the green ointment may then be applied to promote the discharge, when the scratches may be dried up with the ointments and washes recommended in that article. See GREASE.

It is best afterwards to keep the heels supple, and softened with curriers dubbing, which is made of oil and tallow. This will keep the hide from cracking, and be as good a preservative as it is to leather; and by using it often before exercise, will prevent the scratches, if care is taken to wash the heels with warm water, when the horse comes in. When they prove obstinate, and the sores are deep, use the following; but if any cavities or hollow places are formed, they should first be laid open, for no foundation can be laid for healing, till you can dress to the bottom.

Take Venice turpentine four ounces, quicksilver one ounce; incorporate well together by rubbing some time, and then add honey and sheeps suet, of each two ounces.

Anoint with this once or twice a day; and if the horse is full of fleshy, you must bleed and purge; and if the blood is in a bad state, the alteratives must be given to rectify it. *Bartlett's Farriery*, p. 294.

There are a multitude of receipts for this purpose, but I shall prescribe only some of the chief.

Take brimstone finely powdered, mix it with sweet butter, and anoint the part with this once a day.

Take a handful of the tender tops of elder-buds, and as many bramble-berries, before they are ripe, and when they are red, bake them in two quarts of wort, and about the quantity of an egg-shell of allum, with which water, very hot, wash the sores twice a day.

Let the horse bleed in the shackle-veins, spur-veins, and the fore-toe veins, only let it be three days between the bleeding of the one toe and the other; then rub the sores till they be raw and bleed, with a thin hay rope.

Having boiled half a pound of allum in a quart of stale urine, and a quart of strong brine, till they come to a quart, wash the sores well with the liquor; afterwards having procured the sperm of frogs, in the month of March, put them into a pot, and let it stand for a week, in that time it will look like oil: spread this, with what round things appear in it, on a cloth, and bind it on the sores, repeating this several times. This has cured, when the disease has been thought incurable.

But the best of all medicines, and which scarcely ever fails to cure the scratches, is, if the horse be of a strong body and good stature, give him an ounce and a half of the best aloes you can get, pound it to a very fine powder, and mix it with very good butter, working and mixing it very well with a knife, then divide it into three parts, every one of which cover again with fresh butter, and make them as big as a good middling wash-ball; give the horse one of these in the morning fasting, upon the point of a stick, and a little while after ride him to warm his body, which will cause them to work the better: then bring him into the stable and keep him warm, and let him fast two or three hours; when you are to give him a mash of malt, let him eat a little hay, and then ride him softly for two or three hours.

After the balls pour down a horn or two of warm beer, and if you find him purge too much, so that it takes his stomach quite away, give him two wild briar-balls pounded to powder, in a quart of warm beer, and it will soon stop it; or if you have not the briar-balls, boil some cinnamon, pepper, nutmeg, ginger and bay-berries in the beer.

But if the horse does not purge at all, ride him to some green corn that is not cut, or for want of that, to some four grafs, and let him feed on it for about a quarter of an hour, then ride him gently home, set him up warm, and he will purge very kindly without danger.

SCYTHE, **SITHE**, or **SYTHE**, the instrument used in mowing, being a crooked blade joined at right-angles to a long pole. See the article MOWING.

SEAGRIM. See RAGWORT.

SEAM, tallow, grease, hogs-lard.

SEAM of Corn, a quarter, or eight bushels.

SEAM of Wood, a horse load of wood.

SEAR, dry; opposed to green; spoken of wood.

SEARCHER. See the article BORER.

SEAVES, rushes.

SEAVY Ground, ground over-run with rushes.

SEED, the product of a plant, whereby the species is propagated.

The choice of the seed intended to be sowed is an object of greater importance than many farmers seem to imagine. It is not sufficient that the finest grains be chosen for this purpose, unless they are likewise very clean. Such wheat is not difficult to be had from land cultivated according to the principles of the New Husbandry; but we seldom find corn entirely free from seeds of weeds when it has been raised in the common way.

It is natural to suppose, that the grains of flinted and sickly corn necessarily partake of the weakly disposition of the plant which produced them, and that their productions cannot be so fine as those which grow from the seeds of strong and healthy plants. For this reason Mr. Tull advises to take the seed corn from a richer soil than that in which it is to be sowed, and rather from ground in perfect tilth, than from land which has been less carefully cultivated. This seems to be very right (though the contrary opinion is almost generally received), because more may reasonably be expected from the productions of a fine good seed, which are full of vigour and well conditioned, than from a poor weak plant.

M. de Chateaubieux, who often sowed with no other intention than merely to try, for the benefit of mankind, at what time, in what manner, and in what condition, it is best

best to sow wheat, found that this corn sprouted pretty well even when sowed so green that it had not yet lost its milky quality; but thinks it much more advisable to sow none but what is thoroughly ripe; because the seed has then attained its full perfection, from whence we may most certainly expect the best and strongest plants.

"The wheat, says he, which has been reaped in a warm dry year, seems to me fitter for sowing, than that which has been gathered in a cold wet season: for in such a time as this last, all the productions of the earth are less good; their taste is less savoury; and as that corn in particular in which there is most moisture, is most difficult to keep, I infer from thence that the formation of its grain must be less perfect. I should therefore prefer wheat a year old, provided the year it was gathered in was warm and dry, to that which may have just been gathered in too rainy a season: for the same reason, I always choose for sowing, wheat of the growth of my high grounds, rather than that which has been produced in flats. The benefit accruing from all this care, may, perhaps, not be extremely great: but at the same time it does not cost any thing. Let us do in agriculture what is done in all manufactures, where the very smallest profits, the very least savings, are not neglected. Those small articles, often repeated, make large sums in the long run, and are a real gain.

"Another thing, of greater consequence, first made known to me by chance, but since confirmed by repeated experiments, always attended with the same success, I strongly recommended as extremely serviceable to the first sprouting of the seed. In my experimental sowings, I commonly used wheat taken from the heap in the granary; and likewise, frequently, corn picked out of the ears the moment before I sowed it. I counted exactly the grains of both sorts, and suppose that few will think there could be any difference in their productions. Yet I found a considerable one. What was picked out of the ears always rose extremely well; scarce a grain of it ever missed; whereas numbers of those which were taken from the heap, never sprouted at all. I did not perceive this difference at first; but at last it struck me. I relate the fact as it is, without pretending to account for the cause of this difference, which would lead me into too long a digression. The experiment itself may be of real use, by shewing us, that instead of threshing the wheat intended for seed at any time, without distinction, it ought not to be threshed till a very few days, at most two or three, before it is sowed. A few hands will be able to supply the seeds-men with as much as they will want: nor will this method, which may be a means of saving somewhat in the seed, be attended with any extraordinary expence.

"Perhaps too this practice may be attended with a very valuable advantage. I have not indeed yet made the trials necessary to satisfy myself of what I imagine; but my desire to be of service to the public induces me to mention it, that the lovers of agriculture may reflect upon it, and try such experiments as will clear up my conjectures.

"Threshing the seed only just before it is sowed may possibly, in some measure, or perhaps intirely, prevent the cause of smut in wheat. By this I mean, that the seed which has not been mixed with smutty corn, or any way infected by its black powder, will be exempt from that distemper. Not that I take black powder to be absolutely the original cause of this distemper in corn; but I believe it is very capable of communicating it to grains which are sound.

"That nothing may be neglected which can be of any service to the seed, great care ought to be taken in threshing the corn, especially in the manner that business is commonly performed, with flails, upon the barn floor: for a great number of grains are frequently so much bruised thereby, that it is impossible they should ever grow. If the wheat thus threshed for seed is not thoroughly dry and hard, the mischief is still greater; much more of it being then absolutely crushed by the flail.

"As sowing in drills requires less seed than is used in the common method, it will be easier to execute there an operation which might be too long and troublesome for so great a quantity as is used in the old way. The method which I advise, and which I have practised, is this. Let one or two beams, two feet and a half, or three feet thick, be laid across the barn floor; let the threshers stand on each side of the beam, and take out of loose sheafs of wheat, one of

which should be placed behind every man, a handful at a time, and give it two or three strokes against the beam. This will bring out a great deal of grain, which is to be reserved for seed. The ears thus shaken may be bundled up again, and afterwards threshed out with the flail, for other uses. This method is not so tedious as some may imagine: we are sure that not a grain is bruised; and those are the most perfect which drop out thus. I think I may compare this operation with what is done in the making of wine, where the first running is always the highest flavoured and best.

"Another excellent way to separate the fullest, and consequently heaviest grains, which are undoubtedly the fittest for seed, from those which are of less value for that purpose, and at the same time to clear them from many seeds of weeds, is, to make a stout man, with a broad wooden shovel, throw the corn with all his force towards an opposite corner of the barn, or rather of a large boarded hail, which generally is the fittest for the work. All the light, small, shrivelled grain, unfit for sowing, and the seeds of cockle, darnel, &c. not being so heavy as the solid corn, will fall short, and lie nearest to the man who throws them; while such as are large, plump, and weighty, out flying all the rest, are separated widely, and may easily be gathered up. Experience will shew the vast advantages of sowing seed thus chosen.

"The use of steepes was introduced very early into husbandry, not only as a means of preserving corn from several distempers to which it is subject, but also with a view to render the seed more fruitful. That some of them have sometimes answered the former of these instances is undeniable: but with regard to the latter, much stronger and oftener repeated evidences than any that have yet been produced, are still wanted to confirm their boasted efficacy. I shall, however, give a concise account of some of the most famous of both kinds; with this previous observation, that even such of them as have not succeeded in some cases, through causes perhaps unknown to us, may possibly do well in others, when tried with proper judgment and attention. Experiments of this kind should by all means be continued on a double account; first, to take off a prejudice which seems to gain ground, though it be not founded on any rational principle; and next to be well assured whether these preparations do or do not produce any sensible effect. Experiments seldom prove useless to careful and accurate observers. If they do not always answer the end proposed, they at least sometimes lead the way to other important discoveries.

"The Romans had their lees of oil, decoction of cypress leaves, juice of house-leek, &c. on which they have bestowed full as much commendation as they merit. Lord Bacon seems to be the first who has paid any attention to this subject in England: but he has only pointed out the path to others: nor do I know any author who has yet given us a set of experiments with this view, long enough continued absolutely to determine what effects some kind of steepes may have towards rendering grain more fruitful."

Van Helmont, and, since him, the authors of the *Maisons Rustiques*, having given many receipts for steepes, which they vaunt exceedingly, as increasing the fruitfulness of the seed steeped in them. But at the same time that they recommend these receipts, they advise sowing the corn thinner than usual; generally one third less; a circumstance which, alone, will add greatly to the crop, as very many experiments, and particularly all the good trials of the new husbandry, have evidently demonstrated. That the comparison may be just, all circumstances should be alike, as to the goodness of the soil, the quantity and quality of the seed, &c.

M. Duhamel, to satisfy himself whether any benefit does arise from the use of steepes, by way of giving the seed a greater degree of fruitfulness, tried the following experiment. He infused some good wheat in a lye of dung, mixed with lixivial salts, nitre, and sal ammoniac, and sowed with this grain two beds in his kitchen garden, dug with a spade. One of the beds was sowed very thick, and the other very thin. At the same time he sowed two other beds, exactly like the former, with some of the same seed, not steeped, one thick, and the other thin. At harvest time the beds sowed with the steeped seed were so exactly like the others, that it was impossible for the eye to distinguish between them.

A gentleman in his neighbourhood followed exactly the directions given in the *Maisons Rustiques*, in the use of one

one of their boasted receipts, which is there said to be of such efficacy, that the land need be plowed but once for wheat prepared with it. He did so; and his crop was scarce worth reaping.

On the other hand, M. Duhamel mentions his being informed by M. Peirol, many years secretary to the intendant of Auvergne, that he had made several experiments in imitation of those mentioned in abbé de Vallemont's famous book. In the month of May 1755, he planted in his garden (an indifferent soil in a hot exposition) four small cabbages, which then had only four leaves. In September following, the same cabbages were six feet and a half in circumference. Some plants of red wheat, transplanted into a bed dug very fine in his garden, bore one hundred and thirty ears a piece, each of which contained from forty to eighty grains. Some plants of white wheat, transplanted at the same time, produced an hundred and twenty ears, each of which had from thirty to forty grains. Two grains of red wheat, sowed in the same bed, and not transplanted, produced each of them one hundred and forty ears, which contained six thousand grains. Five plants of red wheat, distant from one another six inches, did not branch so well, being too close together: but each of them produced from forty to fifty ears, which contained from forty to sixty grains. Rye, which branches less than wheat, produced from thirty to thirty-five ears, each containing from sixty to seventy grains: and the barley of that country, which branches but little, produced however from sixty to eighty stalks, though the seed of this last had not been steeped in any liquor before it was sowed.

The author of these experiments judiciously observes, that they must be repeated and varied, before it can be made to appear that the extraordinary increase is owing to the steep.

This celebrated liquor of the abbé de Vallemont is made as follows:

Put into a tub, exposed to the south, one bushel of horse-dung, the same quantity of cow-dung, half a bushel of pigeon's-dung, as much sheep's-dung, as much ashes, three gallons of small pricked wine, two pounds of saltpetre, and as much water as will sufficiently dilute the whole, so as to make it thin enough for use. Every time that any of this liquor is taken out to sprinkle the plants, it is filled up again with water; and as it may be too strong at first, it may be weakened accordingly.

It is essential to observe, that M. Peyrol added to this infusion frequent digging; for the ground was dug five times between the plants of wheat: and he observed that each digging sensibly gave fresh vigour to the plants, which grew to the height of six feet.

M. Donat, another of M. Duhamel's judicious correspondents, made trials of these mixtures, from the use of which so much is promised: but says he thinks them of no other service, than to amuse the curious, who do not regret expence. As the authors of them boast that all kinds of soils, whether good, bad, or indifferent, well or ill ploughed, rested or not rested, will produce ten times more than in the common way; this gentleman sowed a large extent of ground, some good, some bad, some well, and some ill ploughed, &c. He made the steep himself, was present when the seed was sowed, and took care that no circumstance was neglected. But notwithstanding all his care, his crop was far from answering their promises. The good, well cultivated soil, produced fine wheat; but not extraordinary in point of quantity. The only advantage was in the saving of the seed. The poor ill cultivated land, and that which had not been rested, produced very little grain: and the very bad soil, none at all. These experiments convinced M. Donat, that the surest means of obtaining good crops, is, to have the ground in good condition. This is the principle on which the New Husbandry is founded: nor indeed does it offer any thing marvellous, or contrary to the most ancient precepts of good husbandry.

If there be in any of these steeps, or preparations, a more than common virtue, by which the grain infused in them is rendered more prolific than it would otherwise be, possibly some such benefit may accrue from the following practice, which is recommended by the author of the New System of Agriculture.

"Take, says he, the corn which is intended for sowing, and throw it, by a bushel at a time, into a large vessel full of water; let a man stir it with a staff, as violently as he can, for a considerable while together, and then giving it a little time to settle, skim off all that swims on the surface: repeat this till no more rises; then take out the corn which

has sunk to the bottom; and lay it by for seed; proceeding in the same manner till you have your intended quantity. After this, make a brine of bay-salt and rain-water, strong enough to bear an egg. Steep the seed corn in this liquor during thirty hours; for less time will not have any effect: then take it out, spread it upon a smooth floor, strew over it a good quantity of fine-ground powder of slaked lime, and sweep the whole up and down till each grain leaves clinging to another, and becomes, as it were, perfectly candied with the lime. It is then fit for sowing; and will infallibly produce a very abundant crop." Some farmers vary this steep, by adding to it a mixture of pigeons or other dung; and in most parts of France, where this receipt is known, they omit the salt; perhaps because it is too dear in that country, and steep the wheat in lime-water. For this purpose they put it into baskets, and carefully skim off all that swims on the top, most of which would not sprout, and is only fit to feed fowls.

The society of improvers in the knowledge of agriculture in Scotland, call the following a very promising receipt for multiplying corn: but as no experiment that we know of, duly attended to, has yet confirmed that surmise, we can only say, that it may not be wrong to give it such farther trials as will not hurt the experimenter, whether they do or do not succeed: a rule which should be constantly observed in all experiments.

"Take as much water as will fully cover the quantity of grain you intend to use; add thereto a reasonable quantity of a mixture of horse, cow, and such other dung as you can conveniently get, so as not to make the water too thick: add likewise for every boll (four bushels) you are to steep, about a peck or a sixteenth part of the same sort of grain as you are to steep. Boil all these till the grain is reduced to a pulp; keeping the kettle or cauldron close covered, to retain the steam. When the boiling is over, pour off the water, and dissolve in it a pound of nitre, or salt petre, to every four bushels of corn: then, while it is lukewarm, infuse your corn for three days; after which, drain off the water, spread the grain on the floor, mix it with a sufficient quantity of sea-sand (if such can be conveniently had), and lastly, with lime, to dry it, as is usually done in other cases."

"It seems reasonable to think," say the abovementioned society, "that nothing can be more natural for impregnating grain, than the strength and essence of itself. But, since nitre is added, it is best to be cautious; for it has been found by experience, that salts, though they have the virtues mentioned, kill or destroy the vegetative powers, when the application is immoderate, either with respect to the quantity, or the time the grain is steeped; so that there has often been a necessity to sow over again with the same, or some other grain. To make the better judgment concerning this critical affair, the nature and condition of different grains are carefully to be considered; but the most certain knowledge and direction are to be obtained by a course of observations and experience. Mean while, it is better to observe the maxim, avoid extremes."

In Mr. Houghton's collection of papers relative to husbandry and trade, are several experiments on the steeping of wheat and barley in a liquor which is there said to have occasioned a very great increase, and is thus made: "Take a quantity of rain-water, and dissolve in every gallon of it two pounds of stone-lime: let it stand two or three days, stirring it three times a day: then pour off the water into another vessel, and add to every gallon of it about four ounces of saltpetre, and one pound of pigeon's dung: mix them well together, by stirring them three or four times a day, and then strain off the liquor to keep for use." Mr. Everard, who communicated this receipt to Mr. Houghton, steeped a handful of wheat in a quart of this liquor, where he let it infuse eighteen hours: he then took it out, and laid it to dry in the air for the space of one day; and then steeped it again in the same liquor for about twelve hours, dried it as before, and steeped it again a third time, about six hours, after which he planted it in his garden, which was but common earth, setting it by single grains, about ten inches asunder, and a finger's length in depth. He could not remember whether every grain sprouted, but thought that very few failed. Those which did grow, produced an extraordinary increase, several of them yielding from sixty to seventy, some of them eighty stalks with very large ears full of fine plump corn: many of the ears were six inches long, and contained sixty grains: none had less than forty.

He also steeped peas and beans in the same liquor; but could not say whether their having been steeped too long was the cause that none of them came up: but he took the thick sediment which remained after the liquor was strained off, mixed it with four times the quantity of earth, let it lie all winter in a gravel walk, south of a codling-hedge, then made a row of holes, about four inches distant, put a handful of the mixed earth into each hole, with a pea upon it, and covered it with common mould. The peas sprouted well, ran up the codling-hedge to the height of about nine feet, shot out branches in several places, like vines, and bore so many well filled pods, that he judged he had above a bushel from about three or fourscore seeds.

He tried also an experiment on wheat infused in lime-water alone, some in brandy alone, and some in brandy and lime-water mixed, and had a great increase from each grain. With some of the liquor made with salt-petre, lime, and pigeons dung, he watered several trees in his garden, and found them grow and flourish much faster than any other of the same kind which were not watered in that manner. He also steeped barley in the same liquor, and found its increase equal to that of wheat.

Whether there be, or be not, any kind of prolific efficacy in these, or any other steeps, of which great numbers are pompously recommended, and which proper experiments can best determine; they are at least so far serviceable to the seed corn, that they clear it from filth, from many seeds of weeds, and from such poor, light and distempered grains as are not fit for sowing, and prepare it in such a manner, that, being already well moistened, it will shift much better than absolutely dry grain, in case a drought should ensue after it is sowed.

This thorough cleansing of the seed may probably be, in a great measure, the reason why corn so prepared is least apt to produce smutty ears. All the lyes generally made use of, certainly preserve the plants from mouldiness, and that in which lime is a principal ingredient seems to be one of the most effectual. But as this part naturally leads to the distempers of corn, another very intricate, but highly interesting subject, we shall resume it under that head, to which it properly belongs; and give in the mean time M. Duhamel's farther opinion concerning the pretended prolific virtues of infusions, with some late experiments relative thereto, as delivered in the sixth volume of his excellent *Treatise on the Culture of Land*, published last year.

We listen readily to the marvellous, especially when it promises any great and singular advantage. Such was the abbe de Vallemont's prolific liquor, by means of which the husbandman was to reap vast crops, without manuring, or scarcely ploughing his land. He was only to soak his seed in this admirable liquid, which was to open, strengthen, and amazingly fertilize the germ. Improbable as this doctrine is, it was greedily received.—It is known, that a seed contains in that part of it which is called the germ or bud, the embryo of a plant, that is to say, a plant in miniature, and that the rest of the seed serves to feed the young plant, or plantule, till it acquires roots which draw its farther nourishment from the earth. As soon as these roots spread, the seed is exhausted, and there remains only its then useless husk. What benefit then can be derived from prolific liquors? Perhaps they may render the nutritive substance of the seed fitter to support the young plant, which in consequence thereof may appear somewhat more vigorous at first, and till it has struck out roots: but from the time of its producing those roots, it ceases to subsist upon the lobes of the seed. Can it be imagined that a single atom of any prolific liquor exists at the distance of four or six inches from the plants in the earth, where its roots are spread, and from whence they draw their subsistence? Yet, such is the fondness of men for projects of this kind, de Vallemont's mixture was extolled as a wonderful discovery, indued with a magnetic virtue, capable of attracting from the bosom of the air certain principles, which probably do not exist in it, and numbers of receipts have been devised for making prolific liquors. Writers upon agriculture have stuffed their books with them, and vaunted their miraculous effects. A desire to see these mighty promises fulfilled, paved the way for their reception, and ill-made experiments have given a sanction to the error.

A little corn, impregnated with these pretended prolific liquors, has been planted grain by grain in a garden, and

its extraordinary increase has immediately been imputed to the steep. I myself was deceived by such trials: but when I extended them to three or four acres of ground, this great fertility no longer took place, and I began to doubt the efficacy of these boasted specifics. About the same time, I saw a single grain of barley produce 230 stalks, without any preparation; and was informed by the Rev. Dr. Hales, that another grain of barley had in like manner produced one hundred and fifty-four ears. From hence I concluded, that the prodigies of vegetation so much vaunted by some writers, as the effect of their favourite infusions, have in fact been owing to the nature of the soil, to good culture, and to the grains being at such distances from each other, that their roots have had room to spread, and thereby collect a great quantity of food. I then had recourse to new experiments, which confirmed me in this opinion.

We see in the Political State of England, that a grain of wheat which grew by chance on a bed of onions, and had not received any preparation, produced 5600 grains. Upon which the author of that work remarks (as indeed I had done before in regard to the former of the above-mentioned productions) that we must not from thence infer that the country where such a thing happens is naturally more fertile than another, or the method of agriculture commonly practised in it better than elsewhere; for that the cause of these prodigious growths is, that the grains stand single and in a good soil; that the only consequence which can be drawn from thence, is that the New Husbandry comes nearest to that state in which these surprising growths are produced; that it certainly must increase the product of the crops; and that it will probably require less seed than is used in the common way.

Though it was pretty well proved by our experiments, that good culture and proper manures contribute more effectually to the increase of crops, than all the boasted prolific liquors; yet several persons, out of zeal for the public good, have published, some of the advantages which they think arise from the use of certain fertilising steeps, and others, receipts for making them.

In this spirit, M. de la Jutais has given us a little tract, entitled. *The true Philosopher's Stone*; according to which, an admirable prolific liquor is to be thus made. Fuse some nitre in an iron vessel; and when it is hot enough to burn the substances which are to be added, throw in a small quantity of the same kind of seed as you intend to sow: for example, if you would have a prolific liquor for wheat, throw a little wheat upon the nitre; if turneps, put in turnep seed, and so on. These seeds take fire, are consumed, and incorporate with the melted nitre. Your prolific liquor is then made, and you have only to mix the nitre with water. What results from this operation? Nothing more, than that there is in this prolific liquor a great deal of nitre with a small portion of fixed nitre, or alkaline salt: whether this nitre be mixed with wheat, barley, turnep seed, or powder of coal, all chymists allow that the result will be the same, and that the same liquor might be made by mixing a little alkaline salt with a strong solution of salt-petre. The question is, what effect it will have upon vegetables. To try this fairly, two exactly similar fields should be sowed, the one with wheat prepared with the prolific elixir, and the other with wheat only limed in the usual way; taking care to sow an equal quantity in each field: for the single circumstance of diminishing the quantity of the seed, may increase the crops in years when the corn does not tiller much, and in good soils. Many have been deceived by not attending to this circumstance. The following are well made experiments:

“M. Delu, after trying M. de la Jutais's essence three times, with the most scrupulous care and exactness, thinks it of no sort of service.

“M. Peirol, whom I mentioned before, communicated to me in 1755, several experiments which he had made with great care, in order to satisfy himself whether these prolific liquors have any virtue; and those trials made him then hope for success. I thanked him for his obliging letters, and exhorted him to repeat the same experiments with some new precautions which I thought important. He did so, with all possible care; and it is with real pleasure that I shall give a just account of them, because they seem to me extremely fit to dissuade those who wish well to agriculture, from putting their trust in such illusions. In-

stead of running after an empty shadow, they may employ their time in useful perquisitions, by which the public will be benefited.

" M. Peirol sowed, both in his own garden, and in that of the intendant Auvergne, 1. many-eared wheat; 2. rath-ripe barley; 3. the common red wheat of the country; and had from each of them an amazing increase.

" Each plant of the many-eared wheat, had from fifty to ninety-two stalks, and these last yielded 13800 grains.

" Some of the rath-ripe barley had two hundred and forty-four stalks of each plant, and yielded 14640 grains.

" Several plants of the red wheat had three hundred stalks; but the grains were eaten by birds.

" These were fine productions: but the most important thing to be observed here, is that M. Peirol sowed all these different kinds of grain, as well in his own garden, as in that of the intendant, on the same day, viz. the 8th of September 1756; part of this corn having been steeped in the abbé de Vallemont's fertilizing liquor, while the rest had not been infused at all: yet their productions were quite alike, the ground had been prepared exactly in the same manner for the steeped and the unsteeped grain, and both were equally watered from time to time with that prolific wash. This last circumstance spoils the whole experiment: for who can doubt but that this watering of the plants with impregnations of dung, must give them great vigour; even more than a considerable quantity of dung itself would have done? However, the following experiment is, luckily, without the fault.

" On the 4th of April 1755, M. Peirol divided a pretty large field into five equal parts. The ground was in good tilth, and he sowed it with barley.

" The first part was sowed with unsteeped barley in rows a foot asunder.

" The second was sowed with the same kind of barley steeped in de Vallemont's liquor, and likewise in rows a foot asunder. Both had a ploughing between the rows, towards the end of April.

" The third was sowed in broad-cast, according to the custom of the country, excepting the quarter part of the usual quantity of seed was retrenched: but still it was the same sort of barley, and this had been steeped in de Vallemont's liquor.

" The fourth division was also sowed in broad-cast, like the former; with this only difference, that the seed was steeped in a prolific liquor invented by M. Robineau.

" Lastly, the fifth part was sowed entirely in the common way, with the usual quantity of the same kind of seed, unsteeped.

" The following was the state of these five divisions at harvest time.

" The first and second, which had been sowed in rows, with only a quarter part of the quantity of seed generally used in the common way, but prepared for the one by being infused in de Vallemont's liquor, and sowed in the other without any impregnation, were both very fine, and yielded a great deal of grain.

" The third and fourth, which had been sowed in broad-cast, with an abatement of only a quarter part of the usual quantity of seed, and where the grain for one had been steeped in de Vallemont's liquor, and that for the other in M. Robineau's, were middling, and not visibly different in any respect.

" The fifth spot, which had been sowed entirely in the common way, and with the usual quantity of seed, was the worst of all.

" Though M. Peirol was prejudiced in favour of prolific essences, he nevertheless concludes from this experiment, 1. That the unsteeped grain used for the first mentioned portion of the field, having yielded as fine a crop as that of the second which was steeped, infusing the seed does not contribute much to make the plants tiller.

" 2. That the products of the third and fourth divisions being quite alike, M. Robineau's sleep is not better than de Vallemont's.

" 3. That the difference between the crop of the fifth, and those of the third and fourth pieces of ground, was probably owing to the different quantity of seed.

" 4. That the superior beauty of the first and second, which surpassed all the rest, was occasioned by the grains being so far distant from each other, that the roots of the plants had sufficient room to collect their food, and that

the husbandman was enabled to stir the ground between the rows, in the spring, by which the vigour of the plants was considerably increased. All this confirms the advantages of the New Husbandry; and M. Peirol is so convinced of it, that he has sowed a very large tract of land, near Riom, in the same manner as the two first parts of the above-mentioned experiment.

" He has likewise made another trial of de Vallemont's specific, by planting vines in two different places. In one of these, where the soil was good, the common practice was followed, and the cuttings sprouted soon: in the other, where the ground was less good, each cutting was watered with two quarts of de Vallemont's liquor. These last shot out later, but then grew with great strength, and retained their leaves a long while. It cannot be doubted but that an infusion of dung will invigorate plants, and make them grow faster than they would otherwise. The owners of vineyards are here to consider, whether the expence of people to do this business may not be greater than the advantages accruing from it will repay: but it is certain that by thus watering their newly planted cuttings, especially with a strong infusion of dung, they will secure their taking root.

" To satisfy myself in regard to M. Robineau's pretended prolific liquor, I chose a piece of ground laid out for wheat, and divided it into three equal parts. One of these was sowed in the common way, with seeds only limed, and produced one hundred and ninety-two sheaves to the acre, which yielded sixty bushels of corn. Another was likewise sowed in the common way, with seed only limed, but two fifths less in quantity than is generally used, and produced one hundred and sixty-eight sheaves, which yielded fifty-four bushels. The third part was sowed with the same quantity of seed as the first, but prepared according to M. Robineau's direction. This produced one hundred and fifty-six sheaves, which yielded fifty-four bushels of grain. From whence it follows, that his method was not of any service to the crop.

" His liquor, when distilled over a very slow fire, yields a little brandy; what remains in the matras, yields a great quantity of salt-petre, and the residue is a bitter water which contains a small portion of alkaline salt. This is nearly what would be obtained from de la Jutais's liquor.

" M. Vandusfel has also tried M. Robineau's prolific liquor, and found it attended with no other effect, than that the field where it was used had somewhat fewer smutty ears than other grounds, for which the seed had not been so prepared. But other seed which he steeped in an infusion of dung, ashes, and lime, produced corn totally exempt from smut."

An ingenious correspondent of the editors of the Museum Rusticum, has given us the following improved method of breeding seed-wheat.

" I join, says this Essex farmer, with many others in opinion, that it is best every year to change one's seed-wheat, and this has been my constant practice: I have had many a weary ride to get seed that would please me, for I am, and always have been, very difficult in this matter.

" I have near two hundred acres of land in constant tillage: these I divide into three portions, so that I have every year about sixty acres in wheat, sixty more in barley and oats: and the remainder are either fallow, or in beans, peas, or turneps, &c.

" When I first came into my farm, I expended annually, of seed-wheat, thirty quarters; for after the example of my neighbours, I allowed four bushels of seed for every acre I sowed.

" These thirty quarters often cost me above seventy pounds; and God knows I could sometimes but little spare so much money, after the great annual expence of getting in my harvest.

" Some part of my land differs greatly in its nature from the other: near half my farm is a stiff deep clay; what bottom it has I know not, as I never could find it in digging my ditches, &c. the other half is a bed of light sandy loam; with a gravelly hard bottom.

" This difference in the soil of my farm is, on many accounts, a great advantage: particularly, my wheat does not all ripen at the same time; I have generally nearly got in that growing on my gravelly land, before that on my clay is fit to cut; and I can besides plough in all weathers, frost excepted.

" But

" But not to digress too much, I took it into my head that, with proper care, I could breed for myself, on my own land, as good seed-wheat as any I could buy, if not better; and I determined within myself to make the experiment.

" Before I made this experiment, I had reduced the quantity of seed I used on each acre, to three bushels, which was a great saving to me. I had still occasion for above twenty quarters.

" My first step was to select ten acres of the best land I had; five from the heavy, and as many from the light part of my farm; this land was by nature rich and good; it lay on the gentle southern declivity of a hill, and required very little manure: it lay in two little detached fields, at some distance one from the other.

" When I had prepared this land by a winter and summer fallowing, in which time the clayey part was ploughed seven times, and the light land five times, I had both fields sown with some of the best wheat I could procure; that for the heavy land I got from Hertfordshire, the other from a particular friend who holds a farm in Cambridgehire.

" When the season for sowing approached, I was mightily pleased with the appearance of my two little plots; for they resembled the best-kept gardens, not a weed to be seen, and the earth as fine as garden-mould.

" On this occasion I did not brine my seed, but had it put into a large tub; some water was then poured on it, and I made a stout labourer, with a stiff half-worn birchen-broom, stir it very briskly about for near half an hour; this I imagined would wash off the smut, if any there happened to be: the light seeds, which were very few, were skimmed off.

" I let the wheat afterwards lie three hours soaking, when my man again stirred it briskly with the same broom, and immediately poured the water off.

" Whilst yet wet, the seed was sprinkled in the usual manner with slacked lime, in order to prepare it for sowing.

" My reason for not brining it was, that I thought it would bring it too forward; and I rather chose to sow it early, which is, I know, in general, a very good practice.

" In sowing this land, I, in some measure, followed Mr. Tull's directions: that is, I sowed my wheat in rows with large intervals in the following manner.

" I had a furrow opened about a rod from the hedge: in this furrow some seed was by a careful hand very thinly scattered, not sowed in the common way with a sling of the arm.

" It took up time; so I had two sowers to each plough. When the ploughman had drawn the first furrow, he then opened another, at about ten feet distance from the first in the land; and seed was in the same manner thinly scattered in this also: after this, he returned to the first furrow, and drawing another close to it, covered the seed; the same thing he did by the second furrow: he afterwards went two bouts without any seed being sown in the furrows; but the third bout, seed was thinly scattered, as before, to form the second row of corn in each bed: another bout was made to cover the seed when the two beds were finished, the middle of the interval being left unploughed.

" In this manner both my little fields were sown, in double rows with intervals about five or six feet wide betwixt the beds, and the rows about two feet asunder.

" The corn came up very well, and preserved a good wholesome appearance all the winter.

" Early in the spring, that is, in the month of February, I made a careful man sow the spaces betwixt the rows of corn on the heavy land with wood-ashes, and on the light land with foot: these were both soon washed in by the rain, and the effects were speedily to be seen in the new assumed vigour of the crops, and this vigour continued till the corn was ripe.

" As soon as any weeds appeared, the intervals which were left unploughed at seed-time were turned up, and the spaces betwixt the rows diligently hand-hoed: this hand-hoeing was several times repeated, to keep the crop quite clear from weeds, the intervals had also several other stirrings; but this work was chiefly done with a very light plough, without an earth-board in the heavy land, and without either earth-board or coulter in the other little field.

" Every thing came very well forward: and when the wheat began to spindle, I had the outsidies of the rows well

earthed up with a plough, and the insides with a hand-hoe; the insides were done first.

" At harvest the fields made a noble appearance: a fine well broke earth striped with rows of healthy wheat.

" The cutting this wheat was very easily performed, it stood so ready to the reapers hands; and when it was housed and threshed, it yielded me about four quarters on an acre, one with another, the first year, though I have since had sometimes more, sometimes a little less.

" My ten acres then yielded me about forty quarters; and I had occasion for only about twenty-two to sow my common wheat-lands: I therefore took only the first and prime part of this crop, getting the sheaves very lightly threshed; what remained made excellent bread-corn.

" I never saw finer seed-wheat than mine was this year: my heavy lands I sowed with the seed produced by the light field, and my light lands with that produced by the heavy field.

" As soon as I had got in this select crop, I got the intervals in order for sowing with a second crop, in most respects continuing the practice of the year before: I had the like success, and might, perhaps, with equal advantage, have continued cropping the fields every year in the same manner; but, not to depend too much on Mr. Tull, my next crop was a full crop of barley on them, which succeeded well: and I selected two other plots of ground, of equal goodness, for my seed-corn husbandry, as I call it.

" In this manner I have now for several years past managed growing my own seed; and, if any thing, my crops have since increased; but I have again reduced the quantity from three to two bushels of seed for each acre of my wheat-land in common: that is, such as I sow in the ordinary way: on some of my rich, strong land, I do not use above six pecks, and find it answer very well.

" I could like to extend this New Husbandry, or this imitation at least of the New Husbandry, over all my lands that are in tillage: but in my method of practising, the expence would be too great; my sowers are well paid; I have enough to do to make my ploughmen go out of their ordinary way; and it cost me a great deal hoeing: yet all this I do not grudge to procure good seed.

" By introducing the drill-plough and the horse-hoe, I could save a great deal of labour on my light lands; and I may probably some time or other attempt it: but, at the same time, I am very sensible, I shall find great difficulty in getting men that will even try to do the work with these instruments. The common labourers in husbandry hate novelty: they pursue, without murmuring, the old beaten track; but put them out of it, and thought will become necessary: the fact is, they imagine it a very great hardship to be obliged to work and think too, and all for the same money.

" Without great resolution, and some kind of authority, a farmer will be obliged to let them even dig a ditch their own way: innovation they like not in any shape, often making use of the expression, that they are too old to learn.

" This, to a man who is very much disposed to lend a helping hand towards the improvement of agriculture, is a mortifying circumstance: there is scarcely any thing so difficult as to make an obstinate man useful: if, by dint of authority, you oblige him to go out of his way, he will rather contribute to the loss of your crop, than not to endeavour to convince you that he is in the right. I have often, to my sorrow, felt the truth of this observation.

" Several reasons, though I deal not much in them, may be assigned for the seed-wheat I raise in the above described manner, being so good.

" In the first place, I sow it on land that has not tasted any dung for some years, but is, in its own nature, rich and good: to this practice I ascribe a great deal of its goodness. In the next place, as the corn does not stand too thick, it enjoys all the benefit it can receive from the sun and air: by this means it attains a perfect maturity, and is certainly improved both in bulk and quality.

" This slight spring-dressing I give it, of foot or ashes, is of very great service: it warms the roots, and brings the corn forward; it loosens the earth, and either itself gives nourishment to the plants, or, at least, puts the earth in a disposition to afford it.

" Not

"Not a little is to be attributed to the frequent hoeing betwixt the rows and the stirrings of the intervals; and I find one very particular and great advantage result from it, which is, that it is an excellent means of clearing my land of weeds; for they no sooner attain a part of their growth, but they are destroyed long before they seed.

"Farmers in general think their fields cannot in the spring be so full of wheat-plants: the ground seems covered with verdure, and the blades are, as it were, crowded for want of room: when the weeds begin to get up, they send in a parcel of men and women with weeding-hooks, not letting a hoe come near the land to cut them up: they are sadly afraid they should not have plants enough at harvest; whereas, if they were to measure and mark off a rod square of land in February, and count the plants growing on it then, and afterwards count them in the beginning of August, it would almost always be found, that four parts in five of them had perished in the intermediate months, and that what remained were, by far too much crowded still, and had each but few stalks.

"I never weed my corn of late years; for as I allow only two bushels of seed, and often less, to an acre, the plants come up thin; and there is of course room for a moderate-sized hoe, which is the instrument I clean my land with; and so far from being fearful of having my crop injured by this means, I order the workmen, where the plants stand too close, to cut them up without mercy, as they would do the most pernicious weeds: if there happens by any accident to be a vacant spot, they easily remove some plants to it, with earth about their roots, by the help of their hoe.

"By this management, I in some measure, reap the benefit of the advantages promised in the New Husbandry; though I have not such opportunities of so often giving the plants a fresh supply of nourishment, nor of earthing them up when the grain is forming in the ear; for, after the corn has put forth its stalks to any considerable length, it would not be so proper to send in the hoers: but all the loss is the want of earthing up the plants so late as I could wish: for the weeds will, before this time, be pretty well got under, and but a few of them will be able to ripen their seeds before harvest, when they will of course be destroyed by turning in the stubble, which I always do as soon as possible; though many of my neighbours let their stubbles lie rough all the winter, for the sake of feeding a few score of ewes.

"Every farmer has methods peculiar to himself; and they are, for the most part, such as were practised by their fathers, grandfathers, &c. whom they succeed, in the culture of their farms.

"My method, as you must now be sensible, differs from most of those used by other occupiers of land; and if I cannot so well defend them by arguments, an experience of several years has convinced me that I ought still to persist in the practice of them: they have answered all the ends I could wish from them: what could I desire more?

"I am enabled to raise my own seed without the trouble of procuring it from a great distance, at a large expence, and with a deal of trouble.

"My crops are to the full as good as ever they were, and I use less seed by above one half: my manure goes a great deal farther than it used to do, because I bestow more ploughing and other tillage on my land; and I am not so much pestered as I formerly was with weeds, for they now very seldom are suffered to seed on my land.

"Of this last evil, I mean that of weeds, I have not, however, yet got quite rid; for such of my fields as border on my neighbour's lands are still often infested; some of these same neighbours, I have several times mentioned, are but slovenly farmers, and the weeds which have winged or downy seeds, are constantly waisted by the wind from their land to mine; so that I, in some measure, am punished for their neglects: thistles are this way particularly troublesome, as the seeds of them will sometimes be carried a very considerable way by the wind.

"I have very little more to say at this time, except that I never thresh the sheaves that are to supply me with seed-corn, till just when I want to make use of it. I have a notion, that the seed keeps better in the covering nature has given it, I mean the chaff, than it would do without it; and I am pretty certain it sprouts sooner in the ground, the husk or bran of the grain being preserved in a tenderer

and more yielding state; than it would be were it exposed to the open air."

The choice of seed-corn is undoubtedly very material in husbandry, and it would seem that the largest, plump, full-bodied corn was the most proper for seed, as being the most vigorous, maturest, and fullest of flour, and therefore capable of furnishing the young plant with the most plentiful share of nourishment: but however plausible this may appear, experience does not confirm it: but on the contrary, it is abundantly proved by experience, that small thin seed, as of wheat, produces as large ears of full-bodied corn, as the full-bodied seed, selected with the greatest care.

This is certain, from the common practice of the best farmers, who, by choice, buy for seed the wheat produced upon burn-baked land, the grains whereof are known to be in general smaller and thinner, than those of wheat raised upon good land cultivated.

"Some have thought, says Mr. Tull, p. 55, that a large grain of wheat would produce a larger plant than a small grain, but I have full experience to the contrary. The small grain, indeed, sends up its first single blade in proportion to its own bulk; but afterwards becomes as large a plant as the largest grain can produce. Farmers, says he, p. 233, in general know this, and choose the thinnest, smallest grained wheat for seed, and therefore prefer that which is blighted and lodged, and that which grows on new broke ground, and is not fit for bread; not only because this thin wheat has more grains in a bushel, but also because such seed is least liable to produce a smutty crop, and yet brings grains as large as any. I myself have had as full proofs of this as can possibly be made, in both respects. It was from such small seed that my drilled Lammas wheat produced the ears of that monstrous length described in this article [eight inches long]. I never saw the like, except in that one year, and the grains were large also. And as full proofs have I seen of thin seed wheat escaping the smut, when plump large grained seed, of the same sort, have been smutty."

Here we see plainly, that the quality of wheat for seed, does not consist in the fullness, plumpness, and largeness of the grain, as by many has been supposed, but principally in the soundness of it, of whatever size it happens to be, whether large or small.

Secondly, the most material circumstance, next to the soundness of the grain, seems to be in the nourishment that the seed receives in the ground. This is a remarkable circumstance, and shews the great advantage of good land, and of preparing it well for the seed. It shews also the great benefit of good hoeing, that can, without the assistance of manure, improve the puny plants arising from small seed, to so great perfection as in this case, and produce large well filled grain, and ears of Lammas wheat of such a surprising length as eight inches, which is near twice the length that good ears of sown Lammas wheat commonly attain to.

It may appear unaccountable in regard to seed wheat, that the quality of it is not discoverable either from its size or appearance, but these in other cases are not to be relied on. The gardeners direct those who would save prime carrot seed, to take up these roots, in order to see that they are fair and straight, and then to replant them, not doubting but the finest carrots will produce the best seed: and in this they seem to be right. Yet in some cases that appear similar, this rule is erroneous. "I should not have believed it, says Mr. Weston, had I not been told it by others, and since experienced it myself, that a very large onion is not the best to plant for seed." Traacts, p. 10. Hence it appears, that we cannot safely reason, in such cases, from analogy; but in tracing the operations of nature, we should depend chiefly upon experiments.

SEED-LIP, SEED-LEAF, or SEED-LOP, a seed-basket, or the vessel in which the sower carries his seed, in order to sow it.

SEEING, a term used by horse-dealers to imply the times when a horse begins to have white eye-brows; that is, when there grows on that part about the breadth of a farthing, a parcel of white hair, mixed with those of his natural colour. This is a mark of oldage, a horse never seeing before he is fourteen, and always before he is sixteen years old.

SELANDERS. See SALENDERS.

SEMBRADOR, an instrument used in Spain for sowing corn. *See the article* **DRILL-PLOUGH**.

SEMIFISTULAR Flowers, are those whose upper part resembles a pipe cut off obliquely.

SEMIFLOSCULOUS Flowers, are those whose petals are hollow in the lower part; but in their upper flat, and continued in the shape of a tongue.

SERVANTS. Mr. Marshall, in his Minutes of Agriculture, says, that on the maturest calculation, he found the yearly expence of a man servant in the house to be 35*l.* and that of a boy 23*l.* supposing the man's yearly wages to be 10*l.* and the boy's 3*l.* Now the expence of a day-labouring man for a whole year, (if he works every day) is but 27*l.* 10*s.* which is 7*l.* 10*s.* difference against keeping a man in the house by the year. But that of a boy is still more in proportion, viz. the expence of a day-labouring boy for a whole year, (if he works every day) is but 7*l.* 10*s.* which makes a difference of 10*l.* more than $\frac{3}{4}$ of a boy's day-wages. In the above account, no deduction in the daily pay is made for rainy days. The impropriety, therefore of keeping plough-boys in the house is very visible: and though it may be convenient to have the carters about the house, the conveniency is not worth 7*l.* 10*s.* a year. Mr. Marshall therefore recommends putting a woman into a cottage, within about two hundred paces of the farm yard, to take in lodgers; and to keep in the house no more farming servants than a butler and a yard-man. Indeed he says it is absolutely necessary to have somebody about a farm-yard, in cases of emergency; but the above two are sufficient, as the carters in the adjoining cottage will be nearly as handy as if they were in the house. (This measure like many others is merely local, but the hint is universal.)

Perhaps the farmer who keeps no accounts, imagines he saves money by boarding his servants in the house; but if he keeps them in the luxurious manner which farming-servants in general expect to be kept, he will be mistaken. A farmer, indeed, who sits at the head of his kitchen-table, may no doubt feed his men considerably cheaper, than a person who eats in a separate apartment. It is a just observation, that one fed by his master costs the community as much as two who provide for themselves; for discharge a grumbler, one who pretends to be dissatisfied, though in fact only satiated, and he will return to his bread and cheese with, perhaps, equal health and equal happiness. He sits down to his master's table with a resolution to eat voraciously of the best, to do himself justice; but at his own table, eats sparingly of the meanest, to save his money. His motive in both cases is the same: self-interest.

Mr. Marshall observes, that in some counties, particularly in Surry, it is an established custom for every man, in harvest, to work by the acre, or by the month, not by the day. If a labourer be constantly employed through the year, he expects during harvest to be constantly employed in mowing, reaping, &c. by the acre, or to have his harvest-month; that is to have an advance of wages certain, wet or dry, during one month; which month commences when it best suits his employer. This Mr. Marshall says is very convenient; they are always at command, in cases of emergency; and nothing but a continuance of rains while the barns are empty can make them burdensome. He strongly recommends the employing of active young men; for one invalid or sluggish fellow will spoil the whole set; and this holds generally. Mix two or three old women, or two or three boys, with a company of men, and the effect will be very soon visible; for the men will soon conform to the ways of either the old women or the playfulness of the boys. It is not prudent to employ many women with the men; and nothing but necessity can excuse it. Two women after the first or second day, will do as much work as half a dozen alone. If it be necessary or convenient to employ a number of both men and women, it is but common good management to keep them separate; with this exception, which may be laid down as a maxim, viz. one man among women, and one woman among men. A crusty conceited old fellow will check the gossiping of the women, and it has been remarked that raking after a young wench has animated more than a gallon of ale. Two are dangerous; they breed contention, and rather retard than accelerate. The most valuable servant in harvest is a good carter. It is necessary to common management that it should be able, willing, and careful. Every pitch of hay and corn, generally speaking, passes twice through his hands; he loads and unloads, which are the two most labourious tasks of harvest; he drives the team backwards and forwards; if he loiters by the way, the field-

men or stackmen must stand idle; if he spill or overturn his load, or if he breaks his waggon, or set his horses, the arrangement of the day is broken; and, perhaps, the damage done by the loss of time rendered irreparable by the next day's rain. A good carter will not suffer his waggon to be overloaded. The fieldmen too, that is the pitchers and assistant loader, should be young and active, and well matched with the carter.

SETTER, a kind of seton or issue, made by cutting a hole in the dewlap of an ox or cow, and putting into the wound a sort of tent formed out of the root of hellebore, by which the ill humours vent themselves.

To SEW, or go SEW, to go dry; spoken of a cow.

SHAKING, a disease incident to sheep, consisting of a weakness in their hinder quarters, so that they cannot rise up when they are down. No cure is yet known for it.

SHARD, a fragment of an earthen vessel.

SHARE of a plough, that part which cuts the ground, the extremity forward being covered with a sharp-pointed iron, called the point of the share: and the end of the wood behind, the tail of the share. *See the article* **PLOUGH**.

The length of the whole share from point to tail, according to Tull, should be three feet nine inches; at the top of the iron it has an upright piece called the fin; and near the iron at the other end, there is an oblong squared hollow, called the socket, the use of which is to receive the bottom of the sheat. Near the tail there is a thin plate of iron, well rivetted to the wood; by means of this plate, the tail of the share is held firmly to the hinder sheet of the plough by a small iron pin, with a screw at the end, and a nut screwed on it, on the inner or right side of the sheet.

The point of the share is that part in which it does not run up to the fin; this point is generally made three inches and a half in length, and should be flat underneath, and round at the top, and the lower part of it must be of hard steel. The edge of the fin should also be well steeled, and should make an acute angle with the share.

The socket is a sort of mortise: it should be a foot long, and about two inches deep: the fore-end of it must not be perpendicular, but oblique, conformable to the end of the sheat which enters into it. The upper edge of the fore-part must be always made to bear against the sheat; but if this end of the socket should not be quite so oblique as the sheat, it may be helped by paring off a small part of the wood at the point.

SHAW, a wood that encompasses a close.

SHAWLE, a shovel used in winnowing corn.

SHEARING of sheep, the operation of cutting off the fleece or coat of wool with a pair of shears. *See the article* **SHEEP**.

SHEAT of a Plough, that part of the plough which passes through the beam, and is fastened to the share.

The sheat, or as it is sometimes called, the fore-sheat, there being another piece of timber behind it called the hinder-sheat, should be seven inches wide, and fastened to the beam by a retch (a piece of iron with two legs), and by a wedge driven by it into the hole of the beam. The angle contained between the sheat and the beam of the plough should be about forty-two degrees.

SHEAVES, bundles of corn bound up in the field. *See the article* **HARVEST**.

SHED, a slight temporary covering.

SHEDDING of the seed, in horses, proceeds sometimes from the abundance and rankness of it, and also from strains, or being over-loaded, and sometimes from an infirmity in the stones and seed-vessels not being able to retain the seed till it be digested and thickened.

When there is a discharge of seed dribbling frequently from the yard, plunge him every morning into cold water, and give him the following ball every night and morning:

Take Venice turpentine, one ounce; make it into a ball with a sufficient quantity of a bole armoniac.

If this suffice not, and ulcers in the urethra are suspected, inject a little of the following up into it, two or three times a day:

Take balsam capivi, one ounce, dissolve it with the yolk of an egg, then gradually add to it a pint of lime-water.

Some colts get a habit of rubbing their yard against their belly until they shed their seed; for this there is no cure but castrating.

Or take a pound of Venice or common turpentine, and the same quantity of bole armoniac finely powdered, and as much wheat flour as will suffice to make it up into a stiff paste; roll it out between your two hands, and break it off about the quantity of a small wash-ball, and give the horse three of them morning and evening, upon the end of a stick, or in a horn full of strong beer, till the flux of seed stop, which will be effected once in ten days, or at most in a fortnight: but before you give him the balls, it will be proper to purge his reins very well, for this will not hasten, but perfect the cure.

For the shedding of seed, or colt evil; mix Venice turpentine and sugar together, and give the horse every morning a ball, until the flux be stopped.

If you add a little of the inner bark of oak, or the powder of an acorn, they will be very good.

This distemper happens commonly in August, and in very hot weather in May.

For the cure, take the powder of aniseeds and leaves of betony in equal proportion; stamp them with white wine, till they come to be a very thick paste; anoint the part with this, and it will cure that imperfection in the yard of the colt.

SHEEP, *ovis*, in zoology, a well known species of cattle, and which are kept at the least expence of any to the farmer. They will thrive upon almost any ground, and for that reason are preferred by many before the larger cattle.

The best sort of sheep for fine wool are those bred in Herefordshire and Worcestershire, but they are small and black-faced, and bear but a small quantity.

Warwick, Leicester, Buckingham, and Northamptonshire, breed a large-boned sheep, of the best shape, and deepest wool we have got. The marshes of Lincolnshire breed a very large kind of sheep, but their wool is not good, unless the breed be mended by bringing in sheep of other countries among them, which is a scheme of late very profitably followed there.

The northern counties in general breed sheep with long, but hairy wool: and Wales breed a small hardy kind of sheep which has the best tasted flesh, but the worst wool of all.

The farmer should always buy his sheep from a worse land than his own, and they should be big-boned, and have a long greasy wool curling close and well. These sheep always breed the finest wool, and also are the most approved of by the butcher for sale in the market.

For the choice of sheep to breed, the ram must be young, and his skin of the same colour with his wool, for the lambs will be of the same colour with his skin. He should have a large long body, a broad fore-head, round and well rising large eyes, and straight and short nostrils. The polled sheep, that is, those which have no horns, are found to be the best breeders. The ewe should have a broad back, a large bending neck, but short; clean and nimble legs, and a thick deep wool covering her all over. To know whether they be sound or not, the farmer should examine the wool that none of it be wanting, and see that the gums be red, the teeth white and even, and the brisket-skin red, the wool firm, the breath sweet, and the feet not hot. Two years old is the best time for beginning to breed, and their first lambs should not be kept too long, to weaken them by suckling, but be sold as soon as conveniently may be. They will breed advantageously till they are seven years old.

The farmers have a method of knowing the age of a sheep, as a horse's is known, by the mouth. When a sheep is one shear, as they express it, it has two broad teeth before; when it is two shear, it will have four; when three, six; when four, eight; after this their mouths begin to break. The difference of land makes a very great difference in the sheep.

The fat pastures breed straight tall sheep, and the barren hills and downs breed square short ones: woods and mountains breed tall and slender sheep, but the best of all are those bred upon new ploughed land, and dry grounds. On the contrary, all wet and moist lands are bad for sheep, especially such as are subject to be overflowed, and to have sand and dirt left on them. The salt-marshes are, however, an exception to this general rule, for their saltiness makes

amends for their moisture; any thing of salt, by reason of its drying quality, being of great advantage to sheep.

As to the time of putting rams to the ewes, the farmer must consider at what time of the spring his grass will be fit to maintain them and their lambs, and whether he has turneps to do it till the grass comes; for very often both the ewes and lambs are destroyed by the want of food; or, if this does not happen, if the lambs are only stunted in their growth by it, it is an accident that they never recover. The ewe goes twenty weeks with lamb, and according to this it is easy to calculate the proper time. The best time for them to yearn is in April, unless the owner has very forward grass, or turneps, or the sheep are field sheep, where you have not inclosures to keep them in, then it may be proper they should yearn in January, that the lambs may be strong by May-day, and be able to follow the dam over the fallows and water-furrows; but then the lambs that come so early must have a great deal of care taken of them, and so indeed should all other lambs at their first falling, else, while they are weak, the crows and magpies will peck their eyes out.

When sheep are turned into fields of wheat or rye to feed, it must not be too rank first, for if it be; it generally throws them into scowings. Ewes that are big should be kept but bare, for it is very dangerous to them to be fat at the time of their bringing forth their young. They may be well fed indeed, like cows, a fortnight before hand, to put them in heart. *Mortimer's Husbandry*.

The feeding of sheep with turneps is one great advantage to the farmers, from the crops they raise of them; they soon fatten upon them, but there is some difficulty in getting them to feed on them; the old ones always refuse them at first, and will sometimes fast three or four days, till almost famished; but the young lambs fall to at once.

The common way, in some places, of turning a flock of sheep at large into a field of turneps, is very disadvantageous, for they will thus destroy as many in a fortnight, as would have kept them a whole winter. There are three other ways of feeding them on this food, all of which have their several advantages.

The first way is to divide the land by hurdles, and allow the sheep to come upon such a portion only at a time as they can eat in one day, and to advance the hurdles farther into the ground daily, till all be eaten. This is infinitely better than the former random method, but they never eat them clean even this way, but leave the bottoms and outsides scooped in the ground; the people pull up these indeed with iron crooks, and lay them before the sheep again, but they are commonly so fouled with the creatures dung and urine, and with the dirt from their feet, that they do not care for them; they eat but little of them, and what they do, does not nourish them like the fresh roots.

The second way is by inclosing the sheep in hurdles, as in the former, but in this they pull up all the turneps they suppose the sheep can eat in one day, and daily remove the hurdles over the ground, whence they have pulled up the turneps: by this means there is no waste, and less expence, for a person may in two hours pull up those turneps; the remaining shells of which would have employed three or four labourers a day to get up with their crooks out of ground, trodden hard by the feet of the sheep; and the worst is, that as, in the method of pulling up first, the turneps are eat up clean; in this way, by the hook, they are wasted, the sheep do not eat any great part of them, and when the ground comes to be tilled afterwards for a crop of corn, the fragments of the turneps are seen in such quantities on the surface, that half the crop at least seems to have been wasted.

The third manner is to pull up the turneps, and remove them in a cart or waggon to some other place, spreading them on a fresh place every day; by this means the sheep will eat them up clean, both roots and leaves. The great advantage of this method is, when there is land not far off which wants dung more than that where the turneps grow, which perhaps is also too wet for the sheep in winter, and then the turneps will by the too great moisture and dirt of the soil, sometimes spoil the sheep, and give them the rot. Yet such ground will often bring forth more and larger turneps than dryland: and when they are carried off, and eaten by the sheep on ploughed land in dry weather, and on green sward in wet weather, the sheep will succeed much the better; and the moist soil, where the turneps grow, not being trodden by the sheep will be much fitter for a crop of corn, than if

if they had been fed with the turneps on it. The expence of hurdles and the trouble of moving them is saved in this case, and this will counterbalance at least the expence of pulling the turneps, and carrying them to the places where they are to be eaten. They must always be carried off for oxen. *Tull's Horse-Hoeing Husbandry.*

"It can hardly be doubted, says M. de Buffon, but that those animals which are at present tame and domestic, were formerly wild. Yet the weakness and stupidity of the sheep being considered, and likewise that this defenceless animal cannot save itself by flight; that all carnivorous animals are his enemies, singling it out in preference to others, and devouring it for the fineness of its flesh: at the same time we must remember that this species is not very prolific, and that each individual is but short-lived: when these particulars are considered, we should be inclined to think that from the beginning of things, the sheep has been committed to the care of man; that his protection is necessary to its subsistence, and his care to its multiplying; nor are any defects known to afford wild sheep; but in all places where man does not govern, the lion, the tyger, and the wolf, reign by violence and cruelty; these voracious animals live longer, and multiply much faster than the sheep: and were we even now to forsake the numerous flocks fed in the pastures, and on the hills, they would soon be destroyed before our eyes, and the whole species extirpated by the number and voracious appetites of carnivorous animals.

"Thus it appears that this species is indebted to our assistance and care for its continuance; for it could not subsist of itself. The sheep is absolutely without defence or resource; the weapons of the ram are but weak; his courage nothing more than a petulance, troublesome to others, useless to himself, and destroyed by castration. The wethers are still more timorous than the ewes. It is from fear that they so often assemble in flocks; the least uncommon noise causes them to leap over each other, or gather close together: while this fear is attended with the grossest stupidity: they have not sense to avoid danger: they even appear not to feel their disagreeable situation; they stay wherever they happen to be, whether it rain or snow; and such is their obstinacy, that in order to make them change their place, or follow any road, they must have a leader, trained to walk before them, whose motions they readily follow step by step. This leader himself would stir no more than the rest of the flock, were he not driven by the shepherd, or hunted by the guardian dog, which is taught to protect and defend them; to guide, separate, gather them together, and direct them in their motions.

"Sheep, therefore, of all quadruped animals, are the most stupid, and have the least instinct and contrivance. The goats, which in so many respects resemble them, have much more sagacity: they stand in need of no guide, they shun dangers: new objects soon become familiar to them; whereas the stupid sheep neither shuns nor approaches: though under the greatest want of assistance, they do not approach man so freely as the goat: and what in animals seem the lowest degree either of fear or insensibility, they see their lambs taken away without anger, without resistance, and without expressing their grief by any cry different from their common bleating.

"But this animal, in itself so despicable, so destitute of sentiment and internal qualities, is to man the most valuable; its utility the most immediate and extensive: it alone satisfies wants of the greatest necessity; it furnishes both food and apparel, besides the advantages arising from the skin, milk, tallow, bones, and dung of this creature, to which nature seems to have given nothing as its property; all is to be delivered up to man.

"Love, the most general and active sentiment, is alone able to impart some vivacity to the ram: he becomes wanton, fights, rushes against the other rams, and sometimes even attacks his shepherd; but the ewe, when in heat, seems not at all the more affected, or the more animated; her instinct reaches no farther than not to refuse the ram's approaches; to chuse her food, and know her lamb. The instinct of this animal is the surer, as it is more mechanical; and, if I may be allowed the expression, the more innate. A young lamb will, amidst a numerous flock, find its dam and seize the dug, without ever being mistaken. Sheep are also said to be impressed by modulated sounds, to feed more assiduously, to be in better health, and to fatten sooner by the sound of a pipe; and that they are evidently sensible of the charms

of music. But it is also said, and I believe with more truth, that music rather serves to amuse the shepherd's tedious hours, and that to this supine and solitary life the origin of that science is owing.

"These animals, whose instinct is so simple, are also of a very weak constitution: they cannot bear walking any length of time: travelling exhausts them; running soon puts them out of breath: the scorching rays of the sun hurt them equally with the rain and snow. Their diseases are many, and most of them contagious. The superabundance of their fat often proves fatal to them, and always hinders their fruitfulness; they yearn with difficulty; they frequently cast their lambs, and require more care than any other domestic animal.

"When a ewe is near yearning, she must be separated from the flock, and watched in order to be assisted; the lambs often presents itself a-thwart, or with its feet first; and in this case, without assistance, the ewe's life would be in danger. After yearning, the lamb is raised on his feet; at the same time all the milk in the ewe's udder is milked out, it being vitiated, and very noxious to the lamb, which is kept from sucking till the udder is filled with fresh milk: the lamb is kept warm, and for three or four days shut up with the ewe, that it may learn to know her, during which time the ewe is fed with good hay, barley-meal, or bran mixed with a little salt; and water, whose chill is taken off, and mixed with a little quantity of flour, bean-meal, or ground millet, given her to drink. At the end of four or five days she may be gradually fed like the rest, and sent with the flock, taking care that she be not driven too far, lest her milk be heated. Some time after, when the sucking lamb shall have gathered strength, and begins to play, no farther care is requisite; it may be left to follow its dam to the pastures.

"All the lambs of a weakly appearance are generally disposed of to the butcher; those intended to be kept being the largest, most vigorous, and having the thickest fleece. Lambs of the first yearning are never so good as the following. To bring up lambs yearned in the months of October, November, December, January, and February, they must be kept in the house during the winter, going out only in the morning and evening to suck; but in the beginning of April they may be turned into the open fields. Some time before this, a little grass is daily given them, in order to habituate them by degrees to this new food. They may be weaned at the end of one month; but it is better to delay it for six weeks or two months. White lambs, without spots, are always preferred to the black or mottled; white wool being more valuable than the black or mixed.

"The proper age for castration is at the end of five or six months, or even a little later in spring or autumn, when the weather is mild. This operation is performed by two different methods: the most common is by incision, when the testicles, which are easily separated, are drawn out through the wound: the other is performed without incision, by tying a string very tight round the scrotum above the testicles: for this compression destroys the vessels which supplies them with blood and juices. The lamb, on castration, becomes sickish and dull, so that it would not be improper to give him, for two or three days, a little bran mixed with a small quantity of salt, to prevent a loss of appetite, which this operation often causes.

"At the end of the year, rams, sheep, and wethers lose the two fore-teeth of the lower jaw; and they are known to want the incisive teeth in the upper jaw. At eighteen months the two teeth joining to the former also fall out; and at three years, being all re-placed, they are even and pretty white: but as the creature advances in age they become loose, blunt, and afterwards black. The age of the ram is also known by his horns, which shew themselves in the very first year, and, often at the birth, and continue to grow a ring annually to the very period of life. Though sheeps are often without horns, yet they have bony prominencies in the same places of the head, where the horns of rams appear. Some sheep however have two, and others four horns, five or six inches in length, but less twisted than those of the ram; when there are four, the two outward are shorter than the others.

"The ram is capable of generating at eighteen months, and a ewe may yearn at the end of a year; but it is better to delay it till the ewe be two, and the ram three years old. The produce of these animals, if too early, and even the first,

first, is always weak, and of a bad constitution. One ram will be sufficient for twenty-five or thirty ewes; but he should be remarkable for strength and comeliness. He must also have horns; for some have none, and such, in these climates, are very indifferent. In a good and comely ram, the head must be large and thick, the forehead broad, the eyes large and black, the nose short, the neck thick, the body long and raised, the back and rump broad, the testicles large, and the tail long. The best are white, with a large quantity of wool on the belly, tail, head, and ears, down to the eyes. The best sheep for propagation are those which have most wool, and that close, long, silky, and white; especially if at the same time they have a large body, a thick neck, and a light method of walking. And it has been already observed, that those which were rather lean than fat, bring forth more easily than others.

"The season of the ewe's heat is from the beginning of November to the end of April; but that they may be brought to conceive in any season, by giving them provocative foods, as salt water, and bread of hemp seed. Each ewe is covered three or four times, and then separated from the ram, which always prefers the older sheep, and neglects the younger. In the season of copulation they should not be exposed to the rain or bad weather, wet hindering their retention; and a clap of thunder often produces abortion. A day or two after being covered, they are put again to their common diet, without having any more salt water; the continual use of which, as well as that of hempseed bread, and other hot aliments, would infallibly cause abortion. They go five months and year at the beginning of the sixth; they seldom bring two lambs. In hot climates they year twice a year; but in France, and the colder countries, only once. Some have the ram given to them about the end of July or the beginning of August, in order to have lambs in the month of January; but the ram is given to a much greater number in the months of September, October, and November; and lambs are in great plenty in February, March, and April. They are also to be had in the months of May, June, July, August, and September, there being no scarcity of them but in October, November and December. The ewe yields, during seven or eight months, plenty of milk, which is a good food for children and peasants. It also makes good cheese, especially if mixed with that of cows. The time for milking ewes is immediately on their going out to pasture, or on their return; twice a day in summer, and once in winter.

"Ewes fatten very fast during their pregnancy, as they then eat more than at other times. As they often hurt themselves, and frequently miscarry, so they sometimes become barren; and it is not very extraordinary for them to bring forth monstrous productions. However, when properly tended, they are capable of yearning during their whole life; that is, to the age of ten or twelve years; but generally, when they are turned of seven or eight, they break, and become sickly. A ram lives to twelve or fourteen years; but after eight is no longer fit for propagation: he should then be knit and fattened with the old sheep. The flesh of the ram, though nit and fattened, is but of a bad taste; that of the old ewe flabby and insipid; whereas that of the wether is the most succulent, and the best of all common meats.

"To form a flock, from which a reasonable profit may be expected, sheep and wethers must be purchased, of about eighteen months or two years old; and one shepherd, if careful, and assisted by a good dog, may take care of a hundred. In leading them out to pasture, he should go before them, and accustom them to know his voice to follow him without stopping, or straying among the corn, woods, and fallow lands, where they would do damage. The places that best agree with them are downs and small eminences; low, wet, and marshy grounds should be avoided.

"During the winter, they are fed at home with bran, turneps, hay, straw, lucern, saintfoin, the leaves of elm, ash, &c. They are, however, led out every day, unless the weather be very bad; though it is rather to walk than feed them; and in this inclement season, it is always near ten in the morning before they are led out; and after staying four or five hours, they are watered, and brought back about three in the afternoon; whereas in spring and autumn they are led to the field as soon as the sun has dispersed the frost or humidity on the grass, and continue there till sun-set. It is also sufficient for them in the seasons, to drink once a day, just before they are brought back to the sheep-house,

where they must always find fodder, though in less quantity than in winter. It is only in summer that they are to live entirely on the pastures, whither they are led twice a day, and also made to drink twice. They are led out very early in the morning to feed, as soon as the dew is down, where they continue four or five hours; after which, and being had to the water, they are brought back to the fold, sheep-house, or some other shady place; about three or four o'clock, when the extreme heat begins to abate, they are a second time led to the pasture, where they continue till the evening; and where it not for fear of wolves, they should pass the night in the open air, as they do in England, which would render them more vigorous, clean, and healthy. As too great a heat is remarkably troublesome, and the violence of the sun-beams disorders their heads, and throws them into vertigoes, it is proper to make choice of places shaded from the sun, and in the morning to lead them on eminences exposed to the east, and in the afternoon on those that are exposed to the west, that when they are feeding, their heads may be in the shadow of their body.

Lastly, in order to save their wool, they must not be led through any bushy places.

"In dry and high grounds, especially if the herbage abound in wild thyme, and other odoriferous plants, the mutton is of a much finer quality than that which is fed in moist vallies and low plains; unless these plains be sandy and near the sea, the herbage then being sprinkled with salt; and the sheep are no-where so good as on these salt plains. The ewes also fed in them, yield more milk, and of a better taste. These animals are remarkably fond of salt, and nothing is more healthful when given in moderation; and in some places it is customary to put into the sheep-house a bag of salt, or a saline-stone, which they all greedily lick one after another.

"Every year the stock should be examined, in order to find out such as begin to grow old, and are intended for fattening; for as they require a different management from the others, so they should also be formed into a separate flock. They should be let abroad in summer before sun-rising, in order to feed on the grass while moistened with the dew. Nothing forwards the fattening of wethers more than a great quantity of moisture; and nothing more obstructs it than the heat of the sun; so that about eight or nine in the morning, before the great heat begins, they should be brought back, and salt given them to excite thirst. About four in the afternoon they should be led a second time into cool and moist places; and after two or three months of these little cares, they will have all the appearance of being full of flesh: indeed they are generally fattened as much as they can be; but this fat proceeding only from the great quantity of water they have drank, may be said to be no more than oedema, or bloated humour, which would in a short time turn to the rot, and can be prevented only by killing them while in this state of fatness. Even their flesh, far from being firm and juicy, is extremely insipid and flabby: in order, therefore, to make good flesh, besides letting them feed on the dew, and giving them a great deal of water, they should have, at the same time more succulent food than grass. They may be fattened in every season, by only keeping them apart in a sheep-house, and feeding them with the meal of barley, oats, wheat, beans, &c. mixed with salt, for making them drink more copiously. But in whatever manner, and in whatever season they are fattened, they must be immediately disposed of; for they cannot be fattened, twice, and they will die by diseases of the liver.

"Worms are often found in the livers of animals; and a description of those found in the liver of sheep and oxen, may be seen in the *Journal de Sçavans*, for the year 1668, and *Ephemerides of Germany*, tom. v. 1675, 1676. These worms were thought to be peculiar to ruminant animals; but M. Daubenton has found the very same in the liver of the ass; and it is probable that the like may be found in the liver of other animals: but it is also affirmed, that moths have been found in the liver of sheep." M. Rouille, secretary of state for foreign affairs, was so kind as to communicate to me a letter to him, from a doctor of physic at Montiers, in the duchy of Tarantaise in Savoy, from whence I have made the following extract. "It has for a long time been observed, that the sheep of our Alps, which are the best in all Europe, sometimes fall away surprisingly. Their eyes become white, sunk, and blinded; their blood ferous, with scarce any redness to be seen in it; their tongue dry and shrivelled; their nose stuffed with a yellow, viscid, and putrid mucus; an extreme debility, though they eat

eat a great deal; and, in fine, the whole animal system visibly decaying. After several close enquiries, these animals were found to have in their liver white papilios, with proper wings; their heads of a semi-oval form, bilious, and of the bigness of those belonging to the silk-worm. I have been convinced of the reality of this fact, by squeezing above seventy out of the two lobes; and, at the same time, all the convex part of the liver became lacerated. They have been found in the veins only, without a single instance of their being in the arteries. In the cystic duct small ones have been found, together with small maggots. The vena porta, and the capsula of Douglas, which are visible there as in man, yielded to the softest touch. The lungs and other viscera were found." It were to be wished that the doctor had given us a more circumstantial description of these papilios; that these animals which he saw may not be suspected to be no other than the common worms found in the liver of a sheep, which are very flat and broad, and of so singular a figure, that they would rather be taken for leaves than worms.

"Every year the whole flock, wethers, ewes, and lambs, are sheared. In hot countries, where the creature may without danger be laid bare, the wool is not sheared, but plucked off; and often they yield two fleeces in a year. In France, and the colder climates, it is cut only once a year with large shears, still leaving the sheep part of their fleece, as some defence against the severity of the climate. The season for this operation is in the month of May, after thoroughly washing them, that the wool may be as clean as possible. In the month of April it is too cold, and it is delayed till June or July, the wool would not grow sufficiently during the remainder of the summer, to secure them from the winter's cold. The wethers have generally more wool than the ewes, and it is also better. That of the neck, and the top of the back, is the prime; that of the thighs, tail, belly, throat, &c. is not so good, and worst is that taken from dead beasts, or such as are sick. White wool is also preferred to the grey, brown, and black, as it may be dyed of any colour. Straight wool is better than curled; and it is even said that the wethers whose wool is too much curled, are not in so good a state of health as the others. A considerable advantage may also be drawn from sheep by folding them; that is, by leaving them for a proper time on lands intended for improvement. In order to this, the ground must be inclosed, and the flock shut up in it every night during the summer. By this means the dung, urine, and heat of the body of these creatures, will in a short time bring the ground into heart, whether exhausted, or naturally cold and barren. A hundred sheep will in one summer meliorate eight acres of ground, which will continue its fertility six years.

"We are told by the ancients, that all ruminant animals have suet, though this is strictly true only of the goat and sheep: and that of the sheep is in greater quantity, whiter, drier, finer, and of a better quality than any other. Fat differs from suet, as continuing always soft; whereas suet hardens as it grows cold. It is chiefly about the kidneys that the suet is found; and the left has always more of it than the right. There is also a great deal of it in the caul, and about the intestines; but this suet is far less firm and good than that of the kidneys, the tail, and other parts of the body. Wethers have no other fat than suet; and so predominant is this fat in their constitution, that all the extremities of their flesh are covered with it. Their very blood is not without it; and the seminal lymph is so saturated with it, as to appear of a different consistence from that of other animals. The lymph of the human species, that of the dog, the horse, the ass, and probably of all animals without suet, liquefies by cold, rarefies in the air, and becomes the mere fluid from the time it was ejected from the animal's body. On the contrary, the seminal liquor of the ram, as well as that of the goat, and probably other animals that have suet, instead of rarefying in the air, hardens like suet, and, with its heat, loses all its liquidity. This difference I have perceived by microscopical observations on these seminal lymphs. That of the ram coagulates in a few seconds after its leaving the body, and to perceive the living organical molecule, of which it contains a prodigious quantity, the object plate must be heated, in order to preserve it in a state of fluidity.

"The taste of the flesh, the fineness of the wool, the quantity of the suet, and even the size of these animals, differs very great in different countries. In France they

chiefly abound in the duchy of Berry; those in the neighbourhood of Beauvais, and some other parts of Normandy are the largest, and fullest of suet. In Burgundy they are very good; but the best are those that feed on the sandy coasts of our maritime provinces. The wools of Italy, Spain, and England, are finer than those of France. In Poitou, Provence, the neighbourhood of Bayonne, and some other parts of France, there are sheep which seem to be of a foreign breed; they are stronger, larger, and have a great deal more wool than those of the common breed. These sheep are also more prolific than the other, it being nothing extraordinary with them to have two lambs at a time, and year twice a year. The rams of this breed, engendering with the common ewes, produce an intermediate breed, partaking of the two from whom it proceeds. In Italy and Spain, the number and variety in the breeds of sheep is still greater: but all must be considered as forming one and the same species with our sheep; though this so numerous are diversified species hardly extends beyond Europe. Those long and broad tailed creatures so common in Africa and Asia, and by travellers called Barbary sheep, seem to be of a species different from ours, as well as the American, Vigonia, and Llama.

"White wool being much more esteemed than black, spotted or black lambs, are almost every where sold to the butcher; though in some places the far greater part of the sheep are black; and for black lambs to be produced by a white ram and ewe, is a phenomenon common in every country. In France there are only white, brown, black, and spotted sheep; Spain has dun sheep; in Scotland there are yellow; but all these differences and varieties in colour are no more fortuitous than the differences and varieties of the breeds, which are, however, only owing to the effects of the food, and the difference of the climate." *Buffon's Histoire Naturelle, tom. v.*

The reader is indebted to the ingenious Mr. Irwin for the following observations relating to the management of sheep in Ireland:

"Of all the quadrupeds, says he, the sheep perhaps is the animal best adapted by Providence to pay the rent. It requires great attention to it; but, at the same time, little bodily trouble. The chief care should consist in their cantonment for food, in which our Irish farmers are extremely negligent (I mean those of them that have abilities to be otherwise); for they station them promiscuously over the land, enclosing only the fattening grounds, which is done but badly, and other cattle suffered to mix with them; whereas sheep, in their rearing and fattening state, should be by no means suffered to perambulate a variety of pasture. For this reason,

"Most closes, or inclosed fields, have some herbage, besides the common grass, predominant in them; and where sheep are suffered to run over too many of these at once, the different mixtures in such extensive pastures have, I am convinced, from repeated experimental observations, very unfavourable effects on this tender and delicate animal, both as to the rearing and fattening, or as to bone and growth.

"It actually gives, or inclines them to a *scourer* (and other disorders well known to the shepherds), oftentimes not less prejudicial than that which they never fail getting in low swampy grounds, which always proves mortal to sheep that are suffered to remain ever so short a time in such places; for though the noxious insane effects of such pasture may not immediately appear, or operate on them, it never fails bringing on the rot in the end, which manifests itself by the scower, and other unhealthy symptoms.

"A gentleman in my neighbourhood, who occupies several thousand acres of deep rich soil, suffered a considerable loss of sheep, particularly ewes, in the spring of 1759, (I think it was); and that season was far from being inclement, especially wet, which is the most unfavourable weather to that kind of stock.

"I made close enquiry into the causes of this uncommon mortality; for such it appeared to me at that time.

"The common reasons for this destructive pestilence were indeed given; but from some observations I made from appearances, I did not judge them satisfactory.

"It seemed to me that a too extensive run of over fertile, luxuriant soil, little or no shelter, negligence in folding, and other care not difficult to be taken, but absolutely necessary to the well being of this delicate animal, had brought on a deadly and general rot.

"Many were with difficulty saved, only to languish away, in all probability, the succeeding winter; for though a sheep, the first time it is tainted with the rot, whether in winter or summer, may for that season, with great care and difficulty, be preserved, it nevertheless seldom happens that any amelioration of pasture will make it a long liver; for when it is once touched with this disorder, a cure may (as in many human chronical diseases) be patched up; but it will never get thoroughly clear of it. Hence the generality of our farmers, though they may think otherwise from their practice, appear to me to be in great error in this respect.

"But their stock is commonly too large, and they are continually buying in, or selling out; so that by not keeping them for any length of time, they have not proper opportunities to explore rightly the effects of the causes we are now investigating.

"The largeness of their stock, I say, prevents them from looking minutely into these necessary matters, which is not in general the case in England. Besides, from the great numbers they often times possess, they are so accustomed to losses in this way, and so little attendant to physical causes, that they are things of course with them; neglects I call them, that a little attention would easily remedy, were the flocks never so large: and in this respect indeed it must be admitted, custom erroneously commits too many to the care of one shepherd in a country not yet thoroughly improved.

"Through the laziness or inattention of the herdsman (for careless they almost all are) many casualties they pretend arise from the unimproved state of the farm, and easily impose them as such on their employers, whereas they solely proceed from their own neglect.

"To remove sheep often is an excellent temporary preventative against the rot, and most other disorders incident to them; but to fold them dry a-nights is still more infallible; that is, to keep them from rain; but the largeness of the flocks in Ireland, most people imagine, is an absolute bar against this salutary expedient.

"This is an ill-founded surmise. If they would divide their stock in smaller proportions, that is, to limit their sheep-walks to one or two hundred acres at most, under the care of one man; to allow to these proportions (the land being, we will suppose, of no more than a middling good sort) three sheep *per* acre in summer, and one and a half in winter, in the rearing or breeding way; and to erect on every such farm proportionable shelter-houses to a south, or south-by-east aspect, (but never to the north or west, the winds blowing, especially from the latter point too long and cold) there would not be one third of the annual dearth of sheep there is; and in this computation I fancy the proportion is exceeded.

"Those who hold very extensive tracts, may say this simple expedient is not practicable; but it certainly is, both to the considerable and inconsiderable farmer, even in parts where timber is not easily to be had, which seems to be the chief difficulty. Suppose now (to give a very feasible hint) a house made of turf (if no stone or brick could be conveniently had) one hundred feet long, about fourteen wide, and the wall about five feet high, with four large doors or openings to the aspects before-mentioned; slight and cheap timber girthing, easily carried from afar, would do for this business as well as the best; the thatch, whether straw out of the barn, or stubble, which last is far the best, we know, is of a trifling value in those parts, and ought to be well saved on with ropes, which makes it effectually resist stormy weather; and the erecting the wall of turf, or, which is much better, with clay mortar, well mixed with straw-rubbish, we also know, cannot cost much, where labour is but from a groat to six-pence a day.

"In short, I could erect one of these houses in this manner on every hundred acres, which is the quantity of land that ought to be allowed to each, for fifteen pounds, Irish money, or, at most, twenty. The land, spoiled by digging off the fods, would be soon restored by the treading of the sheep. The hay-yard, of course, to be adjoining this house.

"All the objection I think can be made is, the not being able to move these houses, thereby to ameliorate different spots of the farm, as they do in Switzerland their wooden houses that run on wheels.

"Conveniencies in countries are different: in Switzerland there is plenty of wood; in many parts of Ireland the length and difficulty of carriage renders a sufficiency of it

for this purpose impossible to be had: besides, moving houses, for aught I know, may do well in Switzerland, or in England; but such as I mention would answer extremely well in Ireland.

"In this way I am sensible the winter-mucking would be almost always on one spot; but it would make much dung, which might be removed to great advantage; and if it had not, is it not evident that it would be much more beneficial to lose the night-mucking, during the three or four most inclement months of the year, than treble the worth of it of one's stock? Moreover, I am not clear, but the dung being preserved from the frost would go farther than if scattered by the sheep about the land in hard weather: and though it is much the custom to turn out dung in that season, I am certain, (and many physical causes will demonstrate it) the sooner afterwards it is mixed with the land, the more of its virtue it will retain.

"But before I quit the article of sheep: as I said before, countries and circumstances differ; for though I do not approve of extensive uninclosed pastures in Ireland, it seems in Spain they do well enough: the flocks there are small, as in France; but they have a right of commonage in that country, perhaps not in any other civilised one that we know of.

"There it is a constant practice with the shepherds, soon after shearing time, to set out with their flocks, generally consisting of about a hundred each, and to pass from one province to another, feeding them promiscuously both on ley and corn lands, the meadows, and some other particular enclosed lands, as parks belonging to the nobility, and clergy especially, only excepted.

"These itinerant shepherds often travel three or four hundred miles from their habitation with their small flock: they sometimes take part of their family, a good deal of provisions, a tent, and some well-trained dogs, and are never stopped if they keep the sheep on the open lands, and often do not return home till after lambing-time.

"They generally have one third, or half the profit of the stocks for their hire." *Museum Rusticum*, vol. I. p. 449.

"I think, says another writer in the *Museum Rusticum*, that early shearing should be preferred on many accounts: some defer this work till at or after Midsummer; but this should be avoided, as very bad consequences often ensue. By this late shearing, the maggots have an opportunity of breeding in their skins; and this frets them in such a manner that they often pine away, and lose all their flesh.

"This is easily prevented by early shearing, and therefore if the weather be any thing tolerable, I generally do this work about the middle of May, and sometimes the beginning of that month: by this method the new growth of the wool has time to get a-head, so as to secure the sheep from the attack of the fly. It is true that at this time of the year the weather is often cold, and chilling rains fall which might endanger my new-shorn sheep, was no farther care taken of them: but this danger I always guard against, by washing my sheep, after shearing, with salt-water taken from the Medway: this is of great service in killing any vermin that may harbour close to their skins; and, besides this advantage, the penetrating quality of the salt so warms this animal's mass of blood, that it is a great means of preserving it from many disorders to which it is fatally subject: such as the gripes, scab, red-water, rot, &c. &c. This I say has been my practice ever since I have lived in Kent; but before that time, when I was not within distance of the sea or Medway, to get salt-water from thence, I always made a brine of proper strength with common salt and soft water, and applied it to the same use with equal benefit, though it cost me, to be sure, somewhat more. When my sheep have sores, either by the bite of flies, or by scratching, &c. I find the best remedy to be that which is commonly in use, viz. a little tar applied to the wound: many, if you ask their advice, will, by way of shewing their judgement, prescribe to you complicated mixtures, which have no other merit but being more expensive: but be assured, the more simple the remedy, the speedier the cure.

"Many farmers suffer great losses by buying sheep that are rotten; for which reason, every prudent man should, when he buys a lot of sheep, agree with the seller, that he should warrant them sound for a month at least; this would prevent many heavy losses, and be a means of guarding honest

neft men from being impofed on: If fheep are the leaft inclinable to the rot, the beft remedy is to drive them directly into a dry upland pafture.

"Though I fhear my fheep fooner than moft of my neighbours, I fhould alfo have obferved, that I always fhear my fat wethers firft, as they are beft able to bear the cold; and I referve my poor fheep till laft, as the cold and chilling rains pinch them more than the others." *Mufcum Rufficum*, vol. I. p. 210.

I never ufed, fays Mr. Lifle, "to fhear till the Monday before Midfummer day; but I now (anno 1714) find I was in an error in fo doing; and that, as my keeping is very good, by which means the wool grows the larger, and heats the fheep the more, and their flefhinefs being fuch as to bear the cold the earlier in parting with their fleeces, I ought to begin to fhear the firft week in June; and the fheep would not only thrive much the better, when the load of their wool was gone, but their new wool would alfo have more time to grow againft Wayhill fair, which would make the fheep look more burley." *Lifle's Husbandry*, vol. II. p. 275.

We cannot but in general approve of the early fhearing of fheep, beginning with the fatteft; but no certain day can, with reafon, be fixed for doing this work; for our feafons differ fo much in various years, that next year, in the beginning of May, the weather may be fo warm as to be very proper for the work; and in the following year, the middle of the fame month may, on account of the cold, be too foon to begin. The beft regulator for this work, as well as many others, would be the ftate of vegetation, from repeated obfervation of fome particular tree or plant, on a particular foil and expofure; for to bring plants to a certain ftate, requires always a certain degree of heat, and this is fooner or later, according to the feafon. Every work of husbandry, in fpring at leaft, might be regulated in the fame manner, and that to great advantage, for nature is an unerring guide.

The fheep of the Ardennes, a foreft in Lower Germany, are very where celebrated for the exquisite delicacy of their flefh; and from a particular method of fhearing them, their wool alfo is in no lefs efteem.

"Amidft all the accidents and diftempers to which fheep are liable, feldom any of them are known to die, certain innocent remedies foon reftoring them. I have obferved every where elfe there is a fixed feafon for fhearing fheep; and accordingly I have feen not a few, after being fhorn, fhivering with the fharpnefs of the air; whereas, in the Ardennes, if the month of April or May be too hot or too cold, the fhearing is delayed; and is not often they fet about it before the middle of fummer. If, when bared, they are found to have received any wound in the fhearing, it is rubbed over with a liquid pitch, and all the reft of the body well wafhed with wine or oil.

"In fome part of the Ardennes, the wine is mixed with oil-lees, or an ointment is made of wine, oil, and virgin-wax; and this precaution is faid not only to thicken their wool, but alfo preserves them from fores and the fcab. They are never fheared in the morning, it being a proverb in the country, that wool is to be fheared, as fruits defigned for keeping are to be gathered, when the dew and coolnefs have been exhauled by the heat of the fun. If fheep are fheared when fwetting, the wool, by imbibing the fweat, becomes the fofter and better coloured.

"Sheep are fubject to a kind of diftemper, which within two or three weeks, frequently fweeps away a whole flock; but, to prevent fuch a fatality, the Ardennes fheep, at the beginning of the fpring, have a certain potion given them.

"The flock is firft carefully examined, and the ailing fheep feparated from the found; an excellent method: yet is the Ardennes the only place where I ever faw it praftifed: after this, the juice of wild fage and horehound, well cleaned, is mixed in their drink, and this continued for a fortnight fucceffively. In autumn this medicament is repeated; and thofe which are fick likewise go through the fame courfe during a fortnight, and generally with a very happy effect.

"Upon being feized with the fcab, which the negligence of the fhepherds does but too often occasion, an ointment is prepared for them of the juice of any kind of fage, mixed up to a confiftency with pulverifed cerufs and frefh butter: with this the fheep are rubbed, and, three days after, wafhed with the urine of a fhe-aſs, which cures them.

"If the exceffive heats have fo affected them; that they grow fickly and faint, and even to a total lofs of appetite; the juice of wild beets is mixed in their drink, and endeavours are ufed that they fhould eat them; which if they can be brought to, they are the fooner upon their legs; but if any afthmatic fymptoms appear in the fheep, the tip of their ears is cut off, after which the paunch of a fheep, being thoroughly boiled in wine, a fpoonful of the liquor given to every fheep; and this never fails, in a very little time, to fet them to rights.

"The cough is fo common a diforder among fheep; that one feldom paffes near a flock without hearing it in feveral: yet in the Ardennes it is otherwife; for upon their firft coughing, a radical cure is wrought by fyringing; during fix or eight days, up the fheep's noſtrils, blanchd almonds pounded in wine.

"It fometimes happens that fheep feed in paftures intermixed with noxious herbs, which not feldom occasion their belly to fwell; and this, without a speedy remedy, proves fatal; but, upon the firft appearance of it, they are bled in the lip, and a fpoonful of man's urine adminiftered to them, which makes a perfect cure.

"If along with the grafs they have eaten any worms or leeches, olive-oil, mixed with warm vinegar, is poured down their throats: this not only cures them of the prefent evil, but preserves them from feveral other accidents.

"An abſcefs, or impoffthume, in the fheep, is cut, and falt, well pulverized and burnt with liquid pitch, ftrewed over the incifions.

"In order to make the fheep good nurfes, fo that they may be able plentifully to fuckle two lambs, all they do is to bind dittany (in fome places called pepper-wort) and trefoil to their bellies.

"Upon the lambs being fick, a few ivy-leaves are given them to eat, which after a week fo well reftores them, that they fuck very vigorously." *Mufcum Rufficum*, vol. IV. p. 420.

"There are, fays Mr. Mills, in this kingdom, vaſt tracts of ground, known by the name of Downs, on which are chiefly fed large flocks of fheep. Experience has abundantly evinced, that though the grafs there is naturally fhort, it is an excellent food for fheep; and as the welfare of thefe creatures is of the utmoſt confequence to one of the moſt eſſential branches of the commerce of England, very great caution ſhould be uſed in making any alteration in their diet, till it be well proved, by fair experiments, that a richer pafture does not injure their fleeces. I would therefore recommend, in the ſtrong-eſt manner, to gentlemen who have eſtates bordering on ſuch downs, particularly on that extenſive tract called Salifbury Plain, which reaches from the weſtward of Marlborough to the ſea, to bring ſome of their fheep into rich paftures, of different graſſes, as well natural as artificial, and to keep them there for ſome generations, in order to aſcertain with certainty, what the effect will be.—The word generations, may, perhaps, here terrify at firſt, as implying a long ſpace of time for theſe experiments, thoſe who do not immediately confider in how few years this ſucceſſion may take place.—A lamb reared from its birth on, for inſtance, burnet, will, in two years, bring a lamb, which, in two years more, brings young, and the ſixth year may ſee the third generation: ſo that by the end of ſeven or eight years the fact may be aſcertained.

"If fheep will be equally benefited by richer pafture, then the farther improvement of theſe downs muſt become a matter of great concern, both to individuals and to the public; becauſe, granting that they may be improved with ſafety, the number of our fheep may be greatly increaſed: but if ſuch improvement ſhould be found in the leaſt detrimental to the wool, inſtead of being encouraged, it ſhould be forbidden, even by law." *Mills's Husbandry*, vol. III. p. 379.

Mr. Young, in his *Annals of Agriculture*, vol. IV. inſerts the following:

"I keep a large flock of ewes for breeding, and which are commonable fheep. By an act of parliament which paſſed ſome years ago, I got a claufe into it, to prevent rams being turned on commons after the 20th of Auguſt, my reaſon for it was, that the breed might not be injured by the ewes communicating with paltry rams; and alſo, to prevent the ewes from taking the ram too early. To avoid theſe two evils, the farmers were obliged to take their ewes to pafture and ſtubbles early in September, when our ewes take the ram, which they ought not to do till the end of

October, and then the lambs will be dropped in the beginning of April. The consequence is, that farmers can, by keeping their ewes on the commons with safety from paltry rams, preserve their winter pastures near two months longer, which is of great advantage to their flocks. Before this act passed, I generally lost about 20 lambs in every hundred, by the severe weather and want of grass in February and March; and a lamb once stunted in its growth, like a stunted tree, never comes on well after. On the 25th October, I draw my ewes into flocks of 25 each, and put a ram to each. In a fortnight or three weeks after, they all go together. Thus every ram has his share of ewes without being harassed out of his life, and I lose very few lambs in consequence of it."

In *vol. XIII*, he says that "A farmer, of a considerable lordship in Bohemia, visiting the hot-wells of Carlsbad, related how he preserved his flocks of sheep, from the mortal distemper which raged in the wet year 1769, of which so many perished. His preservative was very simple, and very cheap: he fed them every night, when turned under a shed, cover, or stables, with hashed fodder straw, and eating it greedily they all escaped."

"This verbal information has since been confirmed by a gentleman, Mr. G. of S. a celebrated agriculturist, for his many judicious experiments, in a letter to a friend of his, who consulted him about it."

"Since you are pleased, says he, to inquire after my agronomical trials, to prevent the destruction of sheep, arising from wet damp weather, during their common pasture-walks, they are much at your service; I made them during all those late wet seasons, and have found them undeniably certain, and to be entirely depended on; though ever so cheap and easy. They consist in nothing more but giving the sheep at night, when turned in, some dry chopped barley or oat-straw, for their fodder, which they devour with eagerness. Their nature requires, it seems, and their instinct calls for this corrective, after having been fed all the day long with wet grass; and having gathered too much moisture in their bodies."

"Many shepherds erroneously pretend, that sheep spurn dry provender, after having tasted green vegetables. But it has been observed, that the flocks of such prejudiced shepherds, were the very flocks that suffered most: whereas those, who followed my example never lost a single sheep; though kept all the day long upon none but wet fallow fields."

In *vol. VIII*. of his Annals, he says, "The following record of the profit of sheep, deserves observation."

"Five Norfolk ewes were bought somewhat after Michaelmas 1783, for 16s. a head, and were kept in enclosed fields and pastures of much inferior quality to some. Early in the spring 1784, they produced seven lambs, which were all sold to the butcher in the month of May, for 16s. a head. They shorn in the summer about half a tod of wool, which was sold for 6d. per pound: the five sheep took the ram again, and in the month of August, in the same year, had seven lambs more, which, not long after Michaelmas, made 10s. each. Of the five ewes, four being tolerable meat, were sold at their original price, in the month of October, and the fifth, early in the next spring, fetched a pound. The total produce of these five sheep, in something more than the compass of a year, was 9l. 16s. 6d. and all this upon little more than an acre of ground; so copious and abundant was a crop of clover."

Mr. Marshall, in his Rural Economy of the Midland counties inserts the following:

"The method of destroying maggots, here, is effectual, and, if applied in time, simple and easy. Instead of cutting the wool off the part affected, and scraping off the maggots with the points of the shears, the wool is parted, and the maggots picked out with a knife, or otherwise dislodged, without breaking the coat; and a small quantity of white lead scraped, from a lump, among the wool; which being agitated, the powder is carried evenly down, to the wound. Too much discolours the wool; a little prevents any farther harm from the maggots, that may be left among the wool; driving them away from the wound; and, at the same time, is found to promote its healing. In well shepherded flocks, which are seen regularly twice a day, there is no such thing as a broken coat."

In his Rural Economy of Yorkshire, he says "The common time of putting ewes to the ram, in the Vale, is from old Michaelmas to the latter end of October; bringing them in the latter end of March, or the beginning of

April. In the Morelands, the latter end of November, or beginning of December, is chosen for the time of putting to, in order that the snows may be pretty well over before lambing-time."

"If twin lambs be preferred, the ewes are put to superior keep a few weeks before the ram be admitted. This likewise brings them in nearer together than when they are put to the ram in low condition."

"It is also understood by attentive shepherds, that ewes ought to have an increase of keep a few weeks previous to their lambing; but less judicious sheep-masters think it sufficient to put them into good keep as they drop their lambs."

"This, however, is a very faulty practice. If there be any mystery in the rearing of sheep, it lies in giving the ewes a flush of milk at the time of lambing. This cannot be done without putting them to good keep a fortnight or three weeks before that time. An additional supply of milk cannot be commanded in a few hours. The carcase of the ewe, as well as her udder, may require to be saturated at the time of lambing, lest, in the interim of preparation, the lamb be stunted or starved."

"Another practice to which attentive breeders pay due regard is, that of trimming provincially, docking, breeding-ewes, as early in the spring as the state of the weather will permit. I have seen the bags of ewes (of the modern breed) so heated with the dung and urine which hung about them, as to become chafed to running sores. The bag ought to be trimmed a few weeks before lambing (when the ewes are put to fresh keep), and the tail and buttocks as soon as warm weather come in."

"To render the breeding sheep profitable, much attendance and attention is requisite. A few ewes, therefore, cannot be worth the notice of any man except a small pains-taking farmer, who has little else to attend to. I have seen more labour and attention thrown away upon a score of ewes than their whole produce was worth. A ewe-flock large enough to employ a shepherd, is, in many situations, the most profitable flock."

"The only particular of management which is here entitled to notice is, that of dressing them in autumn with tar and grease, provincially salving; the tar and grease with which they are anointed being aptly enough termed salve."

"How the practice was first introduced into the district under survey does not appear to be at present known, though not of more than fifty years standing. It probably travelled from the north, where I find it is now in use; not from the south, where I have never met with the smallest traces of it."

"The intention of this practice is to kill lice, prevent the scab, and make the wool grow; and another idea, I believe, is, that it fortifies the skin against the severity of the winter's cold."

"Whether it answer all or any of these intentions I will not assert. Whatever may be its effects, it has now been the invariable practice of the district for near half a century. I have not at least met with more than one man who has deviated from it, through principle."

"This deviation, however, is made by one who seldom acts from caprice. He does not wholly deny its use, but thinks its effect is very transient. He has found tobacco-water more effectual against vermin; oil of tar, if cautiously used, a safe and certain remedy of the scab; and is of opinion, that salving is of little if any use to the growth of the wool: he allows that it may increase the weight of the wool in proportion to the quantity of dirt it contracts; but thinks it does not add to the quantity."

"Whether it does or does not may, nevertheless, be a moot point: ointment rubbed on a recent scar of a horse is believed to assist the hair in growing. Pomatum is allowed to encourage the growth of the human hair; and it is probable that salve may have some effect on the growth of wool: the only doubt in my mind is, whether the advantages, upon the whole, are adequate to the expence."

"This is a matter difficult to be ascertained: I can say, that the scab does not appear to be less prevalent in this than in other districts: and it appears probable to me that, notwithstanding the present prevalency of the practice, it will in time wear away. I will, nevertheless, here give a detail of the process; not to prolong its continuance, but to memorize a practice which at present gives cold and dirty employment to thousands, some weeks in every year."

"The mixture, is eight pounds of butter (of the second, third, or fourth quality, *see article DAIRYING*) to one gallon

gallon of tar. The butter being dissolved, the two ingredients are poured into a tub or other vessel, and stirred for some time with a long wooden spatula; agitating them violently, and uniting them intimately together. The general guide is to keep stirring until the butter has regained its stiffness sufficiently to hold the stirring-stick erect in the ointment; which, when quite cool, is of the consistence of butter in warm weather. Some put the tar previously into the salve-tub, and stir that alone until it loses its blackness, acquiring a mellow yellowish hue; then add the dissolved butter, and continue stirring until the stick stand on-end. If the butter be heated too much, it is thought to injure the tar: it should be barely oiled.

"The time of salving is from Michaelmas or Martinmas.

"The method is this: the feet of the sheep being bound, it is laid upon a bier, provincially a creel (about six feet long, two feet wide in the middle, twenty-one inches toward the ends with four legs about two feet long). The falver sits astride of one end of the creel, the shoulder of the sheep resting against his thigh; its head under his arm. He begins the operation by parting, provincially, shedding the wool from the withers to the tail, leaving a straight open shed or cleft in the wool the whole length of the sheep. This cleft ought to be perfectly straight and clear at the bottom; a form which practice only can give it. It is made by taking the wool on each side in the hands and pulling it asunder, forming the cleft with the thumbs. The failure made and the wool pressed down flat on either side with the hands and wrists, the workman takes a piece of ointment the size of a large hazel-nut (from a kind of dish formed out of a block of wood in the shape of a cheese), upon the side of the end of his fore-finger, and applies it to the skin of the sheep; driving it along the bottom of the shed six or eight inches, with a degree of sleight which experience alone can teach: the perfection of the art lies in distributing the ointment evenly, and in applying it entirely to the skin, without fouling the wool, except immediately at the root. One finger-full being expended, another and another is applied, until the whole length of the first shed be finished; when a second cleft is made, about an inch or an inch and a half from the first. In making the second and every succeeding shed, the fingers of one hand are kept in the last-made cleft, by which means an experienced workman is enabled to make the partings exactly parallel with each other. Towards the back of the sheep the sheds are made closer to each other than they are beneath its barrel; where the wool being thinner, the scab is less liable to make its attack.

"Ten or twelve sheep in the middle size are esteemed the day's work of one man. His wages, and board, fifteen to eighteenpence a day."

Mr. Marshall makes the following observation in his *Rural Economy of Norfolk*, "The shepherd telling me that a cutter in the neighbourhood could extract the concealed testicles of ridgil lambs; and he having last year experienced the inconvenience of three or four of these troublesome and dangerous animals, I let him send for him. This morning he has cut three; the whole number, it seems, this year. They are now from six to eight weeks old.

"Having cut off the end of the bag, and drawn the testicle contained in it, he proceeded to take the other out of the side opposite to that on which the palpable testicle lay.

"It increases the difficulty in cutting ridgils, when the palpable testicle has been priorly extracted; as the operator, then, knows not which side to cut on; and is frequently obliged to cut both sides before he finds the concealed testicle.

"The lamb was laid flat on its side, upon the ground; one man holding it by its neck and fore legs; and another stretching it out, by drawing its hind legs back; both of them at the same time pressing their hands hard to the ground; so that the lamb had no liberty to struggle.

"The cutter then clipped off a patch of wool, about the size and shape of a duck's egg, close below the loin, and about half way between the huckle and the short ribs.

"He then made an incision wide enough to admit, freely, his fore-finger; with which he searched for the stone, and presently brought it out; and, disentangling it very dexterously from the film with his knife, drew out the string.

"He immediately sowed up the orifice, and coated over the wound with cart-grease.

"It is remarkable that the concealed testicles all lay

lay on the same side; namely, the right side; the contrary side to that on which females are cut. This made the operation rather awkward to his hand; he nevertheless performed the business so skilfully, and with so much dexterity, that he extracted the two first in a few minutes. But the last was a remarkably difficult case; the testicle being very small, and braced up close to the vertebræ; and it is observable, he could scarcely draw the palpable testicle of this lamb out of its bag: the punishment to the animal seemed full as much in one operation as the other.

"The price of cutting, a shilling a piece.

"The wind being cold, kept them in the house all night; but the cutter, though the wind continued very pinching, thought it proper for them to go out in the day-time for the sake of exercise: they got very stiff for some days, but are now doing very well.

"One of them, nevertheless, is since dead: owing, I apprehend, entirely to their being too much exposed to an unusually piercing easterly wind."

In the same volume, Mr. Marshall gives the following account of a sheepfold.

"This morning, measured a sheepfold, set out for 600 sheep, consisting of ewes, and wethers, and grown lambs.

"It measures eight by five and a half rods, or forty-four square statute rods; which is somewhat more than seven rods to a hundred, or two yards to a sheep.

"By which it appears that one hundred sheep manured seven square rods daily. But the second folding was thinner; suppose nine rods, this is, on a par of the two foldings, eight rods a day each folding.

"The dung could not be worth less than half a crown a load; and the carriage and spreading ten shillings an acre; together, fifty shillings an acre; which quantity of land the hundred sheep teathed twice over in forty days.

"Supposing them to be folded the year round, they would, at this rate, fold nine acres annually; which, at fifty shillings an acre, is 22l. 10s. a hundred, or four shillings and six pence a head.

"In some parts of the island the same quantity of dung would be worth five pounds an acre, which would raise the value of the teathe to nine shillings a head; which, at two pence a head a week, is more than the whole year's keep of the sheep.

"It does not follow, however, that all lands would have received equal benefit with the piece in consideration; which, perhaps, had not been folded upon for many years; perhaps never before, and sheepfold, like other manures, may become less efficacious the longer it is used on a given piece of land.

"1782, August 29. Last autumn, in order to ascertain the proper time of putting ewes to the ram, I made the following experiment:

"The 20th of September put a score of longwooled ewes of different ages to a Leicestershire ram, and a score of Norfolk ewes to a Norfolk ram. Being in rather low condition, few of them took the ram till the beginning of October.

"The 19th of October put twenty-three long-wooled and forty Norfolk ewes to the same rams, keeping the two breeds separate.

"The 20th of November put the same rams to a score of each sort reserved for the purpose.

"The early lambs were much the stoutest and best for stores; and grafs lamb was out of season before the late ones were fit for the knife.

"But the crones which took the ram early were not able to support their lambs in winter: for grafs was scarce, and they could not break turneps.

"Therefore, this year, all the young ewes have been put to the rams a week ago, and all the old ones are intended for the butcher before this year's grafs be gone: for in a country where turneps are the principal spring food, crones appear to be unprofitable stock."

In his *Rural Economy of the Vale of Gloucester*, Mr. Marshall says, "The sheep is a mountain animal. Even in its present cultivated state, hills are its natural element: Uplands (or very sound dry middlelands) are the lowest stage on which sheep can be kept, with any degree of safety to them; or with any degree of certainty to their owner. Vale lands, in general, are, without great caution, certain ruin to both.

"Formerly, some considerable flocks were kept, or attempted to be kept, in this Vale: even breeding flocks were not uncommon in it. But the wet summer of 1782,

swept the country of them. One farmer, who had, for three or four years back, been recruiting his flock, and got it up to eight or nine score, had not, I was informed, in the autumn of 1783, more than three individuals left.

"The low situation of this Vale, the singular retentiveness of its substrata, and the wateriness of its soils, through a want of surface draining, conspire to render it, what, from experience, it is too well known to be, singularly fatal to sheep.

"How unaccountable, then, is the conduct of those, who attempt to keep store flocks in it? Nothing but the common error, which prevades almost every district, that sheep are essential to farming, can account for it.

"At present, however, the Vale, fully convinced of the folly of attempting to keep store flocks, changes its stock of sheep every year.

"This species of stock, now, consists chiefly of ewes, bought in autumn, and having fattened their lambs in the spring, are themselves finished in the course of the ensuing summer.

"The species of sheep used in this practice are mostly the Ryeland, and the Cotswold; both of which are described in the course of this article.

"Some little folding was formerly done in the fallow fields: but all the folding flocks are dead of the rot. What folly! What cruelty to drive this animal from its native heights; and force it into a situation, where it must inevitably become a prey to disease; and at length, (if not released by the humanity of a butcher), fall a victim to folly, by a loathsome, tedious, lingering death.

"In a district so notorious as this for the rotting of sheep, some accurate ideas of this fatal disorder were of course enquired after. An experienced husbandman, on opening a sheep which he had killed for his own family, and finding a collection of water within it, pronounced the rest of his flock to be tainted. Water he has always found to be the first stage of the disorder: a white scum upon the liver the next: the last, flukes. From these circumstances, and from all the observations I have myself been hitherto able to make on this subject, it appears to me probable, that an unnatural redundancy of water, unavoidably taken in with the food, is the cause of the disorder."

The following is a certain cure for the *Red-Water* in sheep and lambs:

Take one pint of new milk; make it warm; and dissolve in it one ounce of allum, and give it as soon as the disorder is discovered, to the sheep. If a lamb, half the quantity will serve: and let the tail be cut off.

In another part of the Rural Economy of the Vale of Gloucester, Mr. Marshall observes, that "Herefordshire has been celebrated, time immemorial, for a peculiar breed of sheep, called the Ryeland breed; from an indeterminate district, in the southern quarter of the county, which goes by the name of Ryeland; on which this breed of sheep are principally reared.

"The Ryeland sheep are remarkable for the sweetness of their mutton; but still more for the fineness of their wool; which may be said to rival that of the growth of Spain. If the Spaniards improved their wool, by any breed of English sheep, it was most probably by that of the Ryeland of Herefordshire; not by that of the Cotswolds of Gloucestershire.

"The Ryelanders are a small, white-faced, hornless breed. Their form (though little attended to) is often beautiful; and their flesh of the finest quality. The ewes run from nine to twelve or fourteen, the wethers from twelve to sixteen or eighteen pounds a quarter.

"In the management of the store-flocks of this breed a striking peculiarity is practised. Instead of folding them in the open field, agreeably to the practice of other districts, they are generally shut up, during the night, in a building, which is provincially termed a cot, and the practice termed coting.

"The cot is generally, I believe, the ground floor of a large building, which is chambered at five or six feet high. The size is, of course, in proportion to that of the flock. From those which I have measured, a yard square to a sheep may be taken as the medium allowance of room. Racks are fixed up against the walls; and, in the larger cots, some of which will hold two hundred sheep; other racks are sus-

pended across the middle of the room, and hoisted as the dung and litter rise.

"Their food in the cot is sometimes hay, and sometimes barley straw; but most commonly peas halm; a food, which, it seems, is particularly affected by sheep: a fact, which the rest of the kingdom does not seem to be fully possessed of. The halm, however, is not, I find, always thrashed clean; the under-ripe pods being frequently left unbroken for the sheep. The stall is strewed about as litter; and the cot cleaned out once or twice a year; or as often as necessity or convenience requires. The manure is esteemed of the first quality.

"The advantages of coting are not spoken of with sufficient clearness to recommend it, without trial on a small scale, to other districts. The advantage generally held out is, that it fines the wool; but discerning men observe that, in the same proportion as it curbs the growth of the wool, it checks the growth of the sheep; being in this effect worse than folding.

"The dung is, no doubt, of great value: and I have been told, by an intelligent husbandman, that cotted sheep never rot; provided they be kept in the cot in the morning, until the dew be off the grass. This accords with the theory we have before mentioned: the warmth of the cot promotes perspiration: the dry food absorbs the superfluous moisture of the stomach; and keeping them from the grass, until the dews be gone off it, is a still further preventive of superfluous moisture. I have, however, heard it intimated, that if ground be given to rot, coting will not, with certainty, prevent it: nevertheless, I am inclined to believe, that coting, properly, would prevent it.

"Ewes, when full with lamb, are seldom, I understand, cotted; but, after lambing, the cot is found highly beneficial to the young lambs; preserving them equally from cold and from vermin.

"The practice of coting has probably arisen in the tender nature of the Ryeland sheep, which cannot stand the fold. Attempts, it seems, have been made to fold them, but always with great injury to the flock. Housing them was, therefore, the only means of collecting their dung, and rendering them most useful in an arable country: besides preserving them from the vermin of the woodlands, with which this district has formerly abounded, and with which it still abounds.

"This breed of sheep appears to be an object worthy of national attention. Large sums are annually paid to Spain for wool. The wool of the Ryeland sheep is used in the same intention as that of Spain. Though not fine enough as an entire substitute for Spanish wool, it supplies its place, I understand, in some degree. In 1783, Ryeland wool was sold for two shillings a pound, when the ordinary wool of the kingdom was not worth more than fourpence a pound. Spanish wool was then three shillings. Ryeland wool cotted and trended, was this year, 1788, sold for near two shillings. This wool appears to have been formerly considered as a national object. It is under the inspection of sworn trenders; who free it from dirt and oil, and make it up in trendles, or round bundles, for sale. Wool thus made up bears a price of about half-a-crown a stone, (of 12½ lb.) more than the wool of the same quality, in its rough state. And Spanish, I understand, is worth about three shillings.

"It is, I believe, an inevitable consequence, that should the supply of Ryeland wool be discontinued, an increased supply of Spanish wool would be necessary. On the contrary, should the internal supply be augmented, the wants from abroad would be diminished proportionably. Should the long woolled breed of sheep, which is now working its way into all quarters of the kingdom, gain a footing, and acquire fashion, in Herefordshire, the Ryeland breed may, in a few years, be irretrievably lost.

"The farmer's object is the aggregate profit of his flock: no matter, to him, whether it arise from wool or carcase: and, if the carcase of the Ryeland sheep had not been of superior value, it is probable the breed would long ago have been extinct. For although the wool of this breed is sold at a high price, the quantity cut, from a given number of sheep, is in the inverse proportion. Cotted sheep seldom, I believe, afford more than a pound and a half each sheep; while from some breeds of the kingdom, seven or eight pounds of wool are cut; worth at present, 1788, 8d. or 9d. a pound, or twice the value of the Ryeland

land coat. The sheep of those breeds are, however, larger, but not in this proportion.

"What I mean to intimate, in this case, is that the continuation of the supply of Ryeland wool is, at present, in a state of uncertainty; and I leave it to those, whose province it more nearly concerns, to devise the proper means of preserving and encreasing the English breed of fine-wooled sheep."

Mr. Young, in his *Annals of Agriculture*, vol. III. inserts the following receipt to cure the scab in sheep, "Break the scab, and wet it with this liquor when the sheep are dry, it cures at one dressing:

"Two pounds of tobacco, half a pound of verdigris, half a pound of flour of brimstone, five gallons of small lees; boil well, and strain off; then add one pint spirit of turpentine."

In vol. III. he says "if the scab is suspected to proceed from poverty of living, to improve their food. To keep them very clean, and fed as much as possible on high and dry ground. To clip the wool off. To brush and wash them. To anoint them with hog's lard or fresh butter. To dress the parts most attacked with this ointment: take of the mercurial ointment $\frac{1}{2}$ lb. oil of laurels 4 ounces, flowers of sulphur 3 ounces, corrosive sublimate in powder very fine $\frac{1}{2}$ ounce, mix well in a mortar; if too thick add a few drops of oil. Thus made, of mercury and hog's lard equal parts, triturate the former, in a mortar, with a little terebinth, till perfectly divided, then add the melted lard, and mix well till cold. And to wash the parts less affected with the following lotion: human urine three pints, cow's milk 1 pint, leaf tobacco 4 ounces, boil 15 or 20 minutes; this will keep seven or eight days in winter, and four in summer; use it hot. If the scabs should still resist, wash them with extract of Saturn, made by boiling 3 lb. of litharge, in powder, in 3 lb of vinegar. Purgatives are sometimes necessary; the following is proper for a sheep: take of aloes 1 gros, tartarized vinegar $\frac{1}{2}$ oz. honey 1 oz. mix. Thus made, take salt of pot ash 2 oz. common water 4 oz. dissolve and filtre. To this alkaline water add vinegar 1 $\frac{1}{2}$ lb.

"The author, who is at the head of the Veterinarian schools of France, appears to have studied cattle, and their distempers, with great attention. He writes with great knowledge and clearness; I do not permit myself to enter into a particular examination of his work, as his experience in this line must be infinitely superior to my own: I have mentioned it to recommend, not criticize it."

SHEEP'S-DUNG. See the article DUNG.

SHEEP'S-fescue-grass, See the article GRASS.

SHEEP-LEASE, *Sheep-slate*, or *Sheep-walk*, pasture-land, appropriated to the feeding of sheep.

SHEER, pure, clean, unmixed.

SHELLS, a hard, and as it were stony covering, with which certain animals are defended, and thence called shell-fish.

The vast beds of fossil shells found at great depths in the earth, as well as those found lying on the sea-shore, make an excellent manure for cold clayey lands. See the article CLAY.

SHELL-TOOTHED HORSE, is one that from four years, to old age, naturally, and without any artifice, bears a mark in all his fore-teeth, and there still keeps that hollow place with a black mark, which we call the eye of a bean, inasmuch that at twelve or fifteen he appears with the mark of a horse that is not yet six.

For in the nippers of other horses, the hollow place is filled, and the mark disappears towards the sixth year, by reason of the wearing of the tooth.

About the same age it is half worn out in the middling teeth, and towards the eighth year it disappears in the corner teeth; but after a shell-toothed horse has marked, he marks still equally in the nippers, the middle, and the corner teeth; which proceeds from this, that having harder teeth than the other horses, his teeth do not wear, and so he does not lose the black spot.

Amongst the Polish, Hungarian, and Croation horses, we find a great many hollow-toothed horses, and generally the mares are more apt to be such than the horses.

SHEPHERD'S-Needle, the name of a plant, so called from the remarkable shape of the seeds, with their appendage, resembling the crane's bill.

SHIPPEN, a cow-house.

SHOEING of horses, the operation of fastening a piece of iron on the bottom part of a horse's hoof.

The affair of shoeing horses, is so important in its con-

sequences, both for the preservation of the foot, the safety of the legs, and the ease of their motion; that we cannot be too attentive to any innovations that may be recommended to us in this respect; we shall therefore give Mr. La Fosse's sentiments on this subject; with such animadversions as have occurred to us.

In order to understand this new method of shoeing, it is necessary first to premise the following observations; and attend to the anatomical plates referred to.

It is most certain, that all horses, except such as have their feet overgrown; or such as may have a particular occasion of being shod, to preserve the sole, may, at any rate, go without shoes; and there are many examples, without mentioning the customs of Arabia or Tartary, of horses who are at daily work, without the least need of ever being shod: but as we employ all our care, and address, to hollow the foot, by paring it even to the quick; and to form an exact fine frog, it becomes absolutely necessary to set shoes on them.

The original design of shoeing horses, was undoubtedly intended as a preservative of the hoof, and a defence of the sole; but no one sure could think it necessary to pare away, what he wanted to preserve by the use of the shoes; because that would be to act contrary to his first principles, and destroy his own work.

This precaution could never be recommended, but in cases where the horny sole is uneven, inasmuch, that the shoe could not bear equally upon it, which would take off from its necessary firmness; in such a case, it may be reasonable, otherwise it would be very absurd.

Let us now observe the going, as well as the external and internal structure of a horse's foot.

The horse then who draws, presses first on the toe, then successively on the sides, to ease the toe; then the horse's heel yields upon the heel of the shoe, from which it immediately rises again.

The saddle, or pack horse, places the toe but lightly, so that the point of support is fixed neither upon the heel or toe, but between both; which is easy to demonstrate anatomically.

Thus the cannon-bone presses on the pastern, this on the coronary, the coronary upon the coffin, or foot-bone, and upon the nut-bone.

By this description of the bones, we may observe two essential things, which lay open the faults in the present method of shoeing, and points out the means of being able to remedy them for the future; one is, that the effort of the weight of a horse, does not bear either upon the toe or heel, but on the middle between both; the other shews, the greater the distance of the sole from the ground, or from whatsoever point of support, the more the pushing the coronary-bone upon the nut-bone will fatigue the nerve, or tendon upon which it rests, by the inordinate distension it undergoes at every step the horse takes.

Thus we see, that by hollowing away the sole in paring, the horse is sustained only upon the walls of the hoof, which having no assistance of support from the horny sole, is immediately worn, and battered by the weight of the horse's body; and the sooner he treads upon any hard substance, the sooner he grows quite lame.

For by the connection, thickness, and flexibility, as well as contexture of the horny sole, it seems to be wholly destined by nature to serve as a cushion to the fleshy sole, and tendon, which rests upon it, in order to break the violent shocks of a pavement, stone, or any kind of stump, or external violence; but by paring it away in the customary manner, the horse loses his defence of nature, against stumps, nails, glass, &c. and thus the fleshy sole becomes easily bruised or wounded.

It is observable, that a horse seldom goes easy, or escapes being soon jaded, if the frog does not bear upon the ground, and it is the only point of support to the tendon; so that if you keep it at any distance from the ground, by paring it away, an inordinate distension will happen to the tendon: which being repeated at every step he goes, fatigues it, and causes an inflammation; whence also relaxations, de-fluxions, and tendinous swellings, especially after long journeys, or hard riding, which are occasioned more by the paring of the sole, than the length of the journey; experience has shewn, that the frog neither suffers, or has shewn the least sign of fatigue, or sensibility, by being thus exposed; and indeed from the structure of it, it is scarce possible; for being of a soft-spongy flexible substance, by its natural elasticity, yields to the weight of the body, the

the instant the horse presses his foot to the ground, and immediately recovers it again; however, there is one case, whereby the frog may occasion lameness, which is when it grows hard or dry; but by taking off the little end of the frog, this disorder is soon remedied.

As the bad consequences of paring away the sole and frog, have been pointed out, and, I think, evidently proved, let us observe now, the ill effects of modern shoeing; for it is upon the form of the shoes, and the manner of setting them on, that not only the preservation of the foot, but also the safety of their legs, and the ease of their motion depends.

In effect, the more easy our shoes set upon us, the more active we are; so a large, long, thick shoe ought to have the same effect upon horses, that wooden shoes have upon us; that is, make them heavy, unwieldy, and hobbling.

A long shoe is not only perfectly useless, but it is even prejudicial; for the horse's heels coming to sink upon those of the shoes, the longer the lever, the greater will be the drag upon the clinches of the nails of the toe; and thus horses will be more apt to strike them off on many occasions; especially when they are apt to over-reach.

The longer the shoe is, and the more it covers the sole, the more liable the horse will be to fall, trip, and hobble in his walk; particularly if he goes on a pavement; because the surface being formed of round parts, and the shoe having a large uniform hard face, he can scarce have above two or three points of support.

It is thought by some, that strong shoe-heels are an ease to the weak heels, and fetlocks of horses; as if the body of the shoe was flexible enough to yield to the horse's heel; and under this notion, they raise the shoe-heel, and leave a vacant space between that and the horse's heel; but the direct contrary happens, for it is the hoof, that, by its flexibility yields to the shoe-heel, which is quite inflexible: the thicker the shoe-heel is, the more subject that of the horse is to meet it, and instead of being eased, the horse's heel becomes more compressed, as if in a constant vice, because it has always the same point of support.

By this means, they deprive them of the liberty of going with ease upon a pavement: because the shoe does not bear upon a level, and produces an effect, like that of a pivot, upon the middle of the shoe-heels, and the vault, or hollow.

To obviate these inconveniencies, M. La Fosse proposes the following method of shoeing; that neither the sole or frog should be pared at all; for neither will ever become too large by its growth; but in proportion as it grows, it will dry, scale, and fall off in flakes; that the edge of the hoof, if thought too long, should be taken down as usual; and then a shoe, in form of a half moon, set on, reaching the middle of the hoof, the heels may be thinned, and the shoes made a little longer for such horses as have weak hoofs.

Eight small nails, made in the old way, that is, having very small heads, are incrustated in the holes, which are made, as the head is, in an oblong form; the figures both of the shoe and nail are to be seen in the plate. This is the whole mystery.

By this method, the sole is preserved, and consequently the foot defended against hard, or sharp bodies, which the horse may chance to tread on; thus inflammations, and dangerous compressions are avoided, and the many inconveniencies already mentioned, from the lodgment of sand, gravel, or stones.

Another advantage arising from this method of shoeing, and preserving the sole, that natural defence against external injuries, is, that in not paring away the sole, nor setting on any more shoe than is necessary to preserve the horny sole; the horse will not be subject to slip, either on the winter's icy pavement, or the dry smooth one of the summer.

For by making a horse walk upon the frog, and partly upon the heel, and the former being strongly rubbed, and pushed against the ground, or pavement, impresses itself, as it were, by the weight of the horse's body, into the inequalities and interstices it happens to meet in its way; by this means, the foot resting on a great many more parts, which mutually ease it, by multiplying the points of support, gives the animal a stronger adherence, and more security upon the place he goes.

By paring away the sole, the air, when it is in this thin

state, penetrates, and dries it to such a degree, that by its contraction, it compresses the fleshy sole, so as to lame the horse.

By this means, also sand, and gravel get in, and are ground between the sole, and shoe; and again between the horse's heel, and those of the shoe; which not readily coming out again, cause compressions, inflammations, &c. which last accidents are very often the effects of a stone's being wedged in between the shoe-heels.

To recapitulate the whole;

The weight of the saddle-horse does not press upon the toe, or heel, but on the middle between both; so that the greater the distance of the sole from the ground, or from whatever point of support, the more the great tendon will be fatigued, by the inordinate distension it undergoes at every step.

The more the sole is covered by the shoe, the more the horse will slip, slide, or fall; because the surface being formed of round parts, and the shoe having a large uniform hard face, he can scarce have above two or three points of support; so that the greater contact the horse's foot has with the ground, the more points are multiplied, and the safer of consequence he goes.

By shoeing, no other intention could be expected, but preserving the hoof, after paring away its luxuriance.

That long shoes, and raising the shoe heel, is a very pernicious custom.

By paring away the horny sole, it hardens in proportion to its being thinned, and by compressing the fleshy sole, makes a horse lame; he loses also the defence of nature against external bodies, by which means, the fleshy sole becomes often wounded, bruised, &c.

By paring the frog so much way, that it is not in contact with the ground, the tendon will be inordinately distended: by which means, it becomes subject to inflammation, relaxation, defluxion and rupture.

Lastly, it appears from the anatomy of the foot, that horses are chiefly lame in those bones and its tendon; that the present method of shoeing contributes greatly thereto, by paring away the horny sole, and hollowing the foot; by which means, the fleshy sole becomes more exposed to accidents, and the tendon fatigued, strained, and ruptured; its support being taken away by paring the frog.

We may learn also from hence, that no more of the toe should be pared away, than to keep the foot uniform with the shoe; that the shoe should be made flat, in order to adapt itself the better to the foot; not made too thick, or hollow, nor projecting beyond the horse's heel.

This is the substance of M. La Fosse's new method of shoeing; which from its simplicity, and the great ease of performing it, seems to demand our regard and attention; but though it appears well calculated for the flat pavements, and roads of France, yet we doubt its general success with us; especially in some of our rough stony countries, where the heel, and frog, being left so entirely defenceless, might be liable to frequent injuries from such irregular loose bodies, as flints, loose stones, &c. We should suspect also its success, on moist, greasy, and slippery soils, or chalks; where the shoe heel, or cramps, seems of great use, to support a horse, by the impression it makes in the surface; how inconvenient soever it may be in other respects: though it must be confessed, from our method of shoeing race-horses, where the whole foot comes into immediate contact with the ground, notwithstanding the course they run over is often very slippery, yet they seldom fall.

But though this method may not be so generally adopted by us, in its utmost extent, for the reasons above given, as well as from the different texture of the horse's feet, which in some will always demand a particular method of shoeing; yet it undoubtedly may suit many horses, and many different parts of the kingdom; and this particular advantage every one may reap from it, viz. to pare away as little of the sole and frog as possible, even in the old method of shoeing: the many inconveniences of which, we apprehend, have been sufficiently pointed out, and amply explained; and would, by this means, be in a great measure obviated.

EXPLANATION of fig. 1, 2, 3, 4, Plate XXIV.

Fig. 1. represents the bottom of a horse's foot.

a, a, a, is the horny sole.

b, the frog.

2. The

2. The hoof towards its lower edge, called by the author the wall of the foot.

Fig. 2. shews the horny sole *a*, raised from the fleshy sole *c, c, c*, round which is the enchanelled flesh, 6. placed in the fulcus of the inner surface of the hoof: 5. the horny part of which is soft and white.

Fig. 3. represents the under part of the fleshy sole *a*, raised from the foot-bone, or what Gibson calls the coffin-bone *d, d, d*. *g*, the covering or sheath of the tendo Achillis. 2. The cartilage. 6. The edge of the fleshy sole confined in the furrow of the channelled horny substance. *Bartlett's Farriery, p. 352.*

SHOODS, oat hulls.

SHOVEL, a well known instrument, consisting of a long handle, and a broad blade, with raised edges.

SHOULDER OF A HORSE, is the joint in the fore quarters that joins the end of the shoulder-blade with the extremity of the fore thigh; also that part of his fore-hand that lies between the withers, the fore-thigh, the counter and the ribs.

SHOULDER-PEGGED HORSES, are so called when they are gourdy, stiff, and almost without motion.

A horse charged with shoulders, is a horse that has thick, fleshy, and heavy shoulders.

SHOULDER-SPLAIT, a horse is said to be such when he has given his shoulders such a violent shock, as to dis-joint the shoulder-bone from the body.

SHOULDERS OF A HORSE, should be sharp and narrow at the withers, of a middle size, flat, and but little flesh upon them; for if he be charged with shoulders, he will not only be heavy on the hand, and soon weary, but trip and stumble every minute, especially if with such shoulders his neck be thick and large.

Some saddle-horses, on the contrary, are too small in the shoulders; that is, when their breasts are so narrow that their fore-thighs do almost touch: such horses are of little value, because they have a weak fore-hand, and are apt to cut by crossing their legs, and carry them so confusedly in galloping that they are subject to fall.

The shoulders of a well shaped horse are compared to those of a hare, and the distance between them should be little more than half the breadth of his hind-quarters.

SHOULDER-PIGHT IN A HORSE, is a malady, being the displacing of the point of the shoulder by some great fall, rack, or pain, which may be known by one shoulder-point's sticking out farther than its fellow, and also he will halt downright.

As for the cure, swim the horse up and down in deep water a dozen times, which will cause the joint to go back into its right place again.

Then take two pins of assiwood, about the bigness of a finger, about five inches long, and sharp-pointed; slit the skin an inch above and beneath the point of the shoulder, and from above thrust one of these pins downwards, so that both the ends may equally stick within the skin: but if the wooden pin will not pass through easily, you may first make way for it with an iron pin.

When you have done this, make two other holes cross to the first, so that the other pin may cross the first right in the midst, with a right cross, and the first pin should be somewhat flat in the midst, to the end that the other being round, may press the better without stop, and close more exactly together.

Then take a piece of a line, a little bigger than a whip-cord, and make a loop at one end, which being put over one of the ends of one of the pins, so that it may lie between the pin's end and the skin; fasten this last end with your packthread to the rest of the cord, so that it may not slip; both the pins and the cord should be first anointed with hog's grease.

Then bring the horse into the stable, and let him rest for nine to ten days, but let him lie down as little as may be: put a pattern shoe on the fore-leg, and after nine or ten days, anoint the fore place with a little dialthæa, or hog's grease, so turn him out to grass, and let him run there till the pins are rotted off; if he be worked in a cart after the end of a month, it will settle his shoulder the better, and make him the fitter for riding. *See STRAITS.*

SHOULDER PINCING, a misfortune that befalls a horse by labouring or straining when too young, or by being over-loaded.

This malady may be known by the narrowness of his breast, and by the consumption of the flesh of the shoulders, inasmuch that the fore-part of the shoulder-bone will

stick out and be higher than the flesh; and if it be of a very long standing, the horse will be very hollow upon the brisket, towards the arm-holes, and go wider beneath the feet than above the knee.

For the cure: give him a slit with a sharp knife an inch long, upon both sides, an inch under the shoulder-bone; when it is done, with a large quill into the slit, blow up first one shoulder, put then another, as big as possibly you can, and even up to the withers, and with your hands strike the wind equally into every part of the shoulders, and when they are both full, beat all the wind places with an hazle wand, over all the shoulder; after that, with a flat iron slice, loosen the skin within from the flesh.

Then rowel the two slits or cuts with two round rowels made of the upper leather of an old shoe, with an hole in the midst, that the corruption may run out; let the rowels be three inches broad, and put in flat and plain within the cut; this may be as large as you think fit to lay the same open.

SHOULDER-SPLAITING, or SHOULDER-TORN, a malady that may befall a horse by some dangerous sliding, either at home or abroad, by which the shoulder is parted from the breast, and so leaves an open rift, not in the skin but in the flesh, and the film next under the skin, which renders the horse so lame that he is not able to go; and it may be known by his trailing his legs after him in going.

For the cure: put a pair of strait pasterns on his feet, and keep him in the stable without disturbing him. Then take a pint of salad oil, one pound of dialthæa, half a pound of oil of bays, and as much fresh butter, which melt all together in a pipkin; and with this anoint the part, and also round about the sides of the shoulder; this will cause both the said places and all the shoulder to swell in two or three days time; then prick all the swollen parts with a hamet, or fleam, or a sharp hot iron, and anoint the parts with the before-mentioned ointment.

But if it still continues to swell and gather to a head, you must lance it where the swelling gathers most, and feel the softest under your finger, and tent it with green ointment.

SHOULDER-WRENCH, a misfortune that befalls horses several ways, sometimes by turning and stopping too suddenly upon some uneven ground, sometimes by running too hastily out at some door: at other times by slipping or sliding either in the stable or abroad, and by several others.

The best receipt for the cure of it, is to take up the horse's sound leg before, to double it backwards in the joint, and so tie it with a list, or some soft thing, so fast that it will not untie; and then to force him to go upon his three other legs till he sweats at the roots of his ears, flanks, and between his legs; then untie his leg and let it down, and this will cause the blood to descend into the plate-vein, that it will be more visibly seen when it is tied up; but if it does not appear so plain as you would have it, wet it with warm water with your hands, and stroke it downwards towards the place where you are to let him bleed, and this will cause it to appear more visibly.

Then tie up his leg again, and bleed him in the common bleeding place, between his chest and lame leg, taking away two quarts or more, according as the strain is great or small: save a quart of the blood, and put a handful of salt in it, stirring it while it is running, that it may not clod; and when he has done bleeding, and you have pinned up the mouth of the plate-vein with a leaden pin or needle, to prevent it from bleeding, and bound some hairs of the main or tail about the pin, to keep it fast and steady, till a day or two after that you take it out, smear him with the blood; but before you pin him up, anoint him all over the shoulder and breast, between his legs, and down to his knee, with oil of turpentine and strong beer or ale; in equal parts, shaken and mingled together very well in a glass vial, clapping and dabbing it well with your hand; then smear all the said places anointed, with the blood and salt, chasing and dabbing this also very well with your hand; then set him up to his meat, and with a list, or garter, tie both legs together as close as you can; then the next day untie him and walk him out, and if you find that he goes pretty well, ride him gently about a mile; and then set him up again, tying his fore-feet together as before.

But if he does not go well the first day, do not ride him, but only walk him the second; and the third day, after his dressing, do not only tie his legs, but put a flat stick on both sides, like a wedge, about the bigness of a six-pence; drive this between the toe of the shoe and the toe of his foot, fast, so that it may not come out; and always while he stands still in the stable, tie his legs close, and peg him

with the wedge ; and when you take him out to walk or ride, untie his legs and take out the wedge.

Do this every night and morning until he is cured, which will be in a few days, if the hurt has been newly received.

The Sieur de Soleysel, and others, prescribe the following medicine for these maladies :

Take half a pound of new wax, the same quantity of rosin, pitch, and common turpentine ; a pound of oil of olives, two pounds and a half of capon's grease, the same quantity of badger's, horse's, and mule's, and of the marrow of a stag : oil of turpentine, two ounces ; castor, worms, camomile, St. John's wort, linseed, and of foxes fat, two ounces : set the olive oil in a basin over a clear fire, with the wax, rosin, and pitch pounded together, stirring them over the flame till they are dissolved ; then add the fats and stag's marrow, and then the turpentine, and let the whole incorporate over a gentle fire.

Then pour in the oils, and keep stirring them for half a quarter of an hour ; then take it off the fire, continuing to stir it till it is cold.

When you apply this ointment, rub the affected part with a wisp of straw, and having warmed your hand, chafe in the ointment as hot as the horse and your hand is able to bear it, holding a hot fire-shovel near the part to cause it to penetrate : repeat this once in two days.

SHOWEL, a blind for a cow's eyes.

SHROUD, a shelter or harbour.

SHUCK, a hulk or shell.

SICKLE, a toothed hook, with which corn is reaped.

SIEVE, hair, lawn, or basket work, strained on a hoop, for separating the flour from the bran, the dust from corn, &c.

SIG, urine, chamber-lie.

SIGNS OF SICKNESS IN HORSES. The first sign of a horse's indisposition, is, his loathing his food ; then it must be observed, whether he hath a wild and haggard look, for the eye of an horse is, as it were, a glass, through which you may discern the inward disposition of his body ; observe likewise, whether his ears be cold, his mouth hot and foaming, or clammy, the hair of his flanks rough and staring, and paler than usual about the ends ; his dung hard or black, or greenish, and his urine clear and undigested like water.

In this case his eyes are subject to weep, his head heavy and hanging down ; he is apt to stumble as he walks ; he is slow and dull, though he was vigorous before ; he never minds other horses ; contrary to his former custom, he rises and lies down often in the stable, looking towards his flanks, which are doubled and folded in ; his heart beats, which may be perceived, by laying your open hands between the shoulder and sangle, on the left side ; and he is also indifferent and unconcerned at what is done to him.

The Sieur de Soleysel observes, when a horse has been long sick, stales without striding, and even without thrusting forth his yard, letting the water drop from the skin or sheath, it almost always portends death, unless in such horses as have that custom when they are in health ; in which case, you must draw no conjectures from this sign, though they continue to stale after the same manner during their sickness.

Another no less fatal sign is, when the hair of his tail, and on his skull, can be easily plucked off.

It is a dangerous sign, when a horse either never lies down, or starts up immediately, not being able to breathe freely in a lying posture ; whereas, if in the declension of this disease he lie down, and continue long in this posture, it is a very good sign.

When a sick horse turns up the whites of his eyes, you may conclude that he is in pain, and that his disease is of long continuance.

From these signs, you may conjecture in general, that your horse is sick, and afterwards you must endeavour to discover his particular distemper, that you may be able to apply suitable remedies ; for a disease that is known is half cured.

But to be more particular : heaviness of the countenance, extreme looseness, or costiveness, shortness of breath, loathing of meat, a rotten cough, slowness of pace, hollowiness of flanks, hanging down of ears, &c. but

especially if an horse, who before was of a chearful countenance, hangs down his head, it is a sign of a fever, head-ach, the staggers, or sore eyes.

If he turns his head backward on the right side to the part aggrieved, it indicates an obstruction in the liver ; but if down to the belly, of the cholic, bots, or worms.

If water run out of his mouth, it is a sign of the staggers, or wet cough.

The hollowiness of a horse's temples, is a sign either of the strangles, or old age.

A swelling about the ears indicates the poll-evil ; if it be under them, it is a sign of the vives ; and in the mouth, of the canker, flaps, or lampers.

If he has a stinking breath, or foul matter issues from his nostrils, it is an indication that he has an ulcer in his nose or head ; if the matter be black, it is a sign of the mourning of the chine, or the like ; and if white, of the glanders ; if yellow, it shews a consumption of the liver, and rottenness of the lungs.

If his breath or body be hot, they indicate a fever and heat of the stomach ; when a horse's tongue hangs out and is swelled, it indicates the stronger that his liver is inflamed ; if besides he forsakes his meat, that he has either the dry or moist yellows.

Shortness of breath, and beating of the flanks, indicate a fever, or the strangles ; but if the passage of his throat be stopped, it is a sign that the film of the lungs is broken and the spleen is troubled, or else that he is broken winded.

If a horse eats and drinks little, it is a sign of a cold liver ; but if he covets to drink much, and eats a little, it is either a sign of a fever, rotten lungs, heat in the stomach, heat in the liver, or the dry yellows.

If there be a swelling under his throat, an indication of the glanders ; if about the roots of the tongue, of the strangles ; but if there be nothing but little knobs, like wax kernels, they indicate no more than that he has a cold.

Coughing, or an offering to cough, is a sign of the glanders, or a wet or dry cough, or a consumption, or foundering of the body.

If a horse be scabby, and ulcerous all over his body, and about the neck, it is a plain indication that he has the mange ; an ulcer full of knots, creeping about the veins, shews the farcy : if it spread abroad only in one place, it is a canker ; when hollow and crooked, a fistula ; but if it be a spongy wart, full of blood, it is an anbury.

A swelling on the left side, is an indication of a sick spleen ; in the flank, of a cholic ; but if in the belly and legs, of the dropsy.

The hollowiness of the back is an indication of the dry malady of the dropsy.

Staring of the hair indicates a bad stomach, or a foundering in the body ; but generally a cold, or want of cloathing.

Leanness and gauntness indicate him to be hide-bound, in a consumption, that he is troubled with a dry malady, inflammation of the liver, foundering in the body, worms, cholic, or the yellows.

Staling with pain shews foundering in the body, the stone or wind cholic ; and if his urine be blackish and thick, a pain in the kidneys ; but if yellow, the glanders.

Trembling is an indication of a fever, or of foundering in the body ; and if a horse trembles after drinking, it shows he has an ague fit upon him, and he will afterwards glow, and sometimes he will sweat afterwards.

Laxativeness, or looseness of body, is an indication of the heat of the liver ; and on the contrary, costiveness indicates the dry yellows, or diseases of the gall.

If a horse strikes at his belly with his foot, it is a sign of the cholic ; but if in striking he fikes his tail also, then either bots or worms are indicated.

If a horse lie much on his left side, it is a sign of the spleen ; and if on the right side, of the heat of the liver ; and if he be restless, it is probable it may be caused by bots and worms, cholic or griping in the belly ; but if he spreads himself abroad, it indicates the dropsy ; and if he groans when he is down, it betokens a sick spleen, moist yellows, bots, or film broken ; but if he is not able to rise when he is down, it is a sign either of a mortal weakness, or foundering in the body and legs.

Signs may also be taken from the urine of a horse ; these, according to some authors, are accounted not so material and certain as those from the dung are, yet others again say they are more certain. And,

That

"That if a horse in his sickness stales clear, and it being saved and set by, there be no sediment in it, it is an indication of a growing distemper: but if the urine turn of a reddish or yellowish colour, and has either a cloud swimming in it, that is not black or earthy, and a sediment falling to the bottom, and begins to have a rank smell, it shews that the disease is beginning to break; but if the cloud be of an earthy or black colour, cohering in a body without parting, it is a sign that the disease will prove mortal.

"Again, if a horse's urine be different at different times, sometimes giving indications of soundness, and at other times of sickness, it then intimates there is a malignity of the disease, proceeding from an inequality of the composition of the blood, which also causes an inequality in its motion.

"Urine of a yellowish colour, rather thick than thin, of a strong smell, and piercing quality, is reckoned healthful, sound, and good; but, on the contrary, if it be of a deep red tincture, either like or inclining to blood, then the horse has either had too great heats, by being over-ridden, or ridden too early after winter grass.

"If a horse's urine be of a high colour, clear and transparent, like old March beer, it is a sign there is an inflammation in his body, and he has taken a surfeit; if it bear a little cream at the top, it indicates a weakness in the back, or consumption of the feed; but a green one is a kind of a consumption in the body; with bloody strokes, is a sign of an ulcer in the kidneys; and one that is black, thick and cloudy, indicates approaching death.

"The dung of a horse is the best discoverer of his inward parts; the colour or complexion of which ought to be well observed, when he is in best health, and at best feeding; and as he is found to alter, so a judgment is to be made, either of his health or sickness. But to be more particular:

"If his dung be clear, crisp, and of a pale yellowish cast, hanging together, and not separating, more than as it is broke by its own weight in falling, and is neither so thick nor so thin, but that it will flat a little on the ground, and indeed both in scent and substance, resemble the ordure of a sound man, then he is clean, well fed, and without imperfection.

"If again his first and second dung be well coloured, yet fall from him in round knots or pellets, and the rest be good, it is not much matter; for it is only an indication that he has eaten hay lately, and that will always come away first; but if all his dung be alike, then it is a sign of foul feeding, and that he has eaten either too much hay, or too much litter, and too little corn.

"When his dung is in round pellets, and blackish or brown, it is a sign of inward heat in the body; if it be greasy, of foulness, and that the grease is melted, but cannot come away.

"If he voids grease in gross substance with his dung, and it is white and clear, and comes away kindly, he is in no danger; but, on the contrary, if it be yellow or putrified, then it is a sign that the grease has lain long in his body, and, if not prevented, that sickness will ensue.

"Again, if the dung be strong and hard, it indicates that he has had too strong heats, and that he will afterwards be colicive, if it be not prevented; if it be pale and loose, it indicates either inward coldness of body, or too much moist and corrupt feeding; but if the dung is stinking, it shews the heat of the liver: but on the contrary, if it have no smell, the coldness of the liver; but if it be indigested, then it is an indication either of a consumption, or of a dry malady.

"Signs may also be taken from the pulse of a horse, which may be very plainly felt upon his temples, and fore-legs; but as that method has not yet obtained, among the experienced in that way, I shall pass it over.

"But notwithstanding what has been said, in a more particular manner, as to the signs of sickness in horses, it ought to be observed in general, that it is a very difficult task to arrive at any certain knowledge of the diseases of brute beasts, and therefore it ought not to be wondered at, that even farriers themselves are often mistaken, as to the signs, because they can only judge by outward appearances; and especially because there are many diseases that have the same common symptoms; and although a person may by them be assured that a horse has a fever, or a stranguery, yet he can scarcely at the same time be certain,

without a very nice examination, whether he may not have an inflammation in the pleura, or in his kidneys; for the signs that these animals usually give in the affections of particular parts, is their turning their heads towards that part, and indeed that is not always to be depended on; for a horse may turn his head to the right side of his belly, and thereby a person may be mistaken in supposing that distemper to be a diseased liver, as the horse often gives the same sign in the colic."

SIKE, a litterill, a water-furrow, a gutter.

SILVER-WEED, or *Wild Tansey*, a species of cinquefoil, which grows naturally upon cold stiff land in most parts of England, and is a sure mark of the sterility of the soil. Its stalks spread upon the ground, and send out roots from their joints; by which means, and by the frequent sheddings of its seeds, for it flowers during the whole summer, it soon over-runs, and fills the land to a great distance. The leaves of this plant are composed of several lobes or wings, which are generally placed along the mid-rib, and terminated by an odd one: they are jagged at their edges, and are of a silvery colour, especially on their under side. The way to destroy this kind of weed has been already pointed out. Mr. Rays says, that the root of wild tansey, which is somewhat of the parsnip kind, is good to eat, and that hogs are very fond of it.

SIMPSON, groundsel.

SINEW-*Sprung*, is a violent attaint, or over-reach, in which a horse strikes his toe, or hinder-feet, against the sinews of the fore-leg.

For cramps or convulsions in the sinews: these are violent contractions, or drawings together of the limbs, either throughout the whole body, particularly in one limb or member; and proceed from causes either natural or accidental; if from natural causes, they proceed either from too great fulness or emptiness.

When they proceed from fulness, they are caused by a surfeit, either in eating or drinking, or the want of proper evacuation.

When from emptiness, they proceed from too frequent, and too plentiful blood-lettings, or too much and violent purgings, or too hard labour; all which fill the hollowness of the sinews with cold, windy vapour, which are the only great causes of convulsions.

If they proceed from accidental causes, then it is either from some wound received, where a sinew has been half asunder, or only pricked, which presently causes a convulsion all over the body.

The signs of the distemper are, the horse will carry his neck stiff, and will not be able to stir it; his back will rise up like the back of a camel, or like a bended bow; his crupper will shrink inward, his fore-legs will stand close together, and his belly will be clung up to his back-bone; when he lies down he will not be able to rise, especially from the weakness of his hinder limbs.

The cure. First sweat him, either by burying in a horse dunghill, or else by applying hot blankets doubled, about each side of his heart, and body; then after his sweat, anoint his body all over with oil of petroleum, for that is much better than oil of bay, or oil of cypress.

Then give him to drink the following liquor:

Take one dram of assa foetida, with aniseeds, seeds of fenugreek, and cummin seeds, of each half an ounce; put these into a quart of strong white wine, and add to them three or four large spoonfuls of olive oil, taking care to keep him warm after the drink, and to feed him with good bean bread, and warm mashes, made of malt, ground, and warm water; and this will, in a little time, reduce his sinews to their former ability.

But if the convulsion came accidentally, as by the prick, or half cut of a sinew, then search for the wounded sinew, and, with a pair of sheers, clip it asunder, and the convulsion will cease.

But if it be only a cramp, and but in one limb, then rub or chase the grieved part with a hard wisp, or hay-rope, and the pain will cease.

SIT-FAST, a part of a horse's hide turned horny, and which if it cannot be dissolved and softened by rubbing with mercurial ointment, must be cut out, and afterwards healed as a fresh wound. It generally proceeds from a warble. See the article WARBLE.

SIZZING, yeast, or barn.

SKID,

SKID, the chain by which the wheel of a waggon is fastened, so as to prevent its turning round, upon descending a steep hill.

SKILLING, an isle, or hay of a barn.

SLAB, the out-side plank of a piece of timber when sawn into boards.

SLECK, small pit coal.

SLEDGE, common and moulding. See **PLOUGH**.

SMUT, a distemper incident to corn, and which, according to M. Duhamel, may be distinguished by the following marks.

" 1. This distemper destroys entirely the germ and substance of the grain.

" 2. It affects not only the ear, but also, in some degree, the whole plant, when it has made a great progress.

" 3. It very seldom happens but that when one stalk is smutty, all the ears of the other stalks from the same root are so too.

" 4. So early as in March or April, upon opening carefully the hood or blades which cover the ear, and examining the young ear, then not above the sixth part of an inch in length, and almost close to the roots, I found this embryo already black, and attacked with this distemper. Perhaps it may not always seize the plants so early.

" 5. When the distempered ear comes out of its coverings formed by the blades, it looks lank and meagre: the common and immediate coverings of the grains are in this case so very slight and thin, that the black powder is seen through them; and from this time nothing is found, in lieu of grain, but a black powder, which has a fetid smell, and no consistency. As this powder, of which the constituent particles have but very little cohesion, and of which the coverings are destroyed, is easily blown off by wind, or washed away by rain, the husbandman, in housing these plants, houses only skeletons of the ears. If any impression of this powder remains, it is easily taken off by sifting: but I have not experienced it to be contagious, like that of burnt grain.

" M. Tillet, who gained the prize proposed by the Academy at Bourdeaux for the best account of what renders black the mealy substance of grain, has observed that these corrupted ears are often found to be vitiated even in the hood, though this last, looks as green and perfect as if nothing ailed the corn within. The upper part of the stalk of a smutty plant is, not, commonly, quite straight, from within about half an inch below the ear. If such a stalk is squeezed there, it scarcely yields at all to the pressure. If it be cut asunder at about a sixth part, or a quarter of an inch, below the ear, it will be found to be almost entirely filled with pith, in such manner that only a very small opening can be perceived in the heart of this stalk, instead of the large pipe that is in healthy stems. M. Tillet concludes from hence, that the circulation of the juices is obstructed in the upper part of the stalk of smutty plants.

" Bearded wheat is apt to be smutty, as well as that which is not bearded; but neither M. Tillet nor I have ever met with a smutty ear of rye.

" Causes of smut.—The smuttiness of corn cannot be owing to a want of fecundation, as many have hitherto mistakenly imagined; since it affects and destroys the organs of both sexes long before the time of that fecundation.

" It cannot be imputed to the settling of wet upon the ears, or to fogs, or to a violent impression of the sun; since we have seen the ears smutty long before they ceased to be covered with the blades, which continue green till the distemper has made great progress.

" The same observations refute absolutely the opinion of those who suppose the cause of the smut to be in the grains after they are formed, and before they are past their milky state.

" The smut of corn has been also ascribed to the moisture of the earth: but we do not see more smutty plants in the lowest, and consequently wettest parts of a field, than in the highest and most dry. Besides, why should there be a single smutty plant in the midst of numbers of sound ones? However, as it appears that corn is more frequently attacked with this distemper in wet years, than when the seasons are dry, too much moisture may perhaps, without being the immediate cause of the smut, favour its progress more than drought would do.

" Some naturalists have ascribed this distemper to insects. If I am not authorised absolutely to deny this, I can at least assert that, after having been of this opinion for some time,

all my endeavours to establish it by facts have proved ineffectual. Some observers have indeed shewn me different insects in smutty grains; but as I found the very same kinds likewise in sound ears, I believe, with M. Tillet, that they are not in any manner the cause of this distemper. We know that the corn-caterpillar devours the mealy substance of the grain: but it does not occasion smut. Numbers of flies lay their eggs upon these seeds; and the worms and maggots which proceed from them, eat the seeds: but this does not occasion any thing like smut. The Reverend Dr. Hales, to satisfy himself whether the smut of corn might not proceed from the seeds being bruised by the flail, took a number of grains of different sizes, and bruised them with a hammer. They grew well, and bore ears which were not smutty. Thus his own experience convinced this skilful philosopher, that he had conceived a wrong idea of the cause of this distemper.

" Several cultivators have thought that pigeons dung and that of sheep render corn smutty: but this is a groundless notion. We have large pigeon-houses, the dung of which is strewed upon our wheat lands: the same is done with the dung of our sheep, and we even fold our flocks upon those lands: yet we do not find that these fields are more infected with smut than others. This allegation is therefore absolutely destitute of proof.

" Wolfius was of opinion that the smut of corn proceeds from a monstrosity of the embryo: but M. Aimen has refuted that supposition, by shewing that the male flowers of certain kinds of plants are attacked with this distemper: now the flowers have not any embryo.

" M. Aimen, M. D. has very judiciously observed, that the smut of corn cannot derive its origin from a defect in the sap; as all the parts of the plant, except the ear, look healthy, and there are plants whose roots are perennial, which appear vigorous, though their seeds are smutty every year. He is of opinion, that whatever weakens the plant is apt to bring on the smut, and instances, as a proof of this, that it is a frequent custom in his country to cut rye as soon as it spindles, for food for their cattle; and that this rye generally produces other ears, which seldom contain any but distempered grain: to which he adds, that seed-corn which had been pricked or run through with a needle; or which is not thoroughly ripe, and that which produces lateral or second ears, is subject to the smut.

" The same observer, who has made several careful researches into what is properly called the smut of corn, holds that this distemper proceeds from an ulcer which attacks first the parts that sustain the seeds, and afterwards spreads to the rest of the flower. But, some will say, what is the primary cause of that ulcer? In order to discover it, M. Aimen examined several grains of barley with a microscope: some of them were bigger than others; some were very hard; and others yielded to the pressure of his nail: some were of a deeper, and others of a lighter colour; some longer, and others rounder, than they ought to have been: their rind was somewhat wrinkled in several places, whereas in its natural state it is smooth; and lastly, he perceived upon some of them black spots, which, when examined with a magnifying glass, appeared to be covered with mould. These grains were separated carefully, according to their several conditions, and sown apart, though in the same ground. All the mouldy grains produced smutty ears, the shrivelled, the parched, and those that were attacked by insects, either did not grow at all, or did not produce any smut.

" He then singled out a parcel of sound grains, sowed them, and some time after took them up in order to examine them again with a magnifying glass. He found some of them mouldy, replanted them all, and observed that the mouldy grains produced smutty ears.

" M. Aimen, without pretending that this is the only cause of the smut of corn, concludes from these experiments, that mouldiness is a cause of this distemper.

" It is very hard to conceive how mouldiness can produce this distemper; for as soon as the seed has sprouted and produced its plant, the whole substance of the grain is consumed. Whether the hulls or coverings grow mouldy or not, seems to be a circumstance quite immaterial to the plant, which ceases from that time to subsist on what the seed had supplied it with till then. We readily conceive that if this mouldiness attacks the plant, it might either kill it or render it poor and weak: but we cannot imagine how this mouldiness should affect only the organ of

fructification, and entirely destroy them, without doing any visible injury to the other parts of the same plant, even though it be a perennial. However, M. Aimen relates facts; to account for which one might conjecture, supposing the increase of plants to be only an extension of the embryo, that the organs of fructification which exist in imperceptible miniature in the seed, were already affected by the mouldiness before the grains were deposited in the earth. But let us abide by well observed facts: it being of more importance to collect them, than to be in a hurry to explain them by conjectures hitherto attended with little probability.

"Means of preventing this distemper: M. Aimen is of opinion, that to prevent this distemper, the finest and ripest corn should be chosen for seed, that it should be threshed as soon as possible, and that it should be limed immediately after, as well, says he, to keep it from growing mouldy, as to destroy the mould already formed, if any such there be; adding, that every method he has tried to make corn so prepared grow mouldy, has been ineffectual, and that he has never known it produce smutty ears."

According to this principle, the preparations which have been experienced to be serviceable in the case of burnt-grain, and particularly M. Tillet's lye, may be equally beneficial to guard against smut. But we shall not attempt, continues M. Duhamel, to make any addition to M. Aimen's advice, because we have not studied the distemper properly called smut, so much as we have that far more dangerous one which we distinguish by the name of burnt-grain. According to some experiments made by M. Tillet, the black powder of smutty corn does not appear to be contagious. However, we should speak more affirmatively on this point if we had been able to collect a sufficient quantity of that powder: but, as was said before, the wind and rain carry it away, and but very little of it is found in granaries. We exhort those who wish to contribute to the progress of agriculture, to make farther trials, in order to ascertain whether the smut of corn be really contagious or not: but at the same time we caution them to be careful not to confound this distemper with the ustilago, or burnt-ear; for want of which distinction several philosophers have hitherto been misled.

As weak plants are most subject to smut, M. Aimen recommends good tillage, as a sure means of giving them strength and vigour. It is probably for this reason that corn is very smutty when managed according to the New Husbandry.

He observes, that all the lyes generally made use of, preserve the plants from mouldiness; and of all of them, lime seems to him the most effectual.

"M. de Lignerolle says, that the surest means of avoiding smut, and that which he has practised with success ever since the year 1739, on upwards of three hundred acres of land, is to change the seed every year, to be very careful that the seed corn be well dried and thoroughly ripe, and that it be not smutty, nor have any smutty powder sticking to it. He then pours boiling water on quick lime, in a large tub; and after the ebullition is over, as much cold water as there was hot, and stirs it all strongly together, in order to dissolve and thoroughly mix the lime. The quantity of wheat intended to be sowed is sprinkled with this lye, and then well stirred with a shovel, and laid in as high a heap as possible. It is best to keep the grain for a week after this preparation, turning it every day; for otherwise it would heat so as to destroy the germ. By these means he has not had any smut, when the fields around him have been infected with that distemper.

"M. Donat, near Rochelle, thinking the ingredients commonly employed in steeping too dear for the use of farmers, studied for some years to find out something cheaper, easy to be had every where, and therefore better calculated to be of general use. "I have had, says he, in a letter to M. Duhamel, the good fortune to accomplish what I wished, for now I only use pigeons-dung, quick-lime, ashes, and sea-salt; where this last can be conveniently had. I have sometimes made with these ingredients, steeped in water, so strong a liquor, that it has even destroyed the germ of the grain. But there will be no danger of that, if care is taken to observe the following directions, which are the result of seven years successful experience, even at times when farmers who have neglected to follow my example, have had such wretched crops as have not paid the charge of reaping.

"Take quick-lime and pigeons dung, of each twenty-five pounds, forty pounds of wood-ashes, and twenty-five pounds of sea-salt, or salt-petre. Put all these into a tub large enough to hold half a hoghead of common water added to them. Stir them all well with a stick, till the lime is quite dissolved. This lye will keep some time without spoiling. It must be stirred again just before the corn is steeped in it. The grain is then put into a basket, and plunged in the lye, where it remains till it has thoroughly imbibed it; after which it is taken out, and laid in a heap, till it is quite drained of all its moisture: or, which is a still better way, take a mashing-tub, fill it with grain to within four inches of the brim, and then pour in the lye well stirred beforehand. When the tub is full, let the lye run out at the bottom into some other vessel, in order to use it again for more corn. Let the grain be then taken out and laid in a heap to drain; and continue in this manner to steep all your seed-corn. The wheat thus prepared may be sowed the next day, and must not be kept above five or six days, for fear of its heating. This I say from experience. The quantity of lye above prescribed, will serve to prepare more than twenty bushels of wheat.

"Mr. Tull observes, that brining and changing the seed are the general remedies for smut. The former of these, he had heard, was discovered about seventy years before he wrote, by the sowing of some wheat which had been sunk in the sea, and which produced clean corn, when it was a remarkable year for smut all over England: but he afterwards doubts whether this might not happen by its being foreign seed, and therefore a proper change for our soil. He tells us that two farmers, whose lands lay intermixed, used seed of the same growth, from a good change of land, and that the one, who brined his seed, had not any smut, whilst the other, who neglected that precaution, had a very smutty crop. But again he doubts whether this seed might not have been changed the year before, and so might not be greatly infected; or at least not more than the brine and lime might cure. He adds, that smutty seed wheat, though brined, will produce a smutty crop, unless the year prove very favourable; for that favourable years will cure the smut, as unkind ones will cause it: but, above all, he assures us, that the drill-husbandry is the most effectual cure."

"Count Ginanni, a patrician of Ravenna, who has favoured the world with a very accurate and ingenious treatise on the distempers of corn in the blade, deems the rust incurable, after it has once taken place. He has prevented it by sprinkling the plants, before their ears were formed in their hoods, with a solution of sal ammoniac or salt-petre in water mixed with salt of tartar, and with other alkaline substances; but observes that such preparations are too dear for the use of farmers. He thinks, that sowing thin, and keeping the corn quite free from weeds, will generally be a good preservative, as he himself has frequently experienced."

"The smut in wheat, says a writer in the Museum Rusticum, is an evil which has long been complained of, and many methods tried to prevent it, all of which have proved ineffectual, or, at best, but a mitigation of the disease; which methods I need not here enumerate, as they are generally known, or are to be met with in various authors who have wrote on agriculture; some of them being calculated to forward vegetation, and strengthen the plant, such it will be advisable to continue in the practice of.

"But amongst all the authors who have wrote on this subject, I do not remember to have seen one who has pointed out a probable conjecture with respect to the cause of this malady so as to be supported by any tolerable degree of reason. And inasmuch as natural history has been and is my favourite study, (of which I take agriculture and a knowledge of cattle to be no small part), I have frequently employed some leisure hours, to endeavour to assign causes for various diseases, to which the productions of the earth are subject; among which this of smut in wheat is one. And being desirous to improve my knowledge, I am willing to communicate, that if any thing worth notice might come from me, I may have the pleasure of doing something for the public good, and thereby induce others to make their discoveries known, from which myself, as well as many more, may reap some advantage.

"I remember to have read a little treatise, wrote some years since, by James Logan, (chief justice, and president of the council of the province of Pennsylvania) on the generation of plants, containing observations made on the

maize, by which he discovered the plant to be (what Linnæus calls monoecia, or) a plant bearing male and female flowers, and, as such, capable of being impregnated with a fructifying dust from another plant of the like kind.

"I own, the reading this pamphlet first gave me the hint of the generation of vegetables, from which I continued my observations respecting other plants, and among the rest to wheat, and the like; though this is not of the same class with maize, but of the class triandria of Linnæus, and is hermaphrodite, yet, nevertheless, equally subject to be impregnated by dust from another plant, as well as with dust from itself.

"Having frequently observed amongst wheat, while green, (though shot up into spindle) several black, blighted ears, I examined them, and found these were ears in which, by some accident, the intention of nature was prevented; I suppose, by being detained too long in the sheath, and by the natural humidity of the plant, a fermentation was promoted in its ear, destroying the small vessels through which the corns were to receive nourishment; by which means their contents became black, dry, and dusty: these ears, growing up with the others, imbibe moisture sufficient to cause the dusty particles in the grains in them to expand, and burst the fine skin which contained them: being thus set at liberty, the air, if it happens to be a dry season, dries them again; by which means they become light enough to float therein, when separated from the skin which held them. If this happens when the wheat is in blossom, which it often does, part of the dust enters the stigma of healthy corns, and thereby infects them: the pulp in those becoming black, a fermentation is raised therein which destroys the life of the grain thus impregnated; hence the disagreeable smell is acquired peculiar to this disease (the smell in a grain of smut being the same as in a black blighted ear.)

"From hence it is easily accounted for, why, often, a few grains in an ear are smutty, and the others good.

"Some may perhaps object, if this be the case, why are not barley and oats subject to the like disease, since both these are subject to the black blight as well as wheat? Such objectors would do well to observe, that these have a more tough skin than wheat, which does not burst till after the blowing of these sorts of corn is over; therefore, when it does burst, the dust can do no harm.

"Having thus pointed out the cause, I now proceed to prescribe the remedy, which is, when the corn is shot into spindle, and the ears begin to appear, let some persons go along each furrow in the field, and carefully break off all ears of the black kind, (not pull them up, because often from the same root grow several others, which are good and sound ears), and when broke off put them into a bag, and carry them away; for should they be thrown on the ground, there may still be danger of infection from them; as it is possible, there may be some of these diseased ears, which are not bursten, and therefore may escape being gathered, these may be known by the stalks at the neck being crooked, and bent in the length of three or four inches backward, and forward five or six bends, and the sheath nearer to the head of such than the ears which are good.

"The seasons in which wheat is most liable to be smutty are, it is well known, such in which it happens to be dry weather and windy at the time of blowing; but if it happens to be wet during that time, it is very rare to see a smutty ear in a field." *Museum Rusticum*, vol. II. p. 19.

"As the smut in wheat, says another writer in the same work, is an evil greatly complained of, and not without reason, among farmers, I have no doubt but your readers will be well pleased to be informed of a means of preventing the damage which is annually experienced in this respect.

"As I write from experience, what I communicate may be depended on; and I have great foundation for thinking it will be found of particular service to such of your readers as are practical farmers, and who yet are unacquainted with the method I intend to recommend.

"I have for many years past, escaped having smutty crops, by a proper care of the seed-wheat before it is put into the ground; and the method I pursue, though efficacious, is in itself simple and cheap.

"I take four bushels of pigeons dung, which I put into a large tub; on this I pour a sufficient quantity of boiling water; and, mixing them well together, let them stand six hours, till a kind of a strong lye is made, which, at the end

of that time, the grosser matter being subsided, I cause to be carefully drained off, and put into a large keeve, or tub, for use.

"This quantity is sufficient for eighty bushels of seed-wheat.

"My next care is to shoot into this steep a manageable quantity of my seed, which is immediately to be violently agitated, with either birchen brooms, or the rudders that are made use of in stirring the malt in the mash-tub in a brewing office. As the light grains rise, they must be diligently skimmed off; and after the seed has been agitated in this manner for the space of perhaps half an hour, it may be taken out of the steep, and sown out of hand, with great safety: and I can venture to say, that if the land is in good heart and has been properly tilled, it will not, when sown with these precautions, produce a smutty crop." *Museum Rusticum*, vol. III. p. 81.

"Another gentleman, who signs himself a Norfolk farmer, declares he always observed, that if the seed was well washed it never failed: that he took the hint, and washed some seed which he knew to be smutty, in a large tub filled with plain simple water, stirring it violently with birchen brooms, taking care from time to time to skim off the light. This answered very well, and he has ever since continued the practice.

"I read, says another gentleman, the above account with some degree of satisfaction, but am sorry that your correspondent should be so much a lover of brevity, as to say no more upon a subject of such infinite importance.

"The truth is, we English farmers have hitherto known very little of the nature of this disease in wheat, imagining that whenever the corn was black, it was infected with the same disorder; but this is far from being the case, as any of your readers may see, by referring to a piece written by Mons. de Gonfreville of Normandy, published in the second number of the Foreign Essays on Agriculture, &c. (which I cannot but esteem a very useful work), and containing a detail of a number of experiments made by the above gentleman to ascertain the cause of the smut.

"I was not a little pleased to find that the method prescribed in this invaluable essay, for guarding against this distemper, does not materially differ from that above recommended.

"Both these gentlemen depend on the clean washing of the seed, and the trials of both met with the wished-for success."

We shall conclude this article with the following method of preventing this destructive distemper, sent us by the ingenious Mr. Bromwell Powell, of Green's Forge, near Stourbridge in Worcester, dated September 1766.

"I have here, says he, sent you an infallible remedy against the smut in wheat, a thing so prejudicial to the community in general, and which I myself have made use of for several years past, and have sown smutted wheat, prepared as under directed, and have not had one smutted ear from the produce; and am well assured, if the farmers will observe the under direction, they never will have any. Now, as the coating of wheat with brine and lime is so well known to the farmers in general, I need say no more on that subject, as you have directions from many authors concerning it: but when wheat is so prepared with brine and lime, as is usual, then to every strike of wheat so prepared, add one pound and a half of red lead, by putting it into a cullender, and shaking it gently over the prepared corn, and sometimes stirring the corn with a shovel, that every corn may have a spot or two of the lead adhere to it, which, when so done, is an effectual preservative against the above malady, nor will any fowls lie upon it after so prepared.

"By the above method several of the penurious farmers will look upon it to be a great expence, as the lead will cost, bought in small quantities, three-pence per pound; but admit every strike was to cost six-pence per strike, it would greatly answer the farmers purpose; I therefore have ordered as small a quantity as can be complied with; but if more was added it would still be a greater preservative. As the time of sowing is now near at hand, I hope the gentleman will apply to some farmer, whom they can depend upon to try the experiment of one strike so prepared; and if they can readily procure it, let half a strike of it be smutted corn when sown, and to that half a strike would advise one pound of the lead to be applied, which will be a convincing proof of the utility in the above."

SNAIL-COD, or *Snag-greets*, a name given by Mr. Worlidge to a species of manure found at the bottom of deep rivers.

rivers. It is a kind of mud or sludge, very soft, full of wrinkles, and intermixed with many little shells and snails, to which it is thought to owe a great part of its fatness.

SNAKES, and ADDERS. To drive them from the garden, plant wormwood in various parts of it, and they will not come near it.

Or, smother the place with hartshorn, or lily roots, burnt in a fire-pan, and they will fly from the place.

Or, old shoes burnt, or other stinking stuff, will drive them away; or ash-tree boughs, while green leaves are on them, laid about your ground, will have the same effect.

Or, take a handful of onions, and ten river crab fish, beat them well together, and lay them where the reptiles come.

SNATHE, the handle of a scythe.

SOAP-ASHES. See **ASHES**.

SOIL, a general name for all sorts of land. See the article **EARTH and GROUND**.

Soils are divided by our farmers into clay, clayey loam, loam, sandy loam, sand, gravelly loam, gravel, pebbly loam, stony loam, chalky loam, chalk, flinty loam, flint, ragstone loam, limestone loam; as well as other general divisions, stiff or light, wet or dry, good or bad, &c. and the following remarks are relative to soils:

A clayey loam is difficult to be ploughed; a retentive soil ought to be raised in hillocks, or acclivated; clayey loams are fitter for the scythe than the sickle; patched soils are teasing to the plough; light soils are ploughable at a small expence; stiff soils are expensive: a dry loam, culturable by whip-reins, is perhaps the most pleasant and profitable. But a clayey loam, with a retentive subsoil, is the most untoward of arable soils.

The following hint, of importance to the owners and occupiers of lands, is given by Mr. Leyburn, jun. of Hunmanby. This gentleman says, that in order to prevent manure sinking too deep in low or springy meadow or pasture land, a sufficient quantity of the strongest lime that can be procured, should be laid on it; that he has used Knottingley lime with great success; the quantity not less than six chaldrons to a statute acre, to be laid on the land in the winter season. In twelve or thirteen months after, by putting a spade into the ground, it will be found that the lime will be formed into a compact body, which will prevent manure sinking any lower than the lime, and consequently the lands will receive benefit so long as the manure will last. The lime should be laid in heaps till it be wet, before it be put on the land. See the article **SAND, GRAVEL, CHALK, &c.**

SOOT, a fuliginous substance formed in chimnies.

Soot, either of vegetables or of coal, is good both for corn and grass, especially on cold moist grounds, or lands apt to over-run with moss. Many have found their account in strewing it early over their green wheat and barley: but Mr. Ellis says neither of them ought to be sooted after the 25th of April, because the wheat, and generally the barley, have then done gathering and branching, and are upon the spindle. He likewise thinks it proper to be sown over young turneps, just after they have appeared. But care should always be taken not to strew it too thick, lest its hot nature should hurt the plants. Mr. Worlidge seems to think wood-soot the best; but Mr. Mortimer prefers that which is made from sea-coal, of which about forty bushels are commonly allowed to an acre; though some grounds will require more: to which he adds, that it produces a very fine sweet grass, and destroys worms and weeds; and that it ought not to be sown upon wheat till Candlemas, because the long cold rains and snows are apt to wash it in too soon: nor is it safe to lay it on later, lest a drought succeed and burn it up. See the articles **COAL-SOOT and MANURE**.

Mr. Marshall recommends its being sown by a man and horse before rain, which a shower washes in, and will be of obvious service; but if it lies on the surface till near harvest, without rain, there will be no benefit derived from it. A rich soil wants no soot, but a soil much out of heart wants 40 or 50 bushels. In his Rural Economy of Norfolk, he says that, "Near towns, soot is used as a top-dressing for wheat, in February or March.

"The time of sowing is considered as very material. If it be sown early, and the frost catch it, its strength is thereby lowered: if late, and no rain falls to wash it in, it is thought to be rather injurious than beneficial to the crop

of wheat. And it is not, in any case, found of much, if any, service to the succeeding crop of barley.

"The method of sowing it is extremely simple; and, in the only instance I saw the sowing of soot practised, here, was very complete.

"A favourable opportunity being embraced, when the wind blew gently and in the direction, or nearly in the same direction, as the lands or ridges lie, the same waggon which brought it from Norwich, and which, until the opportunity offered, had stood safe under cover, was drawn, in a furrow, against the wind: while a man, standing on the outside of the waggon, spread the soot, with a shovel, several yards wide, on either side of him; the height of his situation at once enabling him to spread it wide and even. As he reached the windward end of the lands, the team wheeled round under the hedges, and took a fresh width.

"The quantity set on was forty bushels an acre."

SORRANCES, maladies incident to horses, and are accounted two-fold, as either an evil state or composition of a horse's body, which is to be discerned either by the shape, number, quantity, or sight of the member diseased; or it is the loosening and division of an unity, which as it may change diversely, so it has divers names accordingly; for if such a loosening and division be in the bone, then it is called a fracture; if in any fleshy part, a wound or ulcer; if in the veins, a rupture; if in the sinews, a convulsion or cramp; if in the skin, an excoriation.

SORREL, is a reddish colour, with which the mane ought to be red or white; it is distinguished according to the degrees of its deepness, into a burnt sorrel; and a bright or light sorrel; but, generally speaking, it is the sign of a good horse.

SOUND, a horse is such, that does not halt.

When a jockey sells a horse, he warrants him sound, hot or cold; that is, that he does not halt, neither when you mount him, nor when he is heated, nor yet after alighting, when he stands and cools.

SOUR LAND, a cold clayey soil. See the article **CLAY**.

SOW, the female of the swine. See **HOG**.

SOWING, the action of scattering the seeds of plants in the ground.

Writers of different countries mention the usual seasons for sowing their several kinds of grain, but do not take notice of any sign by which the husbandman may be directed when to sow his corn with the greater chance of success. For a rule of this kind we are indebted to the justly celebrated Linnæus, a man truly great, not only for his unequalled knowledge in natural history, and his indefatigable industry in the pursuit of that science; but even still more so for his disinterested zeal to turn the result of his studies to the advantage of his country. Far superior to that mean jealousy which little minds are apt to entertain on their discoveries, he nobly calls forth every assistant, and invites each of them to become his rival in promoting the general welfare of mankind, as we are particularly informed by one of his disciples.

"It is now the fourth year, says the ingenious Mr. Harald Barack, a member of the Swedish academy, since our illustrious president exhorted his countrymen to observe with all care and diligence, at what time every tree expands its buds, and unfolds its leaves; imagining, and not without good reason, that our country would, some time or other, reap some new, and perhaps unexpected benefit, from observations of this kind made in different places."

As one of the apparent advantages, he advises "the prudent husbandman to watch with the greatest care the proper time for sowing; because this, with the divine assistance, produces plenty of provisions, and lays the foundation of the public welfare of the state, and of the private happiness of the people. The ignorant farmer, tenacious of the ways and customs of his ancestors, fixes his sowing season generally to a month, and sometimes even to a particular day, without considering whether the earth be prepared to receive the seed: from whence it frequently happens, that the fields do not return what might be expected, and that what the sower sowed with sweat, the reaper reaps with sorrow. The wise economist should therefore fix certain signs whereby to judge of the proper time for sowing. We look up to the stars, and without reason suppose that the changes on earth will answer to the heavenly bodies; entirely neglecting the things which grow around us. We see trees open their buds and expand leaves, from whence

we

we conclude that spring approaches, and experience supports us in this conclusion: but no body has hitherto been able to shew what trees Providence intended to be our calendar, so that we might know on what day the countryman ought to sow his grain. No one can deny but that the same power which brings forth the leaves of trees, will also make the grain vegetate; nor can any one justly assert that a premature sowing will always, and every where, accelerate a ripe harvest. Perhaps therefore we cannot promise ourselves a happy success by any means so likely, as by taking our rule for sowing from the leafing of trees. We must, for this end observe in what order every tree puts forth its leaves, according to its species, the heat of the atmosphere, and the quality of the soil. Afterwards, by comparing together the observations of several years, it will not be difficult to define, from the foliation of trees, if not certainly, at least probably, the time when annual plants ought to be sown. It will be necessary likewise to remark what sowings made in different parts of the spring produce the best crops, that by comparing these with the leafing of trees, it may appear which is the most proper time for sowing; nor will it be amiss in like manner, to note at what times certain plants, especially the most remarkable in every province, blow; that it may appear whether the year makes a quicker or slower progress. In upland, the sowing of barley nearly coincides with the foliation of the birch.

Mr. Stillingfleet, who has given us a judicious translation of some select pieces published by several ingenious members of that great, and hitherto unrivalled school of natural history, the university of Upsal in Sweden, under the presidency of the excellent Linnæus, was told by a common husbandman in Norfolk, that when the oak catkins begin to shed their seed, it is a proper time to sow barley: "and why," adds he, very properly, "may not some other trees serve to direct the farmers as to other seeds." The prudent gardener never ventures to put his house plants out, till the mulberry leaf is of a certain growth." Hesiod, continues this gentleman in his ingenious note on M. Barck's foliation of trees, began to fix the proper seasons for ploughing, sowing, &c. by the appearance of birds of passage, or of insects, or by the flowering of plants; but I do not find that this method was ever after attended to till Linnæus wrote. Hesiod says, that when the voice of the crane is heard over-head, then is the time for ploughing: that if it should happen to rain three days together when the cuckow sings, late sowing will then be as good as early sowing: that when snails begin to creep out of their holes, and climb up the plants, it is time to leave off digging about vines, and take to pruning. There is a wonderful coincidence, which probably takes place in all countries, between vegetation and the arrival of certain birds of passage. Linnæus says, that the wood-anemone (in Sweden) blows from the arrival of the swallow: and Mr. Stillingfleet finds by a diary which he kept in Norfolk for the year 1755, that the swallow appeared there on the 6th of April, and the wood-anemone was in bloom on the 10th of the same month. Linnæus observes, that the marsh-marygold blows when the cuckow sings; and Mr. Stillingfleet finds by his diary, that the marsh-marygold was in blossom on the 7th of April, and the cuckow sung the same day.

A due temperature of the season, with respect to heat or cold, drought or wet, for all these greatly influence the state of the earth, is essentially necessary, and should be carefully attended to by the husbandman when he sows: but the precise time most proper for this work, cannot, by any means, be invariably fixed, because it will always depend on the concurrence of a variety of circumstances. The seasons are more or less forward, and the ground is more or less dry in some years than in others. A proper series of well made observations would furnish the best of rules in this respect, but certainly would not fix the time of sowing to any particular day, or week, for years to come. Linnæus's method, of carefully observing the foliation of trees, &c. would determine the proper time for spring sowing; and Pliny, after mentioning the several constellations by which farmers were guided in his time, instructs the husbandman with regard to autumnal sowing, upon a principle similar to that of our great modern naturalist. "Why," says he, "does the husbandman look up to the stars, of which he is ignorant, whilst every hedge and tree point out the season by the fall of their leaves? This circumstance will indicate the temperature of the air in every climate, and shew whether the season be early or late.

This constitutes an universal rule for the whole world; because trees shed their leaves in every country according to the difference of the seasons. This gives a general signal for sowing; Nature declaring, that she has then covered the earth against the clemency of the winter, and enriched it with this manure."

I therefore can only say, in general, that it is better to sow early in autumn, than too late, provided the season will admit of it; because the plants are better able to resist the severity of the winter, after they have acquired a certain degree of strength; and their roots being then longer, and consequently better fixed in the earth, they will be less liable to be thrown out by frost. For this reason, in particular, perhaps the colder the climate is, the earlier the wheat should be sowed. Some lands are of such a nature, that they swell greatly in hard frosts, and subsiding again upon a thaw, leave the roots of plants quite bare upon their surface. There have, indeed, been years in which fields sowed very late, for instance, in December, have done extremely well: but that ought not, on any account, to be made a rule, experience shewing that such late sowings very seldom answer. On the other hand, the corn is likewise exposed to many dangers when sowed too early: for the stalks which shoot up before winter cannot well bear hard frost, though wheat would not be hurt by them when only in the blade.

M. de Chateauxeux, than whom we cannot have a better guide, is clearly of opinion, that though the proper time of the year for sowing be come, the corn should not be put into the ground if the temperature of the season be not favourable, and that on the contrary, the sowing of it ought to be deferred, in hopes of a change. "If," says he, the weather is very hot, and the earth extremely dry, it will be absolutely necessary to wait till some rain has fallen; for otherwise the seed will rise but very imperfectly. This I am sure of, by which I contradict the common saying of some farmers, that the earth is the best granary to keep the corn in. Full of this notion, whenever the stated times come round, they sow without distinction, in wet land or in dry: even heat does not hinder them: they think their seed will certainly sprout well after the first rain; but I have always experienced that the plants have come up thin.

"To satisfy myself still farther in this point, I tried an experiment purposely to know whether corn can be sowed with any reasonable expectation of success, when the weather is very hot, and the earth very dry. Upon reading M. Duhamel, du Monceau's excellent Treatise on the Preservation of Corn, I observed, that he had found by his experiments, that wheat dried in a stove heated to sixty degrees of M. de Reaumur's thermometer, had lost its faculty of growing. From thence I conjectured, that wheat which should undergo a heat, for example, of thirty degrees during a longer time, would be equally parched up, and rendered incapable of vegetating. I considered the earth, when hot and dry, as a kind of stove, in which the seed, if it remain too long without receiving any moisture, may become so dry, that the greatest part of it will never be able to sprout. This reasoning is just, and I therefore determined to have recourse to that trusty guide, experience.

"On the 18th of July, 1754, at four o'clock in the afternoon, I placed M. de Reaumur's thermometer two inches deep in the earth, and screened it from the immediate impression of the rays of the sun. The liquor rose to the thirty-first degree, which shewed me the heat of the earth.

"The thermometer being afterwards exposed to the sun, the liquor rose to thirty-six degrees.

"The same day, I sowed eighty grains of wheat in this ground. The heat continued near the same during the rest of that month, and almost all August. On the 21st of July, only ten grains had shot up, and on the 16th of August there were in all sixteen; after which not one more rose; consequently sixty-four grains out of the eighty never sprouted at all.

"On the 28th of July I sowed fifty grains. Only four of them rose by the sixteenth of August, and not one after. Here were again forty-six grains which did not grow at all.

"The same day, I sowed sixty grains in another place. On the sixteenth of August only six grains had sprouted, and not one plant more ever appeared after; consequently here too were fifty-four grains which never grew. All

these grains were sowed in my garden, in exceeding good mould.

"I was sure that the wheat which I sowed was perfectly sound, and in every respect capable of growing. It was therefore quite clear, that so great a numbers of grains out of the whole, which did not sprout at all, had lost the faculty of growing, by their being parched up by the heat, and dryness of the earth. To be still more certain of this three weeks after I had sowed these grains, I watered half of them several times: but to no purpose: not one of them rose, and I found several of them quite whole in the earth where I had sowed them.

"After this experiment, on the 11th of August I suspended the sowings I had begun on the 8th, and did not resume them till the 26th, after some rain which fell on the 22d and 23d. These last sowings rose much better than the first."

Upon the whole, M. de Chateauxvieux concludes, from his own repeated practice, that the best time for sowing in such a climate as Geneva, (which differs very little from ours) is from the 20th of August to the end of September: and thinks that even the first fortnight in October may be taken in, if the land cannot possibly be sowed sooner. But he allows of this only in a case of necessity, and judges that, rather than sow later, it is best to stay till spring.

"Thus, says he, it is, that experience and observation teach us to leave off bad customs, or such as are not founded on principles with which a man of sense may rest satisfied."

It is of the greatest consequence to the farmers that every seed be placed in the earth at a proper depth, and in the best manner: but experience is yet wanting to determine with due exactness, what is the depth which best suits each kind of grain, in different soils.

The method which Mr. Tull proposes, is a very good and easy way to ascertain this point for each particular sowing." Saw off twelve sticks, of about three inches diameter; bore a hole in the end of each stick, and drive into it a taper peg; let the first peg be half an inch long, the next an inch, and so on; every peg to be half an inch longer than the former, till the last peg be six inches long; then in that sort of ground, where you intend to plant, make a row of twenty holes with the half-inch gauge; put therein twenty good seeds; cover them up, and then stick the gauge in the end of that row; then do the like with all the other eleven gauges: this will determine the depth at which the most seeds will come up."

Upon the same principle, M. Duhamel dug a trench twelve feet long, sloping it gradually from the surface at one end, to the depth of two feet at the other. He then sowed different seeds in this trench, and having put the earth into its former place, observed, 1. That hardly any seeds rise when buried deeper than nine inches: 2. That some seeds rise extremely well at the depth of six inches; and, 3. That other seeds do not rise at all when they are above one or two inches deep. Experience shews, that the same seeds may be sowed deeper in a light, than in a heavy soil; that grains which lie too deep in the earth to spring up in a dry year, may rise in a warm and moist season; and that others which are buried still deeper in the ground, will sometimes remain there sound and unaltered for ten or twenty years; at the end of which they will grow extremely well, and produce their proper plants, if they chance to be brought to the surface, by moving the earth, as was mentioned before.

The usual way of sowing in broad-cast cannot answer all the intentions of placing the seed properly in the earth, and must be attended with several inconveniencies; such as the seeds becoming the prey of various birds and animals; its being laid so superficially, that the sun often parches it up, or a long continued rain; instead of promoting a kindly vegetation, soaks into the grains, and bursts them; the seed is very unequally sowed, because of the inequality of the handfuls which different sowers grasp: and great part of it necessarily falls together into hollows, where the surface of the ground is any way unequal, &c.

Sensible of these disadvantages, farmers have, especially for their winter grain, adopted the method of sowing under furrow, that is, sowing one half of the seed in broad-cast, and then ploughing it in, and afterwards sowing the other half, which is covered by harrowing. But this method is also liable to almost as many objections as the other: for

the quantity sown in each particular spot, and the equal distribution which ought to take place throughout the whole, cannot but be even more uncertain than in the broad-cast, where the whole is sowed at once; nor dares the farmer, in this sowing under furrow, to omit sowing the second quantity, lest great part of what as been plowed down be buried so deep that it cannot rise, especially if the soil is at all strong.

Another general fault in the common ways of sowing, is, that too much seed is employed; partly, because custom has established a kind of rule in that respect, and partly on account of the allowance which it is necessary to make for what the birds eat, and for what lies too deep ever to rise; the circumstances by which a very great quantity of corn is absolutely lost.

These inconveniencies are prevented by the drill, which, 1. drops the seed at whatever depth and distance experience has shewn to be fittest for the particular kind which is sowed: 2. fills all the furrows with earth, so that none of the grain remains uncovered: and 3. lets fall into each furrow the exact quantity of seed which has been found to be most proper. By this means every seed is so rightly placed in the earth, that we may be confident they will all do well, if they are not hurt by insects. But as this instrument sows only the absolutely necessary quantity of seed, the husbandman ought to be certain of the growth of every grain; because it often happens, that part of the seed is imperfect and does not sprout at all. As the eye cannot distinguish its quality, he should assure himself of it, by previously sowing fifty or an hundred grains taken by chance, but exactly counted: when these spring up, the number of plants will shew what proportion is deficient, and the quantity of the seed should be increased accordingly. To know what space should be left between each seed thus planted in the furrow, for that space ought to be different, according to the nature of the plant, it will be necessary to observe how much ground a strong and vigorous plant of the same kind takes up when arrived at its greatest perfection, which it will most probably attain when cultivated according to the New Husbandry; and the drill may then be set so as to drop each grain at a due distance.

Besides leaving stated distances between each of the seeds which the drill deposits in the furrow, a farther essential object in the New Husbandry, is to leave proper spaces between the rows of corn, which, in this method, are sowed with the greatest regularity, nearer together, or farther asunder, according to the nature of the plants intended to be cultivated. Some do best in single rows, others in double, others again in treble rows, and others in quadruple; as will hereafter be more fully shewn by several experiments. See the article DRILL-PLOUGH.

"Mr. Marshall says, finding a great waste and inconvenience attending the broad-cast sowing, he ordered his seedsmen to walk on the left-hand inner furrow, with his face towards the land to be sown, and to make his cast diagonally, not across the land. This gave him a great scope; and after a few minutes practice he made very good work: before night he walked at the rate of three or four miles an hour, and though a young seedsmen, made as good work as could be wished. A man walking in the smooth, open inner-furrow, may sow three acres in less time, with more ease, than on walking among the rough clods and loose mould could sow two acres. This method proved superior to the usual way, being cropped as well, and with less seed. The extra expence of sowing is about two-pence an acre, but the saving of the seed was at least two shillings per acre.

The method observed was, the seedsmen walks up one side of the bed, and down the other side; always keeping his face, and the hand with which he sows, towards the bed he is sowing. He also keeps his eye on the edge of the opposite inter-furrow, and delivers his seed, principally, on the side of the bed next to it: as he returns, the sides of course are reversed, and the beds become evenly seeded. An old seedsmen, who has been used to throw large handfuls with all his might, in wide casts straight across his walk, will find it awkward at first to make the single diagonal cast which is necessary in sowing five about-beds singly.

SOWING-MACHINE. See HORNE'S *universal sowing Machine*.

SOW-THISTLE, a species of thistle common in corn-fields and pastures.

SPADE, a well known instrument used in digging.

SPANCEL, a rope to tie a cow's hinder legs.

SPARSED-LEAVES are those which are placed irregularly about the several parts of a plant.

SPARROWS are the most mischievous birds to a farmer; and were all the farmers of a neighbourhood to agree to their destruction, by offering rewards for their heads, their numbers might be lessened. Were the practice general, surely the whole race might be extirpated. Suppose six-pence a dozen the first year, nine-pence the second, and a shilling for the third year would nearly reach their extirpation. To enforce this, consider how soon twelve sparrows destroy twelve-penny-worth of wheat. The island of Bermuda was so much pestered with red-birds, (originally brought there merely as curiosities from America) that an act of assembly was thought necessary to decrease their number, and it had the desired effect.

SPATLING-POPPY. See **CHICKWEED**.

SPAVIN, a disease in horses, being a swelling in or near some of the joints, and causes a lameness.

There are two kinds of spavins, called a blood-spavin, and a bog-spavin.

A blood-spavin is a swelling and dilatation of the vein that runs along the inside of the hock, forming a little soft swelling in the hollow part, and is often attended with a weakness and lameness of the hock.

The cure should be first attempted with restraints and bandage, which will contribute greatly to strengthen all weaknesses of the joints, and frequently will remove this disorder, if early applied: but if, by these means the vein is not reduced to its usual dimensions, the skin should be opened, and the vein tied with a crooked needle and wax thread passed underneath it, both above and below the swelling, and the turgid part suffered to digest away with the ligatures: for this purpose, the wound may be daily dressed with turpentine, honey, and spirit of wine, incorporated together.

A bog-spavin is an encysted tumor on the inside the hough, or according to Dr. Bracken, a collection of brownish gelatinous matter, contained in a bag, or cyst, which he thinks to be the lubricating matter of the joint altered, the common membrane that incloses it forming the cyst: this case he has taken the pains to illustrate in a young colt of his own, where he says, When the spavin was pressed hard on the inside the hough, there was a small tumor on the outside, which convinced him the fluid was within the joint; he accordingly cut into it, discharged a large quantity of this gelatinous matter, dressed the fore with dossils dipped in oil of turpentine, putting into it, once in three or four days, a powder made of calcined vitriol, alum, and bole: by this method of dressing, the bag sloughed off, and came away, and the cure was successfully completed without any visible scar.

This disorder, according to the above description, will scarcely submit to any other method, except firing, when the cyst ought to be penetrated to make it effectual; but in all obstinate cases that have resisted the above methods, both the cure of this, and the swellings called wind-galls, should, I think, be attempted in this manner. If, through the pain attending the operation or dressings, the joint should swell and inflame, foment it twice a day, and apply a poultice over the dressings till it is reduced.

SPAYING, the operation of castrating the females of several kinds of animals, as sows, bitches, &c. to prevent any farther conception, and promote their fattening.

It is performed by cutting them in the mid flank, on the left side, with a sharp knife or lancet, taking out the uterus, and cutting it off, and so stitching up the wound, anointing the part with tar, and keeping the animal warm for two or three days. The usual way is to make the incision aslope two inches and a half long, that the fore finger may be put in towards the back to feel for the ovaries, which are two kernels as big as acorns, on both sides of the uterus, one of which is drawn to the wound, the string thereof cut, and thus both taken out.

SPELT, the name of a species of grain, which though commonly reckoned a summer corn, is sowed either in autumn, or in the spring, at the same time as wheat and rye. This grain, of which there are two sorts, one with a single, and the other with a double chaff, though both have always two seeds in each husk, was formerly much esteemed in Italy and Egypt, and is now very common in Germany, where they make bread of it, which is very nourishing, and well tasted, but hard to digest. They likewise brew beer from it in some places. It was of this

grain that the ancients made their frumenty, of which they were very fond. Though commonly ranked as a species of wheat, which it is not unlike when growing, its grain is smaller and of a blackish hue, its stalk thinner and less firm, and its ear flat and bearded, with seeds only on each side. Some writers distinguish a third sort by the name of white-rye, which they take to be the olyra of the Greeks and Latins; and seems to be what Mr. Mortimer calls tritico speltum, a sort of naked barley, or wheat barley, cultivated in Staffordshire, shaped like barley, but with a grain like wheat. It is much sown at Rowley, Hamstall, and Redmore, where they call it French barley. It makes good bread, and good malt, and yields a great increase; and therefore would do well to be tried in other places. It ripens early, does best in a dry soil, and is not apt to be much hurt by birds, from which its beard and double husk preserve it.

SPIKY-ROLLER, a very useful instrument in husbandry, lately introduced by the ingenious Mr. Randall, of York, who has also obliged the world with the following account of it:

"I think, says Mr. Randall, it was in the spring of 1752, when I had fifty acres of ground, designed to be sowed with barley, at one particular farm; but the weather had been so unfavourable, and the spring so extremely dry, that there was no such thing as preparing the ground for the reception of the seed: and this was the case with the whole country, in these parts of England. On looking, one morning, at a barley-roller, which laid just before me, I recollected, that Mr. Ellis, in one of his eight volumes in Husbandry, made mention of a spiky roller, and referred the reader to another volume for its plate and description, which were no-where to be found. I immediately sent for some workmen, and produced this useful instrument against the next morning, as the season was far spent, and much ground was to be sowed, in several farms, with this grain.

"On this morning, a neighbouring, substantial farmer, passed by us, with half the country for clotters, as we were going to put the horses to the roller, as he had no longer patience to wait for rains, to reduce the rough state of his ground, designed for barley seed; he gazed at the roller, smiled, and went his way with his troop. They, after clotting two acres, all returned the same way at night; their master rolled his eyes all over a field of about twenty acres, saw it perfectly fine (as the roller came back upon the same ground it went down), and, after a pause, said, that was a good hedgehog, for doing ten times more in one day than all his troop together, and ten times finer, than a thousand clotters could do in the same time. This was the first time this farmer ever could be brought to say a civil thing of any useful instrument, though common sense would pronounce the utility of this on his first seeing it; but the truth is, nothing but such glaring effects can ever convince these people, as they have the great art of despising what they do not understand, or have not had in practice for ten centuries.

"While the same man was going over the other ground that stood in equal need of the roller, the ploughs were set on to turn up the ground he had rolled; and when all was thus ploughed, the roller went again over the whole, to crush the clots, thus turned up, and made all as fine as before, by going twice in a place: then they ploughed for a seed furrow, sowed the seed in the usual way, and harrowed it in; then the roller with a thorn bush fastened behind, went over again, once in a place, and left all exceeding fine, which even would not have disgraced a gardener in his manner of preparing the ground for the garden culture in general.

"The consequence of this lucky hit was, that, before the country could get their seed into the ground, my barley was fairly up, went forwards, and did extremely well; while, in general, my neighbour's barley made but a sorry appearance, arising from the rough state of the ground which they could not bring into that fine order this grain requires, notwithstanding all their toil and expence. This achievement of the spiky roller established its reputation among the neighbouring farmers; but still they could not prevail on themselves to be at the expence, which indeed was not small, in having one made for their own use. The result of all was, that I had other rollers made for the ground in other parts belonging to me, only they were made heavier, and both longer and larger, the better to suit the soils that were much stiffer.

"From

" From this time we never sowed any seed in the common form, but the spiky roller and thorn-bush at its tail, followed the harrows; as it effectually buried the seed, and left the ground in a fine state. It may easily be conceived, that this operation is of consequence to vegetation; for the fine mould, being thus swept into the holes made by the irons, and where the seed was buried, must needs greatly promote their growing soon, and nourish them well above-ground; as it is well known, the finer the mould is, where the seed is deposited, there vegetables are pushed on to their destined maturity, if all other requisites concur. And upon this principle it is, that if the corn in the spring is rolled once in a place in like manner, the owner will be far from having any cause to complain of the practice, provided the weather and state of the ground, will or ought to bear the tread of the horses, and weight of the spiky roller.

" I am very sensible this will appear strange to many persons, as it looks like sending a herd of rapacious wolves to nourish a flock of tender lambs, or tearing, bruising, and throwing all the corn up from their very roots, and bringing on a general desolation over all the ground. This is like Sisyphus in Homer: we crop the ground with much sweating and tugging, and then suffer all to be destroyed again, by this ponderous, grinning creature. But it may not, perhaps, be ill expressed, when we say, that, in order to come at the truth of things in farming, we must, according to the Greek epigram, ascend downwards, and descend upward: the most triumphant success, in the true bias of nature, in establishing agriculture, rises safely and surely on the foundation laid by bold experiments, that seem to contradict superficial reason.

" Let us now consider the effect of this terrible desolator, as it goes over the young corn. If we consider the system of irons on the roller, they must leave some of the corn untouched by them, and then this is only rolling the corn in the common way, as it is only squeezed by the roller, and not bruised by the irons: so far there is no harm done. There must be corn, you will say, that is crushed and bruised, if not quite destroyed, by the violence of the irons: but supposing the corn lost, wherever the irons pitch, which is very far from being the case, yet the untouched corn will be so improved, by this shattering and loosening of the soil about their roots, and scraping of the mould by the thorn-bush, and shaking and tearing the tender blade, that the owner will judge for himself, whether the Greek epigram ought to have a place among the paradoxes in agriculture. However, it can do no gentleman much harm to let the roller go down in one place, and up again in another, and give over; and this single trial is all that the author pleads for, and that the weather and state of the ground be such as will safely admit of the experiment.

" The use of the roller, in making the fallows, and preparing the ground to a requisite degree of fineness, in the old, new, and what this Treatise calls the Semi-Virgilian Husbandry, is by this time pretty evident to the reader, and needs no more instances, where such perfection is desired. We now come to speak of its use on grass land, where the sward is worn out by age, spoiled by mofs, or a bad sort of grass; or defective in any shape, from some cause or other, and yet it is very dangerous to plough it up, and lay it down better, on account of its situation, or it is not convenient perhaps, for other reasons, to disturb it with the plough: whatever the case is, the owner, undoubtedly, would be exceeding glad to have a better burden of grass on the ground, for the maintenance of his live stock, or for the pleasure of seeing his ground, about his house, put in a better appearance.

" Here then there must be some compost prepared; that is, a mixture of the dunghill, sods, ashes, lime, mould, soap-ashes, and such like ingredients, or as many of them as can be conveniently procured, laid up in a heap, in this manner: a stratum of mould about half a foot deep, then dung, then sods, then soap-ashes, then common ashes, then lime, then dung; and to cover all with mould, about half a foot deep. When these have laid some time, that the dung may communicate its juice to the strata beneath, the heap may be thrown down with spades, so as, in the operation, these ingredients, being mixed together, the first stratum of half a foot, of the new heap, may be composed of all the ingredients; and so, in like manner, all the rest of the strata, till the new heap is completed; and

after these have laid some time, they will be very mellow, and fit for use the Michaelmas after the winter when the first heap was formed.

" We must now suppose the clove, whose sward is to be improved, to have been laid down even, and not in ridges; and that between Michaelmas and Martinmas, the sooner after the former the better, the ground is to be so moist, as to admit the irons of the spiky roller, but not the horses feet; that is, the irons will penetrate three inches, or thereabouts, and the horses feet make little or no impression. Here then the roller must go up and down, till the sward and ground are pretty well broken up: this being done, the seeds of clover, trefoil, and ryegrass, or any other mixed with them, must be sown in the usual way and quantity: then the compost must be spread over the seed, so as to cover them, and a common barley roller, with a thorn-bush fastened to it, must follow, and the ground shut up, lest cattle should do harm, by treading the ground. A gentleman making this experiment, will have great cause to be pleased with what he has done; and will also see the necessity of laying down his ground as even as possible for the future, that he may increase the burden of his grass, whenever it falls short of a proper quantity or quality." *Randall's Semi-Virgilian Husbandry, Append. page 1.*

We have added the figure given of this useful instrument by the above ingenious gentleman, on Plate XXIV. fig. 5.

A correspondent of the editors of the Museum Rusticum, who calls himself a clay farmer, has made the following observations on the structure and utility of the spiky roller:

" Give me leave, says he, to communicate to my brother farmers, a most useful implement in husbandry, which has but of late been introduced amongst us. It is so very efficacious, and its power so much superior to all other instruments yet contrived for the reduction of strong land, that, I think, there is not any possessor of such ground (who has no objection to a fine seed furrow) that will be without this instrument. This last autumn it has been of the greatest utility. For whilst the neighbouring farmers were waiting for rain, so that they might with their own rolls and harrows bring their land to that degree of fineness they could wish to have their seed sown in, those who were possessed of the spiky roller, (for that is the name of the implement I am going to give some faint idea of, as it is impossible by letter to make any body more fully acquainted with it) had their fallows in such a degree of fineness, as I never before saw that kind of land in; and had finished the whole of their sowing, before the others ever thought of taking their ploughs, &c. into the field.

" To begin then with the best description I can give of the most complete I have yet seen. The roller is of oak, six feet three inches long, seventeen inches diameter, hooped with iron at each end; the circumference divided into eighteen equal parts, where rows of iron spikes are set (in the quincunx order) at six inches distance one from the other, in the rows: so that there are thirteen spikes in one row, and twelve in every other throughout the circumference. The number of the spikes is two hundred and twenty-five. They are to project four inches and a half from the roller, and to be one inch by three quarters of an inch square at that part of the spike next the roll, tapering off to three quarters of an inch by half an inch at the top part. The whole length of the spike, with what is driven into the wood, will be about nine inches long. And I would advise the falling side at the end of each spike to have a stroke or two with the hammer, that they may be a little more pointed to give them greater facility in penetrating the very hard clots they are designed to break. Every spike will weigh about one pound and a quarter, which will be of sufficient strength.

" The frame should be made for horses to draw a-breast, or with a pole for oxen. For by the horses, &c. drawing double, the roll is more easily turned; and, besides, it is likely to prevent the end of the roller from going over the driver, if by chance he should fall. That it may with greater ease and convenience be conveyed from field to field, or to any distance, an axis is fixed upon the frame immediately above the roll with wheels; so that by turning the frame, the wheels take up the roll, and away you may drive; and when you have brought it to the field, in

in order to make use of it, by turning the frame back again, you let down the roll, and then the wheels are carried by the roller.

"Since making of the above description, I have talked with the wheelwright, who tells me, he could greatly improve the manner of fixing the wheels, by making them run within the frame; for as they now run without, it sets the wheels at such a distance, as makes it difficult to pass through gates made only the common width. And likewise says, that great care must be taken in fixing that part of the frame which the gudgeons of the rolls run in: for by that means the roll will be let down with greater ease; which will not be the case, if regard is not paid to that particular. The roller, frame, wheels, &c. are, together, about eleven hundred weight.

"If your land, by once passing over it with the roller, is not so fine as you could wish to have it, let a large harrow be fastened to the frame of the roller, which will pull up the remaining clods, and thereby give the roller a better chance for breaking of them the second time going over. Four able horses are equal to this work." *Museum Rusticum*, vol. V. page 372.

These observations induced the inventor, Mr. Randall, to send the following letter to the editors of the *Museum Rusticum*:

"In your *Museum* for the last December, says he, I observe my name mentioned concerning the spiky roller. Without making any comment on the clay farmer's dimensions, for constructing this implement of husbandry, I beg leave to tell him, and the rest of your readers, that the length of mine, which was the first I ever saw or heard of, except what the late Mr. Ellis mentioned to so little purpose, was seven feet, the diameters of the ends eighteen inches, and the whole cylinder made of the heart of oak: and when the irons were burnt in, and the man seated on the box designed for that purpose, the weight of the whole was about a ton. But you will think it strange, that the blunt end of the irons were opposed to the clods, and run more taper, till they came to the surface of the cylinder, into which the irons were burnt, and inserted about three inches, which was their length above the surface of the roller, and which, I always found very sufficient to crush the hardest clod that ever came in their way. Had I, indeed, attempted to go on the ground when the soil was not perfectly dry, this position of the irons would have carried the clods round with the roller: for it is not its province to squeeze but crush. Nor indeed can a man do more harm to his ground, than going upon it, when it is not quite dry, with a roller, constructed according to the clay farmer's form and size of the irons; or by that which I have recommended. I am sensible those who construct the roller, according to the clay farmer's directions, imagine, that by inverting the shape, there is less danger of carrying the moist clods round with the roller; but I must say again, there is no occasion for this precaution: for, if the other form be at all necessary, it must be in the moist state of the ground, which is the only reason why we should keep the roller off the soil. I had the irons fixed in four inches asunder, in the first row, from end to end. The second row began just between the first and second irons of the first row. The third row was like the first, and the fourth like the second. Then alternately for the whole surface of the cylinder, as near as could be, the irons were four inches asunder in each individual row, and four inches from row to row, as nearly as the superficies of the cylinder would permit. I do not know how to convey a juster idea to your readers of the shape of the irons, than to call them ox-harrow teeth, for when I sent for the workman, I desired him to make so many of this denomination, six inches in length; and burn the small end three inches into the wood: he went from me, as perfectly understanding what I meant; brought his number of irons, and inserted them a proper depth into the cylinder. If some of your south-country readers should be at a loss to know what is meant by ox-harrow-teeth, they will be pleased to remember, that they are irons fastened into two harrows, which are drawn by either four oxen and two horses, or six oxen alone, in very stiff soils. Now, it will appear to you, that the roller itself, and one harrow, will require at least four able horses, according to the clay farmer's stating the case: but my roller, without harrows, always stood in need of three stout horses, which the man from his box always drove a-breast, for the greater convenience of turning on

the land's ends. But were I to have two ox-harrows, (which would only extend the length of the roller) following the roller, for the purpose of tearing up clods, in order to be crushed, on going a second time over the same, seven feet in length, I should be obliged to have a much stronger team than four stout horses; and therefore, I must beg leave to observe, for this, an unanswerable reason, that harrows are better omitted; as they always were, by my people, who set in with their ploughs, and turned up the soil from all requisite depths, in order to have it crushed by the roller going twice in a place.

"If the clay farmers will not take it amiss, I would tell him, that wheels to the roller only create expence and trouble. For I do not remember we ever had any disadvantage from the weight of them in my four rollers, made for near a thousand acres of land, of all denominations of soils, stiff and light: for, when the fellows had occasion to convey the roller from one inclosure to another, and sometimes over the hard high road, I never heard, or observed, there was the least difficulty of doing it: as the irons were so stout, as not to receive any injury in the passage, otherwise than by friction; by which they would be indeed in time somewhat impaired. As to the width of the gates, I think there was never any stoppage; since the men, when they found the passage rather too strait, could, by turning the horses heads, easily incline the roller on one side, and by that means wriggle it in, where it was too long for entrance. Let who will be the father or grandfather of this valuable instrument of husbandry, I had reason to be extremely well pleased with my lucky hit, in constructing it from Mr. Ellis's barely mentioning a spiky roller: though from his usual giddiness, he gave his readers no more than the name. As it is of consequence to the world, to keep the expence of this instrument as low as possible, I shall be very sorry to hear any more of wheels, for it may deter farmers from using it; and without their hearty concurrence, all will be only playing at farming. Gentlemen may please themselves in every variation of the implements and modes of culture: but without the assistance of those, who bless the nation with their endless toil, a thousand years hence will be as to-morrow.

"Besides the purposes already mentioned, this roller must undoubtedly be of use in laying, originally, down lawns, or large pieces of grass required to be level. Mr. Randal only mentions the restoring such when depraved: but certainly this instrument must be extremely effectual in the case of all stiff lands, for the producing a good face in the first forming of fine pieces of grass. The manner of doing this, in such cases, is too obvious to persons qualified for executing such work, to require any explanation: as the instrument may be used concurrently with any of the common methods of manuring and sowing grass seeds, as well as with Mr. Randal's compost, &c. they being no ways particularly necessary to the effects of the roller, though it may greatly aid them.

"This roller may likewise be very useful in preparing clay for the making canals or pieces of water. For where, as sometimes happens, the clay grows dry, and will not admit of being duly tempered for use without great pains in breaking it, a very large quantity may very soon be reduced to the requisite fineness, by spreading it on hard ground in a due thickness, and passing this roller a few times over it. In very great works, much trouble and labour may be sometimes saved by this means, where such a roller is at hand; and the clay prepared in a manner that will answer the purpose much more effectually.

"It is certainly an instrument which no farm, where the land is stiff, or in the least liable to clot, should want. For besides the constant advantage of saving labour, and bringing land to a better condition for any kind of sowing than the plough and harrow with any assistance of the work of hands can make it, in favourable seasons, and under such circumstances as Mr. Randal has mentioned in the above quotation, the loss of the whole crop by an otherwise unavoidable delay beyond the seed time, may be with certainty prevented."

We shall conclude this article with the following ingenious account of the uses of this instrument, which we have been favoured with from Mr. John Berington, of Winsley, near Hereford.

"As I live, says he, in a clay country, and had been often put to a great deal of difficulty in a dry unkind season, in reducing the land to a proper tilth, I resolved to make

make a trial of Mr. Randal's spiky roller; but apprehending great stress must lie upon the horse and frame, in turning such, as well as tearing up the ground, it occurred to me, that I had seen recommended a double roller, that is, one divided in two parts. It is very probable that you have it already in design; if not, the following directions, I imagine, may suffice.

"Let the ends of each part be bound with narrow but strong bands of iron, and let the spikes at the ends be placed close to them; let each part have a separate frame, but let the cheeks in which the inward gudgeons turn, be made of iron plates, about two inches wide above, and four where the gudgeons enter; the thickness, a common flat bar of iron; and these fixed in any firm manner, to two cheeks of wood reaching down just to the bands, and of such a thickness at bottom as not to interrupt the spikes. Let the inward gudgeons be made with quite flat heads, to prevent their slipping out in working; and this brings the two ends of the roller near together, which is of some little consequence, as the fewer clots will be missed in working."

"Let the frames be joined together by four eyes, like those of a small gate, two at one end, about five or six inches apart; the two at the end of the other, to take place just within them; an iron pin through all four, and keyed. Let the trills be placed just on the middle of each frame, and a bar of wood just behind the horse to strengthen them; the bar sawed through in the middle, and joined by a strong flat hinge: one side made to hasp upon a staple, kept down with a wooden clet. This gives the whole proper play in working; and I may venture to affirm, it will be found, next to the plough, the most useful instrument in tillage, not only in reducing a stiff soil, but with a bush at its tail, as Mr. Randal, expresses it, will cover the seed when sown much more effectually, and in a better manner, than a harrow, as it turns up the earth light and fine behind it; and though seemingly unweildy, will turn with ease, and may be worked with one, two, or three horses at most, upon any land that is of a proper dryness to work upon, of which I cannot well forbear giving you an instance: the carter that was to drive it exclaimed, when he first saw it, that it would kill all his horses; some time after, as he was using it upon a piece of fallow, a fellow-servant wanted a horse for some use, and was going to catch one; the carter called to him, and told him, he might take one of his, having three, as he could do very well with two. Now I believe you will allow, that if it could so easily overcome the obstinacy of a clown, there are very few clods that will be too hard for it."

"The spikes are about four inches without, and three within the wood; the thickness of the roller, and number of spikes, I think, may be determined, in some measure, by the nature of the soil it is to work upon."

The spiky roller is, undoubtedly, one of the most useful instruments in husbandry of modern invention, and will be found applicable to several other purposes, besides those above-mentioned: one in particular is, to assist in reducing the half burnt turf of burn-baked land, which requires much labour, as commonly done by hand; but by going over the land several times with the spiky roller, and harrowing it with heavy harrows alternately, to pull up the turfs, or ploughing them up, they may be reduced fine, in a much shorter time, and at a much less expence, than by beating, to break them by hand.

"In Devonshire and Cornwall, says Mr. Harte, p. 84. of his *Essays on Husbandry*, they Denshire their old pastures, which when very coarse and grassy, and choaked with weeds, they pare off the surface about three inches thick, with the old English beating axe, (which is nearly the same as the Marquis, de Fourbilly's cob, or paring axe) into turfs about two feet three inches long, and ten or eleven inches broad; and the workman or parer sets up these turfs very dexterously, into a sort of spiral pyramid or cone, with his axe, something in the form of an high-crowned hat, but more obtuse, with the grassy side outmost; in which position they dry conveniently and speedily. They commonly make about two hundred such small heaps upon an acre; but in burning these small heaps, a great part of the outmost turfs will remain uncalcined; and therefore Mr. Harte proposes to make but forty heaps upon an acre, with half a furze faggot placed near the bottom of each, and an air-hole

fronting the wind. That he has known above five hundred bushels of ashes procured from a single acre, and the common expence there, of paring, burning, and spreading the ashes, is about twenty-seven shillings per acre.

But where a paring-plough can be used, much of the expence of paring may be saved. And here we see, that a great part of the outmost turfs remain uncalcined, which must be broken by hand, but much more speedily with the assistance of the spiky roller.

The Marquis of Fourbilly directs the turf, of land over-run with heath, fern, &c. to be pared four inches deep, and the turfs to be cut eighteen inches long and nine broad, to be laid flat with the bare or earthy side downwards; the end of each turf to rest upon the preceding one. Or, if to be dried sooner, in wet weather, to set them up on edge in little round heaps, or else in pairs leaning one against another, with the heathy side outward; and when dry, to be set up in large heaps, rounding towards the top, with the heathy or grassy sides all laid downwards, and a small hearth or chimney near the bottom of each heap, facing the wind: ten heaps to be ten feet diameter, and ten feet high; to be immediately set fire to, as soon as made, with a little straw, &c. at the end of a fork; but he directs no furze to be laid on the hearth, nor is it necessary, if the turfs are dry when set up; for then they will readily take fire by carrying some hot coals from one heap to another, in shovels. The Marquis computes the expences, as it cost him, at about thirty livres per arpent, amounting to about twenty shillings per English acre.

"I have, says the Marquis, often remarked, that in those places where the upper turfs of the clumps, which had burned slow, remained almost whole, and were but merely calcined, insomuch that it was necessary to break them before the ground could be sown, the corn always flourished most, and much better than in those places where the furnaces, after burning every thing, were totally converted into heaps of ashes alone. In general, these heaps where the ashes after burning are white, are the least valuable, as well as least in bulk. This denotes vitrification more than calcination. In proportion as the ashes are yellowish, brown, or black, which is the degree of their perfection, they are the best, and the heaps generally the largest. In proportion to these colours, the calcination exceeds the vitrification." For this reason, those who burn-beat their land, choose to perform it with a smothering fire, as that is a means of preventing the vitrification, and makes the greater improvement; but this leaves a greater proportion of turfs imperfectly burnt, and renders the spiky roller of more use to break and pulverise those imperfect burnt turfs, with less manual labour, especially, as the Marquis observes, the turfs cannot be all broken sufficiently by hand work the first year, but some will remain unbroken to the second year after burning, notwithstanding his giving the land five ploughings, and as many harrowings, before it was sown with wheat or rye; and yet the first crop was but indifferent.

"As to the little freeholders, continues this gentleman, and farmers, who have but a few acres, and after having grubbed, cleared, and burned them, in the manner before mentioned, labour them by the strength of their arms, with the pick-axe, shovel, spade, or other instrument, and wish to sow in one of the above-mentioned methods; they must take care to mix the ashes well with the soil, and to carry off all the stones and roots. These are they who will, in proportion, reap the most corn the first year, as digging stirs the ground much better than ploughing. Were it possible to cultivate all one's ground thus, with a spade, it would produce a great deal more."

Hence appears the advantage of giving such land good and deep culture the first year, and immediately after the ashes are spread upon the land: which may be done by the assistance of the spiky roller, which will break and reduce the imperfect burnt turfs before the land is ploughed up, and will afterwards quickly reduce also the land after it is ploughed and dry, at a much less expence than can be done by the plough and harrows, as appears by the above examples, of the powerful effects of it, upon strong and cloddy land.

Instead of sowing this land, when thus reduced, with corn, for a first crop, it will be better to sow turneps, if the land is ready in proper time; and if they are drilled upon four feet ridges, and horse-hoed, the occupier may obtain, not only a great crop of turneps, which land thus prepared is found to produce, but the land will be admirably

bly prepared (by repeated deep horse-hoeings, and thoroughly mixing the ashes with the land for any succeeding crop; or to lay it down in fine order with saintfoin or grals feeds; in doing which (or for any other crop) great care should be taken, to procure perfectly clean seed, and to lay no farm-yard or stable dung upon the land, or any other kinds of manure, which are suspected to have any feed of weeds in them; for the fire having wholly destroyed the grals, and all the feeds and roots of weeds that were in the land, (together with the worms and noxious insects), it may now be kept perfectly clean, and continued so with proper care, for many years: "for a considerable time, says the Marquis, not so much as a blade of grals grows in the corn: there is scarcely any as yet appears in the lands that I pared and burned at first:" which was more than twenty years before he wrote this.

SPINDLING, running to seed.

SPLINT, a hard excrescence growing on the flank bone of a horse.

Some horses are more subject to splints than others; but young horses are most liable to these infirmities, which often wear off, and disappear of themselves. Few horses put out splints after they are seven or eight years old, unless they meet with blows or accidents.

A splint that arises in the middle of the flank bone is no ways dangerous; but those that arise on the back part of this bone, when they grow large and press against the back sinew, always cause lameness or stiffness by rubbing against it; the others, except they are situated near the joints, seldom occasion lameness.

As to the cure of splints, the best way is, not to meddle with them unless they are so large as to disfigure a horse, or so situated as to endanger his going lame.

Splints in their infancy, and on their first appearance, should be well bathed with vinegar, or old verjuice; which, by strengthening the fibres, often puts a stop to their growth; for the membrane, covering the bone, and not the bone itself, is here thickened; and in some constitutions, purging, and afterwards diuretic drinks, will be a great means to remove the humidity and moisture about the limbs, which is what often gives rise to such excrescences.

Various are the remedies prescribed for this disorder: the usual way is to rub the splint with a round stick, or the handle of a hammer, till it is almost raw, and then touch it with oil of origanum. Others lay on a pitch plaister, with a little sublimate, or arsenic, to destroy the substance: some use oil of vitriol; some tincture of cantharides; all which methods have at times succeeded; only they are apt to leave a scar with the loss of hair. Those applications that are of a more caustic nature often do more hurt than good, especially when the splint is grown very hard, as they produce a rottenness which keeps running several months before the ulcer can be healed, and then leaves an ugly scar.

Mild blisters often repeated, as recommended in the article spavin, should be first tried as the most eligible method, and will generally succeed, even beyond expectation: but if they fail, and the splint be near the knee or joints, you must fire and blister in the same manner as for the bone spavin.

Splints on the back part of the flank-bone are difficult to cure, by reason of the back sinews covering them; the best way is to bore the splint in several places with an iron not very hot; and then to fire in the common way, not making the lines too deep, but very close together.

To SPRAIN feeds, signifies, to throw them with a single motion of the hand at a certain distance from one another.

SPRIG, a small branch, a spray.

SPRING, the season in which plants vegetate.

Spring also signifies a fountain, or issue of water from the earth. See the articles **DRAINING**, and **WATER**.

SPRING-WHEAT, a species of wheat sown in the spring. See the article **WHEAT**.

The following experiment and observations on the comparative ripening of spring and common wheat, made by the ingenious Mr. John Wynn Baker, and reported by that gentleman to the Dublin Society, must not be omitted here.

"Some little time after receiving the instructions I was honoured with from the society, I was desired by the committee, then sitting, to settle the premiums for the succeed-

ing year, to make a comparative experiment between spring and common wheat.

"The purpose of this experiment was to discover, whether common wheat would not ripen when sown late in the spring, as well as spring wheat.

"Accordingly, on the twenty-eighth day of March, I sowed two perches of each sort of wheat in my garden, in drills three feet asunder, at the rate of five stone to an acre. I had but two pounds of spring wheat, otherwise I should have extended the experiment.

"The common wheat came up well, but the spring wheat came up very thin in the drills, which for some time, I apprehended, was owing to some fault in the seed: but the case was otherwise, as appeared afterwards from a second sowing in another place: add to this, that in a few days I discovered mice had eaten great part of the seed; however, some little of it escaped, and planted greatly, as did the common wheat.

"As a substitute for the horse-hoe, which could not be introduced in these small experiments, I used the spade, and the plants grew to admiration.

"The fatality which attends all small experiments in the corn tribe followed these: for I was obliged to cut the spring wheat before it was ripe, the birds, in defiance of all protection, having devoured most of it; however, it would have ripened completely, and, as a proof of this assertion, I had a few ears, which I selected from the rest, which are very fine.

"It may be proper to observe, that the spring wheat was more exposed to the ravages of birds than the other, as the common wheat I sowed was bearded, which is always a great, though not a perfect, protection to it from birds.

"The common wheat met with a distemper which was quite as fatal to it as the mice and birds were to the other: this was the rust, or mildew. Before this disease came upon it, it was as fine corn as ever I saw, but it never ripened; though in appearance the ears were very fine.

"This disease attacking this corn, and sparing the other, I am inclined to attribute to this circumstance, viz. that this was very thick and strong; whereas the other was very thin, from the accident before mentioned: perhaps, had it been as thick, it might have shared the same fate. So that I think these experiments are not by any means conclusive, as to the ripening of either of the species of wheat, when sown late in the spring.

"I sowed another plot of ground, as was before mentioned, on the fourth of May, with spring wheat, which came up well, grew up very strong, and formed very fine ears in appearance, but never ripened.

"On the twenty-ninth of April, I sowed an acre of very good ground with common wheat, which I steeped beforehand in putrid water; it came up in eight days, but made no figure till June; it formed small ears, but produced no grain at all.

"So far we have two conclusive experiments, that spring wheat will not ripen when sown in the beginning of May; and that common wheat will not ripen when sown the latter end of April.

"Notwithstanding that our question is not answered by the two first experiments, yet the disease attending the common wheat has furnished some observations with respect to the mildew, or rust, upon corn and other plants, which tend principally to confirm those made by the ingenious Mr. Tillet, director of the mint at Troyes, and seem to contradict most of our English writers on this disease: many of whom seem to have implicitly followed others, who, I am afraid, have undertaken to account for, and furnish remedies against, a disease which perhaps they had never seen.

"Various are the opinions, and many of them contradictory in themselves; but upon the whole, candour obliges me to own myself as much at a loss to determine with certainty the cause of this disease, as I find, the many writers are, who have thought themselves perfect masters of it. Even by reading six pompous pages, which I have gone over many times, I should scarcely know the disease, so faint is the description; but it will ever be known by the greatest strangers to country affairs under the French name, which indeed is as truly descriptive as it is laconic; by them it is called *rouille*, or rust. By the Romans it seems to have been called *rubigo*.

"I shall omit to give my observations upon this disease at present, as it would oblige me to quote many tedious passages

pages from the books; and where there is a contrariety of opinions, although without evidence: yet a little man, with a few facts only to support a new theory, would stand a chance of making but a poor figure.

"At present I join in opinion with Mr. Tillet and Mr. Reneaume; who seem to think that the extravasated juices of the plants, operated upon and condensed by the acrimony of the air, I should rather say incruited, are the occasion of it. To this I shall only add, that I am at present of opinion, that the lacerated parts of the plant giving passage to, or rather changing the course of, the juices before-mentioned (which are the nutriment and life of the plants), to the diminution and loss of the vegetable food to the nobler parts, is the true cause of the plants failing in their produce: but, I repeat it, I attempt not here to account how, and from what cause, those lacerations, which I believe to be the basis of the disease, happen.

"The comparative experiment between spring and common wheat, I think, should be repeated, as the discovery thereby sought for tends to a public benefit; but it should be in a larger way, and in an open exposure.

"A circumstance has recurred to my memory, which had escaped my attention from the time it happened, till since I entered upon this subject.

"Last spring, a poor neighbour of mine told me he had lost the season for sowing his wheat, for want of money to buy seed, but that, if he could get a barrel of Poland wheat, (as he called it) which was the white cone, he would then sow his ground: accordingly he obtained the seed and did sow it; but I understand, upon enquiry, that it produced not a good crop. He sowed it some time about the beginning of February.

"And yet I am informed there is a gentleman in Scotland, who makes it his constant practice to sow his wheat in the spring by choice; and that he intends to publish a recommendation of that practice.

"The latest I ever sowed any with success was the thirtieth of December; but that was only a small experiment.

SPROUT-HILL. See the article **ANT-HILL**.

SPRIT, a shoot, or sprout.

SPUR, a distemper which frequently attacks rye, and sometimes does damage likewise to wheat. The following remarks will give an idea of it.

"1. The grains which have the spur are thicker and longer than the sound ones, and generally project beyond their husks, appearing sometimes straight, and sometimes more or less crooked.

"2. Their outsides are brown or black; their surface is rough, and one may frequently perceive in them three furrows, which run from end to end. Their outward end is always thicker than that which sticks to the chaff, and the most swollen end is sometimes split into two or three parts. It is not unusual to find on their surface cavities which seem to have been made by insects.

"3. When a spurred grain is broken, one perceives in the middle or centre of it a pretty white flour, covered with another flour, which is reddish or brown. Though this vitiated flour has some consistency, it may nevertheless be crumbled between one's fingers. M. Aimen has indeed sometimes found this powder almost as black as that of finutty wheat.

"4. These grains, when put into water, swim at first, and afterward sink to the bottom. If chewed, they leave a bitter relish on the tongue.

"5. The chaff appears sound, though what is outmost is somewhat browner than when the ears are sound.

"6. All the grains of the same ear are not ever attacked with the spur.

"7. The grains which have this distemper stick less to the stalks than sound grains do.

"8. M. Aimen imputes this distemper to the grains not being impregnated; and assures us that he has not ever found a germ in grains which had the spur. The same observer has collected, in a memoir which he has sent me, several reflections and microscopical observations; but I pass over in silence such researches as are more curious than useful.

"9. I shall not stop to refute the opinion of those who have pretended that fogs, dews, rain, the moisture of the earth, may give this distemper to rye. But I cannot help saying, that Mr. Tillet thinks, as does also M. Aimen, that other plants besides rye, are subject to the spur. M. Tillet has seen, and M. Delu has shewn me grains of wheat

which had the spur. The spur ought therefore not to be confounded with the ustilago on burnt-grain: they are two different distempers: and what seems still more to establish this difference, is, that M. Tillet's experiments prove that the powder of the spurred grains is not contagious like that of the carious or burnt.

"M. Tillet is strongly inclined to think that the spur is occasioned by the sting or bite of an insect, which turns the rye into a kind of gall; and he suspects a small caterpillar of being the cause of this mischief. But neither he nor I dare to speak affirmatively on this point.

"Dodard, Langius, Fagon, Delahire, Noel, and lately, M. Salerne, gave particular accounts of the diseases with which numbers of people have been seized in some years, owing to their having lived upon bread in which there was much rye affected with this distemper.

"As most of the distempered grains are much bigger than the sound ones, it is easy to separate the greatest part of them by sifting. It is what the peasants of Sologne do, when corn is not dear; but in times of great scarcity or dearth, they are loth to lose so much grain; and then it is that they are attacked with a dry gangrene, which mortifies the extreme parts of the body, so that they fall off, almost without causing any pain, and without any hæmorrhage. The Hotel-Dieu at Orleans had had many of these miserable objects, who had not any thing more remaining than the bare trunk of the body, and yet lived in that condition several days.

"As it is not every year that the spur in rye produces these dreadful accidents, Langius is of opinion that there may be two kinds of this distemper; one, which is not hurtful, and the other which occasions the gangrene we have been speaking of. It is however probable that there is but one kind of spur, and that it does not hurt; first, when sufficient care is taken in sifting the grain; and, secondly, when only a small part of the corn is distempered. It is also said, that the spur loses its bad quality after the grain has been kept a certain time: in which case, the reason why some peasants are attacked with the gangrene in years of dearth, may be, that they consume their crop as soon as the harvest is over." *Duhamel's Culture des Terres.*

SPURRE-WAY, a horse-way through inclosed lands, and free to any one to ride in by right of custom.

SPURREY, the name of a weed common in many parts of England. It seldom rises above six inches in height, flowers in the beginning of July, ripens its seed in August, and is an annual plant.

The best method of exterminating this weed is by summer fallows, and cutting it down before it can scatter its seeds, which are very small.

They cultivate two species of this plant in Holland and Flanders for the winter food of cattle, when there is a scarcity of grass. It is said to enrich the milk of cows so as to make it afford excellent butter; and the mutton fed on it is preferable to that fed on turneps. Hens also eat this plant greedily, and it is commonly thought to make them lay an extraordinary number of eggs.

Though this plant cannot, from the lowness of its growth, afford a very great quantity of fodder, yet as it will grow on the poorest land, where no other grass will thrive so well, it may be cultivated to considerable advantage in many places; and by feeding it off the ground, the dung of the cattle will improve the land.

The farmers in the low countries commonly sow it twice a year; the first time in April and May, to be in flower in June or July; and the second time after their rye-harvest, to serve their cattle in November and December. The usual allowance with them is about twelve pound of seed to an acre.

STABBING of cattle. See the article **HOVEN**.

STABLE, a place or house for horses, &c. furnished with stalls and proper apartments to contain their food, &c.

Nothing conduces more to the health of a horse than the having a good and wholesome stable. The situation of a stable should always be in a good air, and on a firm, dry, and hard ground, that in winter the horse may go out and come in clean. It should always be built somewhat on an ascent, that the urine and other foulnesses may be easily conveyed away by means of trenches or sinks for that purpose. As there is no animal that delights more in cleanliness than the horse, or that more abominates bad smells, care should be taken that there be no hen-roost, hog-

hog-stie, or necessary house, near the place where the stable is to be built, for the swallowing of feathers, which is very apt to happen, when hen-roosts are near, often proves mortal to horses; and the steams of a bog house or hog's dung will breed many distempers. The walls of a stable, which ought to be of brick rather than stone, should be made of a moderate thickness, two bricks, or a brick and a half at least, for the sake of warmth in the winter, and to keep out the heat in the summer. The windows should be made on the east or north side of the building, that the north wind may be let in to cool the stables in the summer; and the rising sun all the year round, especially in winter. The windows should either be sashed, or have large casements, for the sake of letting in air enough; and there should always be close wooden shutters, that the light may be shut out at pleasure, by which means the horse may be made to sleep in the day as well as in the night, when it is judged proper he should do so. Many pave the whole stable with stone, but that part which the horse is to lie on should be boarded with oak planks, which should be laid as even as possible, and cross-wise rather than length-wise; and there should be several holes bored through them to receive the urine, and carry it off underneath the floor into one common receptacle; the ground behind should be raised to a level with the planks, and it should be paved with small pebbles. There are two rings to be placed on each side of the stall, for the horse's halter to run through, and a logger is to be fixed to the end of this sufficient to poise it perpendicularly, but not so heavy as to tire the horse, or to hinder him from eating; the best place for him to eat his corn in, is a drawer or locker made in the wainscot partition, which need not be large, so that it may be taken out at pleasure to clean it, by which means the common dirtiness of a fixed manger may be avoided. Many people are against having a rack in their stables; they give the horse his hay sprinkled upon his litter, and if they think he treads it too much, they only nail up three or four boards, by way of a trough, to give it to him in: the reason of this is, that the continual lifting up of the head to feed out of the rack, is an unnatural posture for a horse, who was intended to take his food up from the ground, and makes him, as they express it, withy-cragged. When there is stable-room enough, partitions are to be made for several horses to stand in: these should always allow room sufficient for the horse to turn about and lie down conveniently, and they should be boarded up so high towards the head, that the horses placed in separate stalls may not be able to smell at one another, nor molest each other any way. One of these stalls ought to be covered in, and made convenient for the groom to lie in, in case of a match, or the sickness of a horse. Behind the horses there should be a row of pegs, to hang up saddles, bridles, and other utensils; and some shelves for the brushes, pots of ointment, &c. The other requisites for a stable are a dung-yard, a pump, and a conduit.

Mr. Young, in his *Annals of Agriculture*, vol. VII. gives the following account of littering stables with sand, instead of straw. "Yarmouth is in a manner surrounded by marshes and the sea; straw of course becomes there a dear article. This, and the vicinity of the sea-shore, has established a practice, which I believe has been in use time immemorial, of littering stables with sea-sand instead of straw. As the bed becomes soiled or wet, fresh sand is scattered on, until the whole is in a degree saturated with dung in urine; the stall is then cleared, and a fresh bed of sand laid in. By this means, much of a quality singularly excellent is produced; it is fetched by the farmers of the Fleg hundreds to a very great distance.

To the want of general cleanliness, pure air and regular exercise may be justly attributed all the ills which attend those horses kept at inns and livery-stables. Upon entering the major part of their stables (particularly if the door has been a few minutes closed and is opened for your admission) you are instantly assailed with a disagreeable smell of dung and urine. Here you find from ten or twelve to twenty horses, standing as hot, and every crevice of the stable as closely stopped, as if the very external was infectious, and its admission must inevitably propagate a contagion. You observe each horse standing upon an enormous load of litter, that by occasional additions (without a regular and daily removal from the bottom) has acquired both the substance and property of a moderate hot-bed. Thus stand these poor animals a kind of patient sacrifice to ignorance and indifferetion, and what is an additional contribu-

tion of folly, each horse is loaded with a profusion of body cloaths. In this state such horses are found to be in an almost perpetual languid perspiration; so depressed and inactive, for want of pure air and regular exercise, that they appear dull, heavy, and inattentive, as if conscious of their imprisonment and bodily persecutions. The effect of this mode of treatment soon becomes perceptible to the judicious eye of observation. The carcase seems full and overloaded for want of gentle and gradual motion; the legs become swelled, stiff, and tumefied, and terminates in either crack, scratches, grease, or some other disorder. The hoofs by being constantly fixed in heat of dung, acquire a degree of contraction indicating hoof-bound lameness. The eyes frequently give proof of habitual weakness, in a watery discharge, the heat of the body, &c. all tending to constitute a frame directly opposite in health, vigour, and appearance, to those whose condition is regulated by a very different system of stabularian management.

STACK, a large quantity of corn, hay, straw, &c. regularly piled up; and generally thatched to defend the contents from the weather.

It is very common, in order to preserve corn in the straw, to make it up into stacks, by which means they often meet with very great losses by the dampness of the ground, which commonly rots and spoils it, sometimes near a yard thick; and by rats and mice, and other vermin that breed in the stack, which eat and devour a great part thereof. To prevent both these inconveniencies, where timber is plentiful, they set four, or six, or more posts into the ground, according to the bigness that they design the stack, granary, or barn that the corn is to be laid in: on these posts they lay what is the ground plats of other buildings, upon which they make a floor, or lay pieces across to support the stack: and if they make a barn or granary of it, they erect sides and a roof upon it; but if only a stack, they cover it with thatch, and the post that support it is, by some persons, covered round with tin near the top, for about a foot or so in breadth, in order to prevent the mice and rats getting up. But as tin is apt to rust, and so to lose its smoothness, it will not answer the design long; therefore the better to prevent their getting up, is to cover them with Dutch tiles, which will always keep smooth. But in Hampshire and other counties, where they have plenty of stone, they make their supporters of two stones, which is the best way.

The lower stone is about three feet high, two feet wide at the bottom, and one at the top; over this they lay another stone, of about a yard square: some make it of a round form, which is the best. This prevents not only the mice and rats from climbing up, but also the dampness of the ground: and this way you may keep corn as long as you will, without much inconvenience or loss, except what it loseth in the first year's shrinking, and loss of weight, which is very inconsiderable. Only you must observe, that what corn you stack must be bound up in sheaves, that so the ears of the corn may be turned inward, and the straw ends out, which will save the corn from pigeons, crows, and other fowls, and likewise from the rain that beats on the sides. If your stack be of wheat, you may lay oats or other coarse grain on the top of it, under the thatch, the greatest danger of wet being from the top, if any of the thatch should blow off. And if you suspect any rats or mice have got into the stack, grease a stick and thrust it into it; and if there be any, they will gnaw the stick. The chief inconvenience that attends this way of keeping of corn, is its bulkiness, and the farmer's wanting of his straw to make dung with, and the chaff to give to his cattle, &c. *Also timer's Husbandry*, vol. II. p. 141.

Mr. Marshall, in his *Minutes of Agriculture*, recommends, to hinder the rats from harbouring in truss-bound straw, and gnawing the bands; and to save the trouble and expence of stacking it out of doors, stacking it in the barn, leaving a passage round it for dogs, cats, and rat-killers; and vacancies between the trusses of the first and second layer, wide enough for a tarrier, cat, or ferret, to creep under every part of the pile.

This judicious gentleman-farmer recommends the form of the stacks to be rather smaller than in general has been the method; but he remarks, though at first they appear awkwardly tall and top-heavy while it shall be making; but when the roof is on, and the stack settled, it considerably improves in appearance, and has the advantage of not taking

ing-up so much roots, or requiring so much thatch as they generally do that are made on the old plan. He lays down the following as general rules worth remembering.

A square, not round nor a parallelogram, is the best form of a stack-frame at bottom; this figure is more pleasing to the eye, takes less thatch, and stands firmer, taken jointly, than any other.

The stem should be carried up as plumb as possible, (except the last course, which should project five or six inches, to form the eaves); for the weight of the roof will press out the upper part of the stem sufficiently. If it over-hang in making, its own weight and the weight of the roof will squeeze it too flat, will spoil its appearance, and waste both thatch and thatching.

The stem should contain about two thirds, and the roof one third of the whole stack. If it be built on a frame, the stem should contain less, and the roof more; if on a bottom, the reverse. The corners of the stem should not be built too sharp; should be carried up snug; by which the sides will look fuller, and the swell given by the pressure, will be more perceptible.

The ends of the roof should have a gentle projecture, answerable to the stem; and the sides should be carried up rather convex, than flat or concave. Perhaps a roof gently convex shoots off the rains preferable to any other.

A corn-stack should not contain above 21 loads, as the risk of making and getting-in is much less on a small than on a large-stack; besides, a large stack does not settle so true as a small one, and of course will not stand the weather so well. It is true, a large stack does not in proportion take so much thatch and thatching, which is its only advantage.

STACK of Wood, a pile of wood three feet long, as many broad, and twelve feet high.

STADLE, the bottom of a corn mow, or hay-stack. It also signifies a tree suffered to grow for coarse or common uses, as posts or rails.

STAG-EVIL. See the article **STAGGERS**.

STAGGERS, a disease incident to horses: a kind of apoplexy.

Farriers generally include all distempers of the head, under two generally denominations, viz. staggers, and convulsions, wherein they always suppose the head primarily affected. But in treating these disorders, we shall distinguish between those that are peculiar to the head, as having their source originally thence, and those that are only concomitants of some other disease, where the head is affected secondarily by consent of nerves, the source of this disorder being in the stomach, bowels, &c. By this method we shall avoid many blunders which would otherwise arise in practice, for want of knowing the true seat of the disorder.

In an apoplexy a horse drops down suddenly, without other sense or motion than a working at his flanks.

The previous symptoms are drowsiness, watery eyes, somewhat full and inflamed; a disposition to reel, feebleness, a bad appetite; the head almost constantly hanging, or resting on the manger; sometimes with little or no fever, and scarce any alteration in the dung or urine: the horse is sometimes disposed to rear up, and apt to fall back when handled about the head, which is often the case with young horses, to which it does not prove suddenly mortal, but with proper help they may sometimes recover. If the apoplexy proceeds from wounds, or blows on the head, or matter on the brain, besides the above symptoms, the horse will be frantick by fits, especially after his feeds, so as to start and fly at every thing. These cases seldom admit of a perfect recovery; and when horses fall down suddenly, and work violently at their flanks, without any ability to rise after a plentiful bleeding, they seldom recover.

All that can be done is to empty the vessels as speedily as possible, by striking the veins in several parts at once, bleeding to four or five quarts, and to raise up the horse's head and shoulders, supporting them with plenty of straw. If he survives the fit, cut several rowels; give him night and morning, glysters prepared with a strong decoction of fenna and salt, or the purging glyster; blow once a day up his nostrils a dram of powder of asarabacca, which will promote a great discharge, afterwards two or three aloetic purges should be given; and to secure him from a relapse, by attenuating and thinning his blood, give him an ounce of equal parts of antimony and crocus metallorum for a month; or which is

preferable, the same quantity of cinnabar of antimony and gum guaiacum.

If the fit proceeds only from fulness of blood, high feeding, and want of sufficient exercise, or a fizy blood (which is often the case with young horses, who though they reel, stagger, and sometimes suddenly fall-down, yet are easily cured by the above method), an opening diet with scalded bran and barley will be necessary for some time; and the bleeding may be repeated in small quantities.

As to the other disorders of the head, such as a lethargy, or sleeping evil, epilepsy, or falling sickness, vertigo, frenzy, and madness, convulsions, and paralytical disorders, as they are most of them to be treated as the apoplexy and epilepsy, by bleedings and evacuations, with the alteratives they are directed, we shall wave treating on them separately but mention some particular rules to distinguish them, according to the plan we laid down, and then offer some general remedies for the several purposes.

Thus, in order to distinguish epileptic disorders and convulsions (which are often occasioned by worms, bots, and ulceration of the stomach, bowels, and midriff) from those which arise from original causes in the head only, we shall describe the symptoms which distinguish them from each other; by which means we shall be able to avoid any mistake in the application of the remedy: and as epileptic disorders have by ignorant farriers been mistaken for the gripes, we shall also distinguish these disorders by the symptoms.

In an epilepsy, or falling sickness, the horse reels and staggers, his eyes are fixed in his head, he has no sense of what he is doing, he stales and dungs insensibly, he runs round and falls suddenly; sometimes he is immovable, with his legs stretched out, as if he was dead, except only a quick motion of his head and lungs, which causes a violent working of his flanks: sometimes he has involuntary motions and shaking of his limbs, so strong, that he has not only beat and spurned his litter, but the pavement with it; and with these alternate symptoms a horse has continued more than three hours, and then has as surprisingly recovered; at the going off of the fit, he generally foams at the mouth, the foam being white and dry, like what comes from a healthful horse when he champs on the bit.

But in all kinds of gripes, whether they proceed from disorders in the guts, or retention of urine, a horse is often up and down, rolls and tumbles about, and when he goes to lie down generally makes several motions with great seeming carefulness, which shews he has a sense of his pain, and if he lays stretched out for any time, it is generally but for a short space.

Epilepsies and convulsions may arise from blows on the head, too violent exercise, and hard straining; and from a fullness of blood, or impoverished blood, and surfeits; which are some of the causes that denote the original disorder.

But the head may also be affected by sympathy of nerves; for excessive pain in any part of the body will excite convulsions, especially if the nerves and tendinous parts are affected, as by wounds, punctures, and bruises externally; and by ulcers, gatherings of matter, and by bots and worms, wounding and vellicating the nervous parts internally; long costiveness has sometimes also occasioned these disorders. In all such cases, the original cause must principally be attended to.

In lethargic disorders the horse generally rests his head with his mouth in the manger, and his pole reclined to one side; he will shew an inclination to eat, but generally falls asleep with his food in his mouth, and he frequently swallows it whole, without chewing: emollient glysters are extremely necessary in this case, without the nervous balls recommended for the staggers and convulsions: strong purges are not requisite, nor must you bleed in too large quantities, unless the horse be young and lusty. In old horses rowels and large evacuations are improper, but volatiles of all kinds are of use, when they can be afforded; an alterative purge may be given and repeated on his amendment.

This distemper is to be cured by these means, if the horse is not old and past his vigour. It is a good sign if he has a tolerable appetite, and drinks freely without flabbering, and if he lies down, and rises up carefully, though it be but seldom.

But if a lethargic horse does not lie down, if he is altogether stupid and careless, and takes no notice of anything that comes

near him ; if he dungs and stales seldom, and even while he sleeps and dozes, it is a bad sign if he runs at the nose thick white matter, it may relieve him, but if a viscid gleet that sticks to his nostrils like glue, which increasing, turns to a profuse running of ropy, reddish, and greenish matter, it is an infallible sign of great decay of nature ; and that it will prove mortal.

Young horses from four to six years, are very subject to convulsions, from bots in the spring ; and the large coach-breed more than the saddle : they are seized without any previous notice, and if bots and worms are discovered in their dung, the cause seems to be out of doubt, more especially if they have lately come out of a dealer's hands.

When this convulsion proceeds from a distemperature of the midriff, or any of the principal bowels, it is to be distinguished from bots and vermin, by previous symptoms : the horse falls off his stomach ; and grows gradually weak, feeble, and dispirited in his work ; and turns short-breathed with the least exercise.

The lively description of that universal cramp, or convulsion, called by some the stag evil, which seizes all the muscles of the body at once, and locks up the jaws, so that it is impossible almost to force them open, we shall give in Mr. Gibson's own words ; who says, As soon as the horse is seized, his head is raised with his nose towards the rack, his ears pricked up, and his tail cocked, looking with eagerness as an hungry horse when hay is put down to him, or like a high spirited horse when he is put upon his mettle ; inasmuch that those who are strangers to such things, when they see a horse stand in this manner, will scarce believe any thing of consequence ails him ; but they are soon convinced, when they see other symptoms come on apace, and that his neck grows stiff, cramped, and almost immovable ; and if a horse in this condition lives a few days, several knots will arise on the tendinous parts thereof, and all the muscles both before and behind, will be so much pulled and cramped, and so stretched, that he looks as if he was nailed to the pavement, with his legs stiff, wide, and straddling, his skin is drawn so tight on all parts of the body that it is almost impossible to move it ; and if trial be made to make him walk, he is ready to fall at every step, unless he be carefully supported ; his eyes are so fixed with the inaction of the muscles, as gives him a deadness in his looks ; he snorts and sneezes often, pants continually with shortness of breath : and this symptom increases continually till he drops down dead ; which generally happens in a few days, unless some sudden and very effectual turn can be given to the distemper.

In all these cases the horse should first be bled plentifully, unless he is low in flesh, old, or lately come off any hard continued duty, then you must be more sparing of his blood ; afterwards give the following ball :

Take assa foetida half an ounce ; Russia castor powdered, two drams ; valerian root powdered, one ounce ; make into a ball with honey and oil of amber.

This ball may be given twice a day at first ; and then once, washed down with a decoction of mistletoe, or valerian, sweetened with liquorice or honey : an ounce of assa foetida may be tied up in a piece of strong coarse linen rag, and put behind his grindlers to champ on.

The laxative purges and emollient glysters should be given intermediately to keep the body open ; but when the former balls have been taken a week or ten days, the following may be given once a day with the valerian decoction.

Take cinnabar of antimony six drams ; assa foetida half an ounce ; aristolochia, myrrh and bayberries, of each two drams : make into a ball with treacle and oil of amber.

This is the most effectual method of treating these disorders ; but when they are suspected to arise from bots, and worms, which is generally the case, mercurial medicines must lead the way. Thus,

Take mercurius dulcis, and philonium, of each half an ounce : make into a ball with conserve of roses, and give the horse immediately ; half the quantity may be repeated in four or five days.

The following infusion should then be given, to the quantity of three or four horns, three or four times a day, till the symptoms abate ; when the above nervous balls may be continued till the bots are removed.

Take penny-royal and rue, of each two large handfuls ; chamomile flowers one handful ; assa foetida and castor, of each half an ounce ; saffron and liquorice root sliced, of each two drams : infuse in two quarts of boiling water ; pour off from the ingredients as wanted.

If the castor is omitted, add an ounce of assa foetida.

The following ointment may be rubbed into the cheeks, temples, neck, shoulders, spines of the back, and loins, and wherever there is the greatest contractions and stiffness.

Take nerve and marshmallow ointment, of each four ounces ; oil of amber two ounces ; with a sufficient quantity of camphorate spirit of wine : make a liniment.

To horses of small value give the following :

Take rue, penny-royal, and tobacco, of each a handful ; assa foetida an ounce ; boil in a quart of forge-water : let the decoction stand on the ingredients, and give as the former.

When the jaws are so locked up that medicines cannot be given by the mouth, it is more eligible then, to give them by way of glyster : for forcing open the jaws by violence, often puts a horse into such agonies, that the symptoms are thereby increased. The infusion above may be given for this purpose, or the following :

Take rue, penny-royal, and chamomile flowers, of each a handful, valerian root two ounces, boil in five pints of water to two quarts ; in the strained liquor dissolve castor and assa foetida, of each half an ounce, or of assa foetida alone one ounce, common oil four ounces. Give this glyster once a day.

In this case also he must be supported by nourishing glysters, made of milk pottage, broths, &c. which must be given to the quantity of three or four quarts a day ; glysters of this kind will be retained, and absorbed into the blood ; and there have been instances of horses thus supported for three weeks together, who must otherwise have perished.

Mr. Gibson mentions some extraordinary instances of success in cases of this sort by these methods, and repeated frictions, which are extremely serviceable in all convulsive disorders, and often prevent their being jaw-set ; they should be applied with unwearied diligence every two or three hours, wherever any stiffness or contractions on the muscles appear, for a horse in this condition never lies down till they are in some measure removed.

He takes particular notice of a horse, whose jaws were so locked up for three weeks, that both food and medicine were forced to be given by glyster ; that not having recovered the use of his jaws for a fortnight, though he now moved them with less stiffness, he was determined, from the known relaxing power of opium, to give him half an ounce of it, dissolved in one of his glysters, the good effects of which were so evident, by a general amendment, that he was encouraged to continue it in the following manner :

Take Matthew's pill, and assa foetida, of each an ounce : make into a ball.

This ball he gave for one dose, and repeated once : and by this, and the use of the nervous medicines given twice a week, and gentle purging, the horse was perfectly recovered.

The use of rowels in these cases is generally unsuccessful, the skin being so tense and tight, that they seldom digest kindly, and sometimes mortify ; so that if they are applied, they should be put under the jaws, and in the breast.

The red hot iron so frequently run through the fore-top and mane, near the occipital bone, for this purpose, has often been found to have destroyed the cervical ligament. See the article ROWEL. Bartlett's Farriery, p. 78.

A stable-keeper asserts, that he had lost several horses in the staggers, when he was persuaded to keep a he-goat in the stable. This he at first looked on as a vulgar superstition, and neglected paying any attention to it ; but on losing more horses in the same way, he procured a he-goat, which lived about nine years, and during that time the stable-keeper declared his stables were totally free of the staggers, and although they contained a great number of horses. A few months after the death of the goat, he lost several horses in that disease, which induced him to procure another he-goat, to ascertain, by experience, whether the goat was a pre-

a prevention of the like misfortune ; which he asserts with great confidence is such, as from the time he procured a second goat, he has never lost a single horse by that complaint, and the goat still remains in the stables.

Sheep are also subject to the staggers, and the best remedy they find for it is, to drive them to change of grounds, often, to keep the grounds from tainting.

" I observe, says Mr. Lisle, that those lambs which die of the staggers, do not die till they begin to eat grafs, and of those the finest and lustiest ; whence I conclude, that it is not the cold weather alone that brings the staggers, but from their feeding on cold watery grafs in the months of March and April, which makes them abound in watery humours in the bodies, which the cold winds seize on and chill, and bring those cramps and aches into their limbs. It is observed this disease is much prevented by the early folding of lambs, and with good reason, for thereby, in the cold nights, the lambs are kept warm, and also prevented from eating so much grafs as they otherwise would, whereby such watery humours are fed. *Lisle's Husbandry*, vol. II. p. 210.

STAGGERWORT. See the article **RAGWORT**.

STAKE, a piece of wood, or strong stick fixed in the ground.

STALE, urine.

STALK, the stem, or stock of a plant.

STALL, a crib at which a horse is fed, or where any horse is kept in a stable.

STALL-FED, fed with dry food, not with grafs.

STALL-FEEDING. See **FATTENING**.

STALLION, a stone-horse, designed for the covering of mares, in order to propagate the species. See the article **HORSE**.

STAMWOOD, the root of trees grubbed up.

STANCHING BLOOD ; in case a horse, &c. happens to be cut or hurt, fill the cut full of the wool of a hare or rabbit, and hold it in some time with your hand, or else bind it on the part ; then burn the upper leather of an old shoe, and strew the ashes among the wool, and let it lie on for twenty-four hours, and it will stanch the bleeding. Or,

Boil together honey, wax, turpentine, swine's grease, and wheaten flour, stirring and mixing them well together, till they are become an ointment, then take it off the fire, and put it up in a gallipot for use ; but if the cut be of any considerable depth, put in a tent of flax, or linen cloth dipped in the ointment, and lay a plaister of the same over it, letting it lie on twenty-four hours.

If a horse happens to bleed violently at the nose, stamp betony in a mortar with salt, and put it into his nose, applying it to the wound and it will stop it : but if he be taken suddenly in the highway, &c. and you cannot get the herb, scrape a felt hat or piece of woollen cloth with a knife, and apply it to the part, and it will stanch it.

STANDARDS, or *Standrels*, signify the young trees reserved at the felling of woods, for the growth of timber.

STANDARDS, also imply fruit trees, intended to grow in an open exposure, and not to be hacked and mangled with the knife, as the dwarf trees, and those planted against walls are.

STANK, a dam, or bank to stop water.

STANNER-WORT. See the article **RAG-WORT**.

STAVERS. See the article **STAGGERS**.

STEE, a ladder.

STEEPS, certain preparations for steeping of corn intended to be sown. See the article **SEED**.

STEELE, a stalk, a handle.

STEER, a young bullock.

STEM, that part of a plant arising from the root, and which sustains the leaves, flowers, fruits, &c.

STEG, a gander.

STERCORARY, a collection of dung properly secured from any injuries of the weather.

In collecting manures from time to time, as they come to hand, farmers generally keep them together in what they call dung-hills, where they remain exposed to the heat of the sun, the washing of rain, and drying winds : by which means all their virtue is drawn forth, and carried away. M. Evelyn justly censures this wrong practice, and at the same time gives the following directions for making a stercorary, to contain the compost collected by husbandmen.

Dig a square or oblong pit, of the size suited to the quantity of compost wanted, or proportioned to the ex-

tent of the ground intended to be manured. Let the side next the fields be made sloping, so as to receive a cart to load or unload easily. Let the bottom be well paved, and both the sides lined, unless it be made in a bed of clay or chalk, that it may be capable of retaining water like a cistern ; for it is of great importance, as Columella observes, that the dung be well soaked in liquor, in order to destroy the vegetative faculty of the seeds of weeds which may chance to be mixed with it, or the litter. If channels or gutters can be directed to this pit, from the stables and offices about the house, they will be of great service. Mr. Evelyn is of opinion that this stercorary should be under cover, so as at least to hinder downright rains from falling upon it :—but if care be taken to make the pit in a place where no running water, or springs can come to it, and if the farmer covers the dung, as it is collected, with a coat of mould, to prevent the sun's exhaling, or the rain's washing away its richness, I cannot help thinking that the quantity of water which falls in rain, would not be more than requisite to moisten the mixture, and bring on that putrid fermentation which is necessary for the due incorporating and perfecting of the compost. It will, however, be right to have a shed to put over it occasionally, in case the season should prove extremely wet.—Columella informs us, that the Romans covered their stercoraries with hurdles ; but does not speak of covering them with mould, as here directed.

The pit being thus prepared, the farmer's next study should be to fill it with a compost suited to the nature of his land. Thus, if his soil is a strong clay, a layer of dung should be covered with a layer of sand, rubbish of old houses, or other substances already mentioned for the improvement of clay. Litter of all kinds becomes of good addition, because it is slow in decaying, and if mixed with the clay, keeps its parts asunder. The compost for meliorating clay may be carried out, and mixed with the earth, fresher than for any other soil ; because in this state, it will more effectually keep the particles of the clay separated ; and if some degree of its putrefaction is carried on in the soil, it will much more powerfully open it. If, on the contrary, the soil is sand, the dung should be mixed with clay, scouring of ponds, or other fat slimy substances, which may give consistence to the sand. And if the farmer is happy in a soil in which neither of the extremes prevail, he may then mix his manure with the richest mould he can find, and incorporate them well together, by frequent turning, before the compost is carried to the field. Columella thinks they are slothful husbandmen, who, in thirty days, have not a load of dung of twenty bushels, from each of the lesser cattle, and ten loads from each of the larger sort, by means of judicious mixtures with their dung. He thinks this mixture, or compost, most beneficial to corn, after it is a year old ; because it still retains all its strength, and does not then breed weeds.

" Many good effects, says Dr. Home, particularly that of hindering the oils from being volatilized, and of fixing them, will arise from a mixture of lime with these composts, after they are thoroughly rotted. But as many experiments have proved that quick-lime powerfully resists putrefaction, it does not seem judicious to mix it with dunghills which are not sufficiently putrefied, as it must stop that process.

" There is a very great attraction betwixt quick-lime and all oily bodies. It unites intimately with expressed oils. With this intention it is used in the manufacture of soap, to help the junction of the alkaline salts and oils. It must, therefore, attract the oils powerfully from the air and earth, dissolve them, and render them miscible with water : it must, from this reason, soon exhaust the soil of all its oleaginous particles, if the farmer does not take care to supply them by dung or animal substances. Farmers have, by experience, discovered it to be a great impoverisher of lands ; but they did not know how it acted. Its operation is, to exhaust the earth of its oils. The proper cure for this is, to mix dung with the lime, so that it may have something to act on.

" Lime is a great dissolver of all bodies, both vegetables and animal ; but particularly the latter. We know how soon it reduces hair and woollen rags into a pulpy substance. This effect is so strong, that in the common method of speaking, it is said to burn them. In this way it certainly operates in the earth, by dissolving all animal and dry vegetable substances, and converting them to the nourishment of vegetables, at least sooner than otherwise they

they would be. Like other calcarious bodies, it is not dissolvable but by acids. With these, a great effervescence happens, a solution of the calcarious body is made, and a neutral salt is formed from that conjunction. This neutral salt is always soluble in water, unless where the acid of vitriol is used." *Home's Principles of Vegetation*, p. 69, 70.

The Society of Improvers in the Knowledge of Agriculture in Scotland, have paid great attention to the subject of composts, and are very particular in their instructions on this head, to several of their correspondents. I gladly take this opportunity of paying the tribute of praise justly due to their public spirit, and congratulate them on the great success which has attended their labours in many parts of their country. At the same time I cannot help regretting, that, though all our neighbours have set us so many examples of periodical instruction in this most useful art, there are yet many institutions of that kind in England. It is to be hoped, that the Society for the Encouragement of Arts, Manufactures and Commerce, will soon take off this reproach, and not suffer it to be longer said that agriculture lies neglected in this kingdom, where the people enjoy every advantage requisite to promote it, in a far higher degree than the inhabitants of any other country in the world. The wealth of our farmers is incomparably greater; their property, and the tenure of their lands are infinitely better secured; and the happiest of soils and climates combine to reward their labour.

The Society in Scotland gave to a gentleman who had written to them, and who had clay and lime at command, the following judicious directions for collecting a compost, or making a stercorary, for the improvement of a sandy soil. "Take, say they, in the field intended to be manured, a head ridge, the most conveniently situated for a stercorary. Plough it two or three times, as deep as can be in the cleaving way, if the ridge be high gathered, and harrow it well: then lay thereon your slimy clay, about a foot thick, leaving a part of the ground uncovered: next lay a thin layer of dung, another of clay, and after that a layer of unslaked lime, at least a foot thick: then throw up the earth left uncovered on each side. After this, repeat another layer of clay, and lime-stone, as before, and finish it with a layer of clay and sea-wreck, covered with earth. The more of the slimy clay the better: for though it may be cold, yet it will not be the worse for a sandy hot ground. If you examine the clay, we doubt not but you will find it a very fat substance; being, as we conjecture, mostly muscle and other shells mixed with earth, brought by the tide and river Southesk. On the coast of Lothian we found that slimy substance to be nothing else; and if it be so with you, it is certainly one of the best manures.

"After this stercorary has stood six weeks or two months, incorporating and fermenting, turn and mix it; and that this work may be performed to the better purpose and with as small an expence as possible, yoke your plough, enter upon your stercorary with a cleaving furrow, and continue repeating the ploughings the same way, until the very bottom of the stercorary be ripped up; then harrow it: it is impossible to over-do it. If it be very cloddy, it should be harrowed between the ploughings. Begin then in the middle, and plough again and again in the gathering way, until it be brought into as narrow bounds, and be raised as high as possible. Let all that the plough has left be gathered up, and thrown with shovels on the top. Every such turning and heaping occasions a new ferment, and improves the manure. If the seeds of barley, or of any other quick growing vegetable, were sprinkled thin on the stercorary, and the plants buried in it, when fullest of sap, before they come to seed, by turning or more heaping, the manure would be improved." This might be repeated several times in the course of the season; for the practice has been found successful. *Maxwell's Collection*, p. 26.

In another place, they observe, that such a stercorary may be turned in the same manner as ground is trenched. The higher it is raised the better. Each turning will make it heat like a garden hot-bed, and this fermentation will reduce it to a fine fat mould. If the first heat should go off (which may easily be known by thrusting a pole into it) before it has produced this effect, it may be turned over again, and will take a new heat, which is of great advantage to it, besides the better mixing of the several manures. About fifty or sixty cart loads of this compost

are used upon an acre of ground. I have been the more particular in extracting this account, because any farmer, by attending to the rules here given, may suit his compost to the nature of his soil. Where the soil varies, he will do well to have another stercorary, properly composed, in a convenient part of the field he intends to manure.

The same society, in their directions for the management of sheep's dung, where the sheep are housed, or fed under cover, during the inclemency of the winter, advise laying under them substances suited to the nature of the soil intended to be improved. A layer of sand, for instance, for stiff land, will be greatly benefited by being covered with a couch of litter in the sheep-house. When their dung becomes troublesome or offensive to them, or begins to make them dirty, the whole should be removed to the stercorary. But if the dung of the sheep is to be laid on a sandy soil, clay, or any such substance, though covered with litter, it would soon become wet, and too cold for the sheep to lie on; it would therefore be better, in this case, to spread a thick couch of litter under the sheep, and mix this in the stercorary with the lime, &c. by which means the same advantage may be obtained, without injury to the cattle. If loam, or a rich mould, be laid under sheep, the judicious farmer will be careful to collect a sufficient quantity of it, when it may be got dry, in the summer. Whatever is used for this purpose, should be renewed as often as it is sufficiently impregnated by the urine and dung of the sheep.

The well preparing of mixed dung, is, as Mr. Worlidge rightly insists, a piece of husbandry by no means to be neglected; for the more and better the dung is, the greater will be the crop; and an increase of the crop will augment the quantity of dung. On the contrary, a decay in the dung makes a decay in the crop, &c. The rise or fall of the value of many farms in this kingdom must therefore necessarily depend upon the good or bad management of this essential part of husbandry. See the article DUNG-HILL.

The carriage being a principal article of the expence of manuring land, the farmer should endeavour as much as possible, to save this expence; for which purpose he should contrive to dress the lands of his farm, that lie at the greatest distance from the home stead, with such manures as are of the lightest carriage; such as soot, coal, or peat ashes, pigeon dung, lime, &c. and with the sheep fold.

Next to these in cheapness, is making composts upon the head lands, as recommended above by the Edinburgh Society. In arable fields, the earth of the head lands is continually accumulating by the plough turning upon them, inasmuch that in no long course of time, the head lands are thereby raised so high above the adjoining parts of the field, that they obstruct the current of the water that should be discharged there from the furrows, and keep the land wet; for which reason it is advisable to carry the earth frequently off the head-lands, so that they may lie lower than the contiguous ridges; and to turn this earth to the best account, it may be mixed and made into a compost, with dung or other manure, and afterwards carried and spread upon the field. If the head-lands at the two opposite ends of the field are thus prepared, and the compost carried from each end, and spread till it meets in the middle, half the carriage will be saved, which will render this a cheap method of manuring.

Instead of carrying the compost upon the land as soon as it is mixed with the earth of the head-land, if the head lands are planted with potatoes in the spring, a good crop of them may be obtained, and the tillage bestowed upon them will thoroughly mix the compost, and prepare it to be laid on the field.

But for such lands as are situated near the farm-yard, it is best to collect the manure there: and if the farm-yard is laid regular, having a hard dry bottom, and the sides rising gradually all round, so as to form a kind of basin, a great deal of excellent manure may be collected there, without losing any of the dung or urine of the cattle: for this purpose some good mould should be spread all over the yard, and fern, straw, litter, or stubble upon the mould; and when that is trod and mixed by the cattle, add more mould and straw. The cattle should be foddered, and the dung from the stables regularly spread all over the yard, till the whole is sufficiently raised, to be collected in heaps, and then covered with earth: this will prevent the dung being wasted by the sun

sun and drought; and the drainings from these heaps, being thrown up from time to time upon them, a moderate fermentation will be kept up, and great quantities of excellent manure will be thus obtained.

Those who give directions in what manner to prepare composts, commonly advise to lay strata of different materials, clay, lime, dung, &c. each six or eight inches, or even a foot thick; but when clay or strong earth is laid so thick, the fermentation of the intermediate layers, not being strong enough to penetrate those thick strata; when the compost is turned, they rise in great lumps, and must be several times turned and broken before the whole can be thoroughly mixed and incorporated. It is therefore a much better way to lay the several ingredients in thin layers at first, and still better to lay them in heaps, round the foundation of the compost dunghill: and if men are employed, one or more at each heap to throw up and spread them equally over the compost heap, still, as it rises, the materials will thus be well mixed at first, the fermentation will go on regularly, and the compost will be prepared, and ready to lay on the land sooner, and in much better order, than if made of thick layers of strong earth.

STERILE, barren, unfruitful.

STEW, is a kind of fish-pond, contrived for serving the daily use of a family, so that with little trouble the house may be furnished with fish at any time.

This should be so situated as to be near the chief mansion-house, and inclosed, the better to be defended from robbers.

If you have two great waters of three or four acres a-piece, it will be proper to have four stews, of two rods wide and three rods long each.

In making of these the sides should be cut down sloping, carrying the bottom in a continual decline from end to end, so as you may have a convenient mouth, as horse-ponds have, for the taking out your nets when you have drawn for fish; and if you have room enough you may make a mouth at both ends, and the deepest part should be in the middle, by which means your net may be drawn backwards or forwards, and the fish should not have such shelter as a depth under a head will be.

Add to this, that fish will delight in coming upon the shoals, and in all probability thrive the better.

These may chiefly be reserved for carp, but not absolutely; and if you perceive your tench and perch to increase and prosper, you may make lesser stews to serve them a-part, and so you may have them when you please, without disturbing the other fish.

STIFF-LEGS, a disease in horses, under which are also comprehended dry, decayed, or bruised legs.

For the cure, take of spirits of wine a quart, oil of nuts, half a pint; butter half a pound; put them into a glazed earthen pipkin and melt them, covering the vessel with another that is less, exactly fitted to it, lute the junctures well with clay, mixed with horse-dung, or hair; and after the cement is dry, set the pot on a very gentle fire, and keep the ingredients boiling up, very softly for the space of eight or ten hours; then take off the pot and set it to cool: when used, rub the largest sinews with your hand till it grows hot, then anoint it with this composition, chafing it in, and repeat the same every day.

STIFFLE in a horse, a large muscle, or that part of the hind-leg which advances towards his belly, and is a most dangerous part to receive a blow upon.

STIFFLING, is a malady that accidentally befalls a horse either by some strain, by leaping, or by a slip in the stable, or on travelling, or else by some blow or stroke, which puts out the trifle-bone, or much hurts and strains the joint.

The sign of this is by the dislocated bone bearing itself out, which will make him go lame, and unwilling to touch the ground but only with his toes, till it be put in again.

The common method of cure is to swim the horse in some deep water or pond, till he sweats about his ears, which will put the bone into its right place again, and when he is thought to have swam enough, to take him out of the water and to throw an old blanket over him, to prevent him from taking cold, and lead him gently home.

Then being in the stable; they put a wooden wedge of the breadth of a sixpence between the toe and the shoe, on the contrary foot behind, and when they find him thoroughly dry anoint the part aggrieved with hen's grease, or oil of turpentine, and strong beer, of equal parts alike, well shaken and mixed together in a vial.

It is to be well chafed in with the hand, one holding at the same time a hot bar of iron or fire-shovel, to make it sink in the better: or you may apply to it brandy and common soap, and strong beer, mixed together:

Or, tie down the horse's head to the manger, and fasten a cord to the pastern of the stiffed leg, and draw his leg forwards, so that the bone will come right by being helped with the hand; keep it in this position exactly, and tie the other end of the cord to the rack, so that the horse may not pull his leg back so as to dislocate the bone for an hour or two, till after it has been settled and dressed.

Then having ready melted pitch in a pot, dip a bit of a clout tied to a stick into the pitch, anoint the stiffing with it, to the breadth of three or four inches, and the length of ten; and immediately before the pitch can cool, having ready a strong piece of canvas cut fit for the purpose, and very well warmed by the fire, clap it so neatly upon the place that the bone cannot slip out again.

Take notice, that this plaster must not be long-ways towards the foot and flank; but cross-ways upon the joint, as it were about the thigh; for otherwise it cannot hold in the bone.

When you have laid on the plaster, anoint it all over with the melted pitch, and while it is warm, clap flax, the colour of the horse, all over the outside of the canvas.

Let the plaster remain on till it falls off of itself; but if the bone be out, then put in a French rowel, a little below the stiffing place, and let it remain fifteen days, and turn it once every day; at the end of fifteen days take it out, and heal up the orifice with green ointment.

STOMACH-SKINS; there are some foals under the age of six months, which, though their dams yield abundance of milk, decay, and have a cough, occasioned by certain pellicles or little skins that breed in their stomachs, even to that degree as to obstruct their breathing, and at last utterly destroy them.

To cure this malady, take the bag wherein the foal came out of the belly of it's dam, and having dried it, give as much thereof in milk as you can take up with three fingers.

This remedy is also good for all diseases that befall them while they are under six months old: but if you cannot have the bag, then take the lungs of a young fox, dry and powder them, and use it instead of the afore said powder.

STONE-BRUISE, a misfortune that befalls the cuds of a horse by divers accidents.

For the cure: take honey and fresh butter of each half a pound, melt them; to which add the juice of green coleworts, one pound; leaves of rue picked from the stalks, a good handful: black soap, four ounces, and one pound of bean-flour; stamp the rue in a marble mortar, then add the honey, and afterwards the juice of coleworts, butter, and black soap; mix them well without heat, and make a poultice with the bean-flour, and apply it cold with a hog's bladder, and keep it on with a bandage tied about the horse's back.

Hard swellings may be cured by this method; and removing the dressing once a-day, and the quantity here prescribed will probably be sufficient to perfect the cure, by being applied frequently.

But if the swelling be attended with a great inflammation, then add to the whole composition two drams of camphire, dissolved in three spoonfuls of the spirit of wine; but if by the bruise the tumour be seated in the ligaments that are above the stone, chafe the part with spirit of wine camphorated, and afterwards apply the forementioned cataplasm or poultice.

If you have reason to believe that there is matter generated in the stones, spread emplastrum divinum on very soft leather, about the bigness of the palm of your hand, and lay it upon the part affected, even where the matter seems to be seated, and then apply the poultice, and if the matter be either actually generated, or ready to be formed, the plaster will draw it.

You must take the plaster off once a-day and wipe it, but you need not change it; and by following this method the horse may be cured without gelding.

The horse must be let blood both at the beginning and end of the cure.

STONES-SWELLING, **STONES-HARDENING**, (in horses), a malady to which they are incident. See the article Cuds.

For the cure : take yellow wax, fresh butter, and oil of olives, of each half a-pound ; strong vinegar, half a pint ; boil them together till the vinegar be almost consumed, then take the vessel off the fire, and put in an ounce of camphire powdered ; make a poultice and apply it to the swelled cods ; let it lie on 24 hours, then lay on another poultice upon the first, without taking off the former or uncovering the part.

If the inflammation be but a simple one, it will assuage the swelling and abate the pain ; but if the swelling should continue after the heat and pain is removed, and the cods do hang down very low, it is a sign that the horse is troubled with a hydrocele, that is, when by a relaxation of the peritonæum, the cods are filled with water, which having been too long retained in the part, by reason of the great difficulty of expelling it through the pores, may corrupt and ulcerate the stones.

For the cure of this sort of swelling, or hydrocele, make a sort of gruel and barley-meal and vinegar, and when it is almost boiled, and half the quantity of chalk, with a sufficient quantity of oil of roses and quinces, and two handfuls of salt, apply this remedy as hot as you can endure it with your hands, and bind it on very carefully.

Or, boil a sufficient quantity of beans in lees of wine, till they are soft and tender, then pound them to a mash, to every pound of which add a quarter of an ounce of castoreum in fine powder ; incorporate them well together, and sew two pounds of them up in a bag large enough to cover the stones ; first anoint the cods with ointment of the oil of roses, and then lay on the bag as hot as you can suffer it to lay on the back of your hand, binding it on as well as you can ; let it lie on for twenty-four hours ; then heat the bag again in the same lees of wine in which the beans were boiled, and lay it on again ; repeat this continually till the swelling be abated.

If the peritonæum, or rim that holds the entrails, be relaxed, the guts will fall into the cods, which will appear visible. In this case you must first endeavour to put up the fallen guts, and then apply the following fomentation.

Take of the bark of the pomegranate and oak trees, green oak-apple, cyprus nuts, barberries and sumach, of each two ounces : anise and fennel seeds, of each an ounce, camomile, melilot, and pomegranate, flowers, of each a handful, and powder of crude allum four ounces ; put them into a bag large enough to cover the horse's cods (and if this quantity be not sufficient, double it) sew it up after the manner of a quilt, and put the first quantity with a quarter of a peck (or half for the double) of beans in a pot of shoe-wine, or some thick red wine, and boil them for the space of two hours : then apply the bag moderately hot to his cods or stones, cleverly fastening it on with a bandage, put round the flanks, and tied on the rump. Continue this application for some time, heating the quilted bag a-fresh every time in the same liquor.

But after you have put up the guts, the surest way is to geld the horse, for then the cods will shrink up, and the guts will not any more come down into them.

But if it be a rupture incording or burstness, which is when the rim, thin film, or caul, which holds up the entrails, is broken, or over-strained, or stretched, so that the guts fall down either in his cods or flank ; then use the following remedy :

Take common pitch, dragon's-blood, powder of bole armoniac, mastic, and frankincense, of each one ounce ; make a plaster of these, and lay it upon the loins of the horse, and on the rupture, letting it abide on till it falls off itself, and it will cure him ; but then you must at the same time give him strengthening things inwardly, of which there are many prescribed, as rupture-wort, crosswort, valerian, &c.

Or, carry the horse into a place where there is a beam over-thwart, and strew it thick with straw ; then put on four pasterns, four rings on his feet together, and he will fall, then cast the rope over the beam and hoist him up, so that he may lie flat on his back, with his legs upwards, without struggling ; then bathe his stones with warm water and butter melted together ; and

when they are become something warm, and well mollified, raise them up from the body with both your hands, being closed by the fingers, close together ; and holding the stones in your hand, work down the gut into the body of the horse, stroking it downwards continually with both your thumbs, till you perceive that side of the testicle to be as small as the other.

Having thus returned the gut to the right place, taking a list of the breadth of two fingers, and having anointed it very well with fresh butter, tie his stones close together with it, as nigh the body as you can possibly, but not too hard, but so that you can put your fingers between.

Then raise the horse, and lead him gently into the stable ; set him up and keep him warm, and let him not be stirred for the space of twenty-one days ; but do not omit the next day to unloose the list, and to take it away, and to throw a bowl or two of cold water upon the cods once or twice for that day and every day after : this will make him shrink up his stones, and by that means hinder the gut from falling down.

At the end of twenty-one days, in order to render the cure more effectual, take away the stone on the bursten side, and so he will hardly be bursten again on that side ; and during the cure, let him neither eat nor drink much, and give him his drink always warm.

STONE-BREAK, or English saxifrage, a perennial plant common in pasture grounds. The root has a sharpish and aromatic taste. The stalks are round, streaked, and reddish towards the bottom. The leaves are smooth, of a dark green, and divided twice, into long, narrow, sharp segments. The foot-stalks are membranaceous at the base. The flowers grow in loose umbels ; and of a pale yellow colour. The seeds are oval, streaked, and red at the top.

" Every farmer, says a correspondent of the editors of the *Museum Rusticum*, knows which sort of grass he would wish to have predominant in his meadows : it would surely be very easy for him to save some of the seeds of such grass, and propagate it apart till he had saved sufficient to sow, suppose an acre of land with it, pure and unmixed : when arrived at this point, he might propagate it as extensively as he thinks proper.

" I must not however forget the chief intended subject of my letter, which is, to recommend to your readers the saxifrage as a plant proper to be intermixed with the grass of their meadows.

" I have now in my holding above thirty acres of meadow land, which fortunately for me bears a grass that needs no improvement ; though this I in part attribute to my having drained my land properly some years ago, since which the bite is much improved.

" Amongst this grass in my meadows there grows a considerable quantity of saxifrage ; which in the opinion of all the dairy-men in my neighbourhood, is the reason my cheese is so particularly good.

" Now I should imagine that when a farmer has ploughed up a foul meadow, and intends sowing it with good grass seed, it would be no difficult matter to procure a sprinkling of saxifrage-seed to mix with it : this would certainly be of service ; and we should not despise this excellent plant, because it is common, and not far-fetched : there is great plenty of it in the Netherlands, in their finest cow-pastures ; and that I have often heard assigned as a reason for their having such quantities of cheese of a superior quality ; though I must at the same time own, I have in London tasted some Dutch cheese, stuffed full of cloves, which was not the best in the world ; but this might have been an accident, for they say their cheese is in general excellent.

" But, to return to my immediate subject, I would by all means recommend the propagation of the saxifrage plant, in meadows, not only on account of its great use in improving the quality of cheese, and butter also, which it does, but because it is a native of our island, and there is no danger of its succeeding to the farmer's wish ; which cannot be said of every plant recommended for cultivation.

" But it must be remembered, that I do not recommend it to be cultivated alone ; I never tried it in that manner : that it will thrive very well when mixed with good meadow grass, daily experience convinces me ; and this method it is I urge." *Museum Rusticum*, vol. 1. p. 472.

The burnet cultivated to so much advantage by Mr. Rocque

Rocque and others is a species of the faxifrage. See the article BURNET.

STONE, a hard solid body, neither malleable, fusible by fire, nor soluble in water, formed by succession of time in the bowels of the earth.

It has been argued, and is not yet determined whether stones are hurtful or beneficial to arable lands. Examples are not wanting on both sides of the question; though, in general, it seems rather to be carried for them. However, nothing can excuse leaving a stone in any ground so large as to interrupt the plough. If they are very large, they should be blown to pieces with gun-powder, and then be carried off. Some spots, very fertile in several kinds of grain, seem to consist of nothing but stones; and instances are given of fields being rendered barren by taking away the stones which covered them. Theophrastus accounts for this in a hot country, where it happened to the Corinthians, by saying, that the stones shelter the earth from the scorching heat of the sun, and thereby preserve its moisture. The same holds true even in our colder latitude, where the heat of the sun is less apt to hurt us; and Mr. Evelyn is clearly of opinion that husbandmen rather impoverish, than improve, those grounds which are almost covered with stones, especially where corn is sown, if they pick them off too minutely; because they thereby expose the land too much to the effects of heat and cold. Certain it is, that a moderate mixture of small gravel preserve the earth both warm and loose, and prevents too sudden exhalations. But it seems highly probable that there must be some farther reason, beyond what has yet been assigned for the benefit arising from the stones. The example already given of the stone used in Oxfordshire, and a remarkable incident which happened to M. Duhamel, gives great room to think that the stones which are thus beneficial, are of the lime-stone or calcareous kind.

"The stone which is used for building at Denainvillers, says M. Duhamel, is very hard. It bears polishing like marble, and is here and there intermixed with shells, some of which are filled with a kind of oker, and others contain a crystalline substance. This stone is very fit to make lime of. Some workmen, who were building about our house, cut pieces of this stone upon a grass-plot. When they had done their work, the rubbish was cleared away, and nothing was left upon the grass but the dust and very small fragments which had fallen from the stones in cutting them. The next year, the grass grew surprisingly thick in all the places where these stones had been cut, was much taller and greener than any where else, and preserved its vigour for several years. One would scarcely have thought that so hard a stone, reduced to powder, would have produced an effect like that of marble. The goodness of lime, as a manure, is perhaps, chiefly owing to the fineness of the powder, to which the lime-stones are reduced by calcination.

"This fact may help to clear up another, which cannot have escaped the notice of those who attended to the differences of soils. They must have observed some grounds so thickly covered with stones, that scarce any thing else is seen after a heavy shower of rain. Yet some of these lands are very fertile, and produce fine wheat. I know not whether I am mistaken, but I think I have observed that this fertility is found only in fields where those stones are calcareous. It is very probable that the dust which is formed by the mutual rubbing of those stones contribute to that fertility. *Culture des Terres, tom. V. page 220.*

The farmer may easily inform himself whether this be the case; and if it is, he has a certain rule to go by in the management of stones; viz. by trying with aqua fortis, or spirit of sea-salt, as mentioned before, whether they are calcareous or not: for every stone on which the spirit does not effervesce, is of no use, and therefore should be removed, as an impediment to the necessary labour. However, the prudent husbandman will make the experiment of clearing his land, first, on a small spot; that he may be sure of the success, before he embarks in a greater expence. See the article LIME.

STONE also denotes a certain quantity or weight of some commodities.

A stone of beef at London is the quantity of eight pounds; in Herefordshire, twelve pounds; in the north sixteen pounds.

A stone of wool, according to a statute made in the eleventh year of the reign of Henry VII. is to weigh four-

teen pounds, but in some places it is more, in others less; as in Gloucestershire fifteen pounds, in Herefordshire twelve pounds.

A stone, among horsemen, is the weight of fourteen pounds.

STONE-PICKERS, in general take almost as long time in emptying their baskets as in filling them: besides drawing them off is breaking into the day's work of a team. To prevent these inconveniences, one horse and a light cart, attending seven or eight women, boys, and girls may run over forty acres in about four days: four women at 10d. is 3s. and 4d. four boys or girls, at 6d. is 2s. The man is 8d. the horse 15d. wear and tear 9d. together 8s. a day, and for the four days is 30s. for the forty acres, or 9d. an acre for picking and carrying off. The pickers in this practice have nothing to do but fill their baskets; the cart and the man are always at hand to empty them: and a strong horse will draw a great many to the next hole, slough, or gateway.

STONY-LANDS, such as are full of flints, pebbles, or small fragments of free-stone.

These lands, in many places, yield good crops, and the general rule is, that in stiff and cold lands the stones should be as carefully picked out as possible, but in light and dry grounds they should be left. In Oxfordshire they have great quantities of a lean earth, and a small rubble stone, or a four sort of land mixed with it; this is sometimes very full of weeds, and sometimes very clear of them. If they are weedy they fallow them late; but if they are scary, as they call it, that is, if they have a sward upon them, they either fold them in winter, and add some hay-seed to the sheep's dung, to bring up the grass: or else they lay old thatch or straw and dung upon it: for they reckon that if those lands have no sward upon them, before they are fallowed, they will by no means be brought to bear a good crop, but a great deal of May-weed, and other useless weeds. In September, November, and December, they fallow as the sward directs them: if this be done in either of the two last months, they call it a winter fallowing; and never stir it again, till they plough it, and sow it with barley: and those lands are reckoned to do better than if finely tilled. They will bear wheat and messin in a kindly year, and large crops of barley, if they are well managed, and kept in good heart.

They always fallow those lands every other year, unless they sow peas upon them; sometimes they sow them with lentils; and when they are quite worn out, they lay them down for clover or rey-grass.

STONE-WALL. See FENCE.

STOOKING, SHOCKING, or STACKING, the setting the sheaves into shocks, the better to guard them from the rain.

A correspondent of the editors of the Museum Rusticum has given us the following method of stacking, or stooking corn to preserve it from the wet, and in which situation it may remain in the field six weeks or two months, without any danger from the inclemency of the weather.

"They set one sheaf upright, with the ears uppermost; and round that they place a circle of many other sheaves, with their ears uppermost, inclining on the first sheaf; and when so placed they look like the figure of an extinguisher.

"They then lay an horizontal circle of sheaves, with all the ears in the centre, and cover those ears with a loose sheaf or two.

"Thus placed, they are protected from all wet, and may remain in the field six weeks, or two months, as safe as in a barn; and this method of stacking has been adopted in Sussex, Surry, Kent, and many other southern counties, to the great benefit of the farmers and the public." *Museum Rusticum, vol. II. p. 35.*

In a subsequent number of the same work, the Rev. Mr. Comber, of East-Newton, in Yorkshire, has made some remarks upon the above method of stooking, and also described the method followed in Yorkshire:

"It is to be wished, says he, that this gentleman had been more particular in his account. He does not tell us whether this stack, as he calls it, is made immediately after the wheat is gathered, or after it has had field-room in some other manner, though this circumstance is very material towards a right judgment of its usefulness, and even of the expedition. He does not tell us, whether by a circle of many other sheaves he means a circle of one row of sheaves,

sheaves, or of more, though this circumstance too is very material.

"I will now give a short, but, I hope, sufficient description of the method of stooking used in Yorkshire, &c.

"Ten sheaves are disposed in two rows, each row leaning against the other: then two sheaves are laid on the top, so as to meet at the centre with their tails, and to slope downwards.

"Now to compare the methods, I must observe, first, that in your correspondent's the sheaves appear to be set so close as to exclude a free course of air, most essential to give, preserve, or restore dryness to corn; whereas in ours, the air has a free course, whether it bears against one or other end of the stook, or even against either side of it.

"Secondly, in your correspondent's method, only some loose ears are laid as a cover to the whole stock; and those cannot reasonably be supposed long to resist the beating of the rain, but to transmit it to all, or many of the ears below them, which they are supposed to cover: and if we consider what violent winds often visit us in and soon after the harvest, we shall readily allow, that these loose ears may reasonably be expected to be blown off, and become no cover; nay, to be blown about and away, and often totally lost; whereas in our method, the closeness and weight of two of the best sheaves in the twelve may reasonably be supposed to be a good cover, and to continue so, and hardly to be blown off by any wind, if carefully laid on; at least, not to be blown away, but so as soon to be replaced.

"Thirdly, the flat position of your correspondent's cover must make it extremely liable to receive all the rain that descends, and transmit it to what lies beneath; whereas the sloping position of our cap sheaves, neither exposes them to receive directly, nor to retain, nor transmit the rain to the corn below, but to throw it off, especially as the tails of the sheaves, in which the straw is thickest and strongest, receive the most of the rain, which can do them little or no harm, and especially if the tails of these sheaves be thrust closely together. In short gentlemen, your correspondent's method seems to threaten that dreadful malady, mow-burn, whilst ours gives the corn all possible guard against it, viz. access of sun and wind.

"It is of great consequence to the public, as well as individuals, to guard against every species of destruction to so valuable a crop as wheat is, in every stage, but more especially in its last, in which almost all the expence is over: therefore, the above gentleman's assertion, that his method of stacking is adopted in Suffex, Surry, Kent, and many other southern counties, made me more solicitous to examine it; and since, on a fair comparison with our Yorkshire method, it appears to have every disadvantage, I persuade myself I am doing my duty to my country, by shewing to many countries a much better method than that which they have adopted." *Museum Rusticum*, vol. II. page 250.

STOOMING of wine, is the putting bags of herbs, or other ingredients into it. See the article WINE.

STOOP, a post fixed in the earth.

STOT, a young bullock; a steer.

STOVER, fodder for cattle.

STOUND, a wooden vessel to put small beer in.

STOWK, the handle of a pail: also a shock of twelve sheaves.

STOWRE, a round of a ladder; a hedge stake; also the staves in the sides of a waggon, in which the eye-rings are fastened.

STRAIN, or **SPRAIN**, a violent extension of the sinews or tendons of some muscle, whereby the tendinous fibres are over stretched, and sometimes ruptured, or broken.

To form therefore a true idea of these disorders, let us first consider every muscle, and tendon, as composed of springy elastic fibres, which have a proper power of their own, to contract and extend themselves: or, to make their action more familiar, let us compare them to a piece of catgut, that we may the better judge with what propriety oily medicines are directed for their cure. Thus then, if by a violent extension of this catgut, you had so over-stretched it, as to destroy its springiness, or elasticity, and was inclined to recover its lost tone; would you for that purpose think of soaking it in oil? And is not the method of treating strains, or overstretched muscles and tendons, full as preposterous, when you bathe or soak them in oily medicines at a time when they want restringents to brace them up? Yet custom has so established this practice, and

fallacious experience seemingly so confirmed it, that it would be a difficult task to convince the illiterate and prejudiced, of the absurdity; who, by attributing effects to wrong causes, are led into this error, and the foils usurp the reputation that is due only to rest and quiet: they seem however to be aware of the ill consequences, by their adding the hot oils, as spike, turpentine, and origanum; which, though they in some measure guard against the too suppleing quantity of other oils; yet the treatment is still too relaxing to be of real service.

And indeed in all violent strains of either tendon or muscles, whatever opinion we may entertain of bathing and anointing with favourite nostrums, which often succeed in slight cases, where perhaps bandage alone would have done, yet it is the latter, with proper resting the relaxed fibres, till they have thoroughly recovered their tone, that are the chief things to be depended on; and frequently some months are necessary for effecting the cure.

All violent strains of the ligaments, which connect the bones together, especially those of the thigh, require time, and turning out to grass, to perfect a recovery. External applications can avail but little here, the parts affected laying too deep, and so surrounded with muscles, that medicine cannot penetrate to them. The sooner in these cases, a horse is turned out to grass, the better, as the gentle motion in the field will prevent the ligaments and the joint-oil from thickening, and of course the joint itself from growing stiff; nor do I believe that firing, so commonly practised in this case, is of half the consequence as rest, and turning out for a considerable time; which by the bye, is always advised at the same time the horse is fired. I could not avoid saying thus much, in order to shew the great advantages of rest in all strains, and that no horse should be worked till he is thoroughly recovered.

When a horse's shoulder is over-strained, he does not put out that leg as the other, but to prevent pain, sets the sound foot hardly on the ground, to save the other; even though he be turned short on the lame side, which motion tries him the most of any. When, trotted in hand, instead of putting his leg forward in a right line, he forms a circle with the lame leg; and when he stands in the stable, that leg is advanced before the other.

In order to cure this lameness, first bleed him, and let the whole shoulder be well bathed three times a day with hot verjuice or vinegar, in which may be dissolved a piece of soap: but if the lameness continues without swelling or inflammation, after resting two or three days, let the muscles be well rubbed for a considerable time, to make them penetrate with good opodeldoch, or either of the following mixtures:

Take camphorated spirits of wine two ounces; oil of turpentine one ounce; this proportion will prevent the hair coming off.

Or,

Take the best vinegar half a pint; spirit of vitriol, and camphorated spirit of wine, of each two ounces.

When the shoulder is very much swelled, it should be fomented with woollen cloths (large enough to cover the whole), wrung out of hot verjuice and spirit of wine; or a fomentation prepared with a strong decoction of wormwood, bay-leaves and rosemary, to a quart of which may be added half a pint of spirit of wine.

A rowel in the point of the shoulder in this case often does great service; especially if the strain has been very violent, and the swelling very large; but as to boring up the shoulder with a hot iron, and afterwards inflating it, is both a cruel and absurd treatment; and the pegging up the sound foot, or setting on a patten shoe, to bring the lame shoulder on a stretch, is a preposterous practice, and directly calculated to render a horse incurably lame; for it can only be necessary in cases the very opposite to this, when the muscles have been long contracted, and we want to stretch them out.

Where poultices can be applied they are at first undoubtedly very effectual, after bathing with hot vinegar or verjuice, and are to be preferred greatly to cold charges, which by drying so soon on the part, keep it stiff and uneasy: let them be prepared with oatmeal, rye-flour, or bran boiled up in vinegar, strong beer, or red wine lees, with lard enough to prevent their growing stiff; and when by these means

means the inflammation and swelling is brought down, bathe the part twice a day with either of the above mixtures, opodeldoch, or camphorated spirits of wine; and roll the part three or four inches, both above and below, with a strong linen roller, of about two fingers width, which will contribute not a little to the recovery, by bracing up the relaxed tendon; and perhaps is more to be depended on than the applications themselves.

As opodeldoch is variously made, and those usually sold in the shops do not seem so well calculated for horses, we shall insert the following, as better adapted to this purpose, and recommend it to be kept ready prepared for the use of the stable; it being not only very proper for the above use, but for bruises, cold swellings, benumbed parts, and for dispersing many other such sort of tumours: it may occasionally also be given internally for the gripes from wind, or taking cold; for the strangury also, and as a cordial; one ounce or more may be taken for a dose in a pint of ale.

Take Jamaica pepper, four ounces; Winter's bark, carraway seeds, laurel, and juniper berries bruised, of each two ounces; rosemary, marjoram, and lavender flowers, of each one ounce; rectified spirit of wine, three pints; let them digest in a warm place ten days, then strain off the tincture, and dissolve in it Venice soap, a pound and a half; camphor, three ounces; Barbadoes tar, four ounces; oil of turpentine, six ounces; oil of amber, two ounces; mix, and make a liniment.

In strains of the coffin-joint that have not been discovered in time, there will grow such a stiffness in the joint, that the horse will only touch the ground with his toe; and the joint cannot be played with the hand; the only method here is repeated blistering, and then firing superficially.

Strains of the back sinews are very common, and are easily discovered by the swelling, which extends sometimes from the back side of the knee down to the heel, but for the most part the horse sets that leg before the other. The tendon should be well bathed, three or four times a day, with hot vinegar: and if much swelled, apply the poultices above recommended, and when the swelling is down, bathe with the mixtures above, or with camphorated spirit of wine and oil of amber, in which is dissolved as much camphor as the spirits will take up, and roll up the tendon with a proper bandage, or laced stocking; which last, properly fitted to the limb, might be wore to great advantage, not only in these kinds of injuries, but in most others, where there is a disposition to the grease, or other swellings of the limbs, from weak and relaxed fibres. Carriers shavings wetted with vinegar have been found useful for this purpose; as has also tar and spirit of wine: but where the tendon has suffered by repeated injuries of this kind, the case will demand blistering, firing, and proper rest.

Strains of the knees and pasterns arise frequently from kick, or blows; if they are much swelled, apply first the poultices; and when the swelling is abated, bathe with the above, or the following:

Take vinegar, one pint; camphorated spirits of wine, four ounces; white vitriol, dissolved in a little water, two drams.

Or,

Take the whites of three or four eggs, beat them into a froth with a spoon; to which add an ounce of rock alum finely powdered, spirit of turpentine, and wine, of each half an ounce; mix them well together.

The following is also recommended by the French writers, and has been found very successful in some old strains, when other remedies have failed.

Take one pound of tar, and two of rectified spirit of wine, stir them together over a fire till they incorporate (but take care the flame does not catch the spirits); then add two ounces of bole finely powdered, and a sufficient quantity of oatmeal to bring it to the consistence of a poultice; to which add lard enough to prevent its growing dry; apply it, spread on cloth, twice a day.

As great weakness remains in the pasterns after violent strains, the best method is to turn the horse out to graze till he is perfectly recovered; when this cannot be complied with, the general way is to blister and fire.

When a horse is lame in the fistle, he generally treads on his toe, and cannot set the heel to the ground. Treat him at first with the vinegar and cooling restringents; but if a large swelling with puffiness ensues, foment it well with the discutient fomentation till it disperses; and then bathe the part with any of the above medicines.

A lameness in the whirle bone and hip, is discovered by the horse's dragging his leg after him, and dropping backward on his heel when he trots. If the muscles of the hip are only injured, this kind of lameness is cured easily; but when the ligaments of the joint are affected, the cure is often very difficult, tedious, and uncertain. In either case, at first bathe the parts well with the cooling medicines, four or five times a day; in the muscular strain, this method alone may succeed, but in the ligamentous, it is rest and time only can restore the injured parts to their proper tone.

Strains in the hock are to be treated by soaking the parts with coolers and repellers; but when the ligaments are hurt, and they are attended with great weakness and pain, use the fomentation. If a hardness should remain on the outside, it may be removed by repeated blistering; if within, it may be out of the power of any external applications to remove; however, the joint should be fired gently with small razes or lines pretty close together, and then covered with a mercurial plaster. To the discutient fomentation above mentioned may be added crude sal ammoniac, with a handful of wood-ashes boiled in it.

The blistering ointment for the above purposes may be found under the article SPAVIN; but the sublimate should be omitted.

The firing used for the strengthening relaxed sinews or tendons should act only on the skin, which by contracting and hardening it all round the sinews, compresses them more firmly like a bandage. See the article FIRING. *Bartlett's Farriery*, p. 224.

STRANGLES, a distemper to which colts and young horses are very subject; and begins with a swelling between the jaw-bones, which sometimes extends to the muscles of the tongue; and is attended with so great heat, pain, and inflammation, that sometimes, till matter is formed, the horse swallows with the utmost difficulty.

The symptoms are, extraordinary heat and feverishness, with a painful cough, and a great inclination to drink without being able; some horses losing their appetites entirely, others eating but little, by reason of the pain which chewing and swallowing occasion: when the swelling begins on the inside of the jaw-bones, it is much longer in coming to matter than when more to the middle; when it arises among the glands, and divides into several tumours, the cure is generally tedious, as it breaks in different places; and when it forms upwards on the wind-pipe and gullet, there is sometimes danger of suffocation, unless the swelling soon breaks. But the most dangerous kind is, when, besides the above symptoms, the horse runs at the nose; this by some is called the bastard strangles.

As this disorder seems to be critical, the most approved method is to assist nature in bringing the swellings to maturity, by keeping them constantly moist with ointment of marshmallows, and covering the head and neck with a warm hood. But as all swellings in glandular parts suppurate slowly, the following poultice may be applied hot twice a day; it is also a very proper one to ripen, or bring any other swelling to matter:

Take leaves of marshmallows, ten handfuls; white lily-root, half a pound; linseed and fenugreek seed bruised, of each four ounces; boil them in two quarts of water till the whole is pulpy, and add four ounces of ointment of marshmallows, and a sufficient quantity of hogs-lard, to prevent its growing stiff and dry.

In five or six days, by these means, the matter is generally formed, and makes its way through the skin; and if the discharge is made freely and with ease, the opening need not be enlarged, but should be dressed with the following ointment spread on tow, still continuing the poultice over it to promote the digestion, and prevent any remaining hardness.

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Take rosin and Burgundy pitch, of each a pound and a half; honey and common turpentine, each eight ounces; yellow wax, four ounces: hogs-lard, one pound; verdigris finely powdered, one ounce: melt the ingredients together, but do not put in the verdigris till removed from the fire; and it should be stirred in by degrees, till the whole is grown stiff and cool.

If the fever and inflammation run high, and the swelling be so situated as to endanger suffocation, a moderate quantity of blood must be taken away, and the remainder diluted with plenty of water-gruel, or warm water, mashes &c.

The running at the nose, which often attends the strangles, is dangerous; especially if it continues after they have ripened and broke, as the horse will be greatly weakened thereby. To prevent this waste and decay, give him every day, for some time, an ounce of Jesuits bark; or a strong decoction of guaiacum shavings, which has been found extremely beneficial in restraining these glandular discharges when too liberal, and in drying up ulcers of all kinds in horses. [See the article GLANDERS.]

If a hardness remains after the sores are healed up, they may be anointed with the mercurial ointment; and when the horse has recovered his strength, purging will be necessary.

STRANGURY, a disease incident to cattle, consisting in a difficulty of making urine, attended with great pain. See the article KIDNEY.

This may happen to a horse divers ways; sometimes by hard riding, or much labour; sometimes by hot meats and drinks, and sometimes by an ulceration of the bladder, &c.

The first application necessary is to bleed largely, and after the operation give the following drink, and repeat it two or three times every two hours:

Take of Venice turpentine, well rubbed with the yolk of an egg, one ounce; of nitre, or salt prunella, six drams; of sweet oil half a pint; and a pint of white wine.

The horse should have plenty of marshmallow decoction, with an ounce of nitre, the same quantity of gum arabic, and two ounces of honey dissolved in every quart of it: for it must be remembered, that the more a horse drinks of this emollient decoction, especially when improved with nitre, gum arabic, and honey, the sooner he will recover: as it will greatly tend to remove the cause of the disease, and consequently to terminate its effects.

Some bathe the horse's loins with warm water, and then temperate bread and bay berries with butter; give him two or three balls of it for three days successively. Or,

You may use powder of flint-stone calcined, mixed with an ounce of the powder of parsley-seed, and as much of that of ivy-berries, and boil them a little in a pint of claret, and give the horse, and it will do. Or,

A quart of new milk, and a quarter of a pound of sugar, brew them well together, and give it to the horse to drink in the morning fasting, and keep him warm. Or, boil a good quantity of hog's fennel in the water you give him to drink, and it will cure him.

The following poultice applied a-cross the loins, over the kidneys, hath been followed by good effects.

Take a handful of garlic, fresh gathered, of mustard-seed and fresh horse-raddish root bruised, each half a pound; camphor, two ounces; green soap, enough to give the whole a proper consistence; spread it on a coarse cloth, and renew it every twenty-four hours until the horse stales easily.

STRAW, the stalk on which corn grows, and from which it is thrashed. See the articles DUNG and RICK.

STRAWBERRY-TREFOIL. See the article TREFOIL.

STRICKLE, the whet-stone placed upon the extremity of the shaft of a scythe.

STRIKE, a bushel, or four pecks of corn.

STRINGHALT, a disease in horses, consisting in a twitching and snatching up of the hinder leg much higher than the other.

It seizes them after a sudden taking of cold, after hard riding, or much labour; especially by washing him while he is hot, which chills his blood, and so benumbs his sinews, that it will sometimes take away the sense and feeling of a limb.

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For the cure:

Take up the hinder vein upon the thigh; and underneath the same there lies a string, which you must cut away, and then anoint him with butter and salt, and he will do well.

STUBBLE, the stalks of corn left in the field by the reaper.

It has been a dispute among farmers, whether wheat-stubble should or should not be ploughed in. We shall therefore give the following remarks of a sensible Vale-farmer on this subject.

"We are far from being advocates, says he, for ploughing in stubble: yet our land is not light, but the contrary, and bears as good crops of wheat as any in the kingdom.

"As our soil is not light, it agrees very well with horse-beans, which we frequently sow after wheat; but if ever we let the stubble remain uncut till bean season, and plough it in, the consequences are surely fatal; it causes the earth to lie hollow; the bean plants to fall down; the sun and air get at the roots, and prevent the plant thriving; and the crop is always very greatly lessened: besides, the stubble, which with us is very strong, clogs the ploughshare, and gathers up in clods, which are a sure and a fatal shelter for many noxious insects.

"These facts, which every Vale-farmer is well acquainted with, induce us always to mow our stubbles, which we apply to many and various uses: if it is long, it serves very well for thatching: we litter our yards, stables, and cow-houses with it for making dung; we use it for drying malt; and a great deal is burnt by the poor cottagers, for warming themselves in winter, dressing their victuals, baking, brewing, &c. *Museum Rusticum* vol. III. p. 225.

STUM, the unfermented juice of the grape, after it has been several times racked off, and separated from its sediment.

STUMP, the part of any solid body, particularly of trees, &c. remaining after the rest are taken away.

A bare view of fig. 6. Plate XXIV. is sufficient to explain a very simple engine which Mr. Evelyn gives, for pulling up large roots.

The handle *A* turns the pinion of the spindle *B*, which has four or five teeth. These teeth turn the larger wheel *C*, which moves the cylinder *D*, on which the rope *E* is rolled as the root is drawn up; one end of the rope being previously fastened to the cylinder. The whole frame is let into a block of wood *F*, about four feet high and one in breadth; and the other end of the roller or cylinder is sustained by a lesser block of wood *G*. *H* is an iron plate which holds the wheel and pinion in the larger block. The cylinder, wheel, pinion, and handle of this machine should be made of good tough iron. The cylinder may be about four inches in diameter, and fourteen or sixteen inches in length. The rest is obvious: though I apprehend an improvement might be made, by adding a catch to secure either the handle or the cylinder, while the labourer (for one man will easily manage this engine) may be obliged to suspend his work, in order to clear away any obstacle that may have occurred. It would likewise certainly be right to place the wheels, and consequently the handle, somewhat higher than is here directed, to save the very great fatigue of stooping down continually while this last is turned.

Where the roots are very large, and obstinately tenacious, M. de Turbilly's advice, to blow them up with gunpowder, will be found very beneficial; especially if the above instrument cannot be had.

Where a place has been over-grown with wood, the earth is so thoroughly stirred by digging and pulling up the stumps and roots of the trees, that one ploughing in autumn is generally sufficient. The frosts in winter kill the weeds and break the clods; and after the second ploughing in the spring, these lands may be sown with expectation of an abundant crop: for the trees not having exhausted the earth towards the surface, but having on the contrary manured it with their leaves, a considerable produce may be expected for many years.

M. Duhamel mentions a small field, which had formerly been underwood, and being converted into arable ground, produced plentiful crops of wheat and oats for upwards of twenty years running, without being rested. It is true the soil was peculiarly proper for wheat, and would have been exhausted much sooner if it had not been a proper earth.

STUMPY,

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STUMPY, full of stumps ; hard, stiff.

STURK, a young bullock ; a heifer.

STY, a cabin, or small building, to keep hogs in.

SUCCORY, or **WILD ENDIVE**.

SICHOREA or **WILD ENDIVE**, is by the Patriotic Economical Society at Hamburg, recommended as a fodder plant for cattle, more particularly cows ; equal, if not superior, even to the pimpinella. This plant is now become, all over Germany, an excellent addition to coffee ; which it greatly increases in strength, taste, and salubrity when but one part of its dried and pulverized roots, is added to two parts of ground coffee, and boiled together. These sichorea roots, ready prepared, sell there for eight English pence the pound ; and save one third of the coffee beans, without weakening, altering the taste, and wholesomeness of the very best Mocka-coffee ; but improving, on the contrary, all the inferior sorts of coffee, of the English, French, and Dutch West Indies. This beverage is, by this means, become universally preferred to tea, being cheaper, wholesome and more nourishing. See **CHICORIUM INTIBUS**.

SUCCULENT, juicy, moist.

SUCKER, a young twig, or shoot from the root.

SUCKLING-CALVES. See **CALVES**.

SUFFLATION. See **BLOWN** and **HOVED**.

SUFFOLK-GRASS, the same with meadow-grass or poa. See **POA**.

SULLAGE, a drain of filth.

SULL, a plough. See the article **PLOUGH**.

SULL-PADDLE, a plough-paddle.

SUMMER, the season in which the sun arrives at the northern solstice, and the days are at the greatest length.

SUMMER also implies the large piece of timber, or principal beam of a floor.

To SUMMER-LAND, or **To SUMMER-STIR**, to fallow land in the summer.

SUN-SCORCHED, a term used in some parts of England to express a distemperature of fruit-trees, owing to the sun's affecting them too forcibly on a sudden ; the consequence of which is the loss and withering of the fruit. Such trees are only subject to this, as are planted in places sheltered from the spring-sun, and open to that of the summer ; and may be always cured by proper waterings.

SURBATING, a term used by farriers to signify the sole of a horse's foot being worn, bruised, or spoiled by beating the hoof against the ground in travelling without shoes, or going in hot sandy lands, or with a shoe that hurts the sole, or the like. It also sometimes happens by over-riding the horse while young, before his feet are sufficiently hardened, or even by the hardness of the ground, and high lifting of his feet. The signs of this defect are his halting on both fore-legs, going stiffly, and creeping as if foundered.

There is nothing better for surbated feet than tar melted into the foot, or vinegar, boiled with foot to a proper consistence and poured into the foot boiling hot, with hurds over it, and splints to keep it in.

SURFACE-DRAINS. See **DRAINS**.

SURFEIT, a disease incident to horses and other cattle.

Surfeits arise from various causes ; but are commonly the effects of some diseases not attended to, or ill cured.

A horse is said to be surfeited, when his coat stares, and looks rusty and dirty, though proper means has not been wanting to keep him clean. The skin is full of scales and dander, that lay thick and mealy among the hair, and is constantly supplied with a fresh succession of the same, for want of due transpiration. Some horses have hurdles of various sizes, like peas or tares : some have dry fixed scabs all over their limbs and bodies ; others a moisture attended with heat and inflammation ; the humours being so sharp and violently itching, that the horses rub so incessantly, as to make themselves raw. Some have no eruptions at all, but an unwholesome look, and are dull, sluggish, and lazy : some appear only lean and hide-bound : others have flying pains and lameness, resembling a rheumatism : so that in the surfeits of horses, we have almost all the different species of the scurvy, and other chronical distempers.

The following method is usually attended with success in the dry species. First take away about three or four pounds of blood ; and then give the following mild purge, which will work as an alterative, and should be repeated once a week, or ten days, for some time.

Take succotrine aloes, six drams, or one ounce ; gum guaiacum, half an ounce ; diaphoretic antimony, and

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powder of myrrh, of each two drams ; make into a ball with syrup of buckthorn.

In the intermediate days, an ounce of the following powder should be given morning and evening in his feeds :

Take native cinnabar, or cinnabar of antimony, finely powdered, half a pound ; crude antimony, in fine powder, four ounces ; gum guaiacum, also in powder, four ounces ; make them into sixteen doses for eight days.

This medicine must be repeated till the horse coats well, and all the symptoms of surfeit disappear. If the horse is of small value, two or three common purges should be given, and half an ounce of antimony, with the same quantity of sulphur, twice a day, or the alterative balls with camphor and nitre.

If the little scabs on the skin do not peel off, anoint them with the mercurial ointment ; during the time of using which, it will be proper to keep the horse dry, and to give him warm water. This ointment properly rubbed into the blood, with the assistance of purging physic, has frequently cured these kind of surfeits, without any other assistance.

The wet surfeit, which is no more than a moist running scurvy, appears on different parts of the body of a horse, attended sometimes with great heat and inflammation ; the neck often swells so in one night's time that great quantities of a hot briny humour issues forth, which, if not allayed, will be apt to collect on the poll or withers, and produce the poll-evil or fistula. This disease also frequently attacks the limbs, where it proves obstinate, and hard to cure : and in some horses shews itself spring and fall.

In this case bleed plentifully, avoid externally all repellers, and give cooling physic twice a week ; as, four ounces of lenitive electary, with the same quantity of cream of tartar ; or the latter, with four ounces of Glauber salts, quickened, if thought proper, with two or three drams of powder of jallap, dissolved in water-gruel, and given in a morning fasting.

After three or four of these purges, two ounces of nitre made into a ball with honey may be given every morning for a fortnight ; and if attended with success, repeated for a fortnight longer.

The powders above-mentioned may also be given with the horse's corn ; or a strong decoction of guaiacum shavings, or logwood may be given alone to the quantity of two quarts a day. These, and indeed all alterative medicines, must be continued for a long time where the disorder proves obstinate.

The diet should be cool and opening, as scalded bran or barley ; and if the horse is hide-bound, an ounce of fenugreek seeds should be given in his feeds for a month or longer ; and as this disorder often proceeds from worms, give the mercurial physic too, and afterwards the cinnabar powders, as above directed ; but as in general it is not an original disease, but a symptom only of many, in the cure, regard must be had to the first cause : thus, as it is an attendant on surfeits, fevers, worms, &c. the removal of this complaint must be variously affected.

In a mangy horse the skin is generally tawny, thick, and full of wrinkles, especially about the mane ; the loins and the little hair that remains in those parts stands almost always straight out or bristly : the ears are commonly naked and without hair, the eye and eye-brows the same ; and when it affects the limbs, it gives them the same aspect ; yet the skin is not raw, nor peels off, as in the hot inflamed surfeit.

Where this distemper is caught by infection, if taken in time it is very easily cured : and I would recommend a sulphur ointment as most effectual for that purpose, rubbed in every day. To purify and cleanse the blood, give antimony and sulphur for some weeks after. There are a great variety of external remedies for this purpose, such as train oil and gun-powder, tobacco steeped in chamber-ley, &c. Solleyfell recommends the following :

Take burnt alum and borax in fine powder, of each two ounces : white vitriol and virdegris powdered, of each four ounces ; put them into a clean pot, with two pounds of honey, stirring till they are incorporated : when cold, add two ounces of strong aqua fortis.

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But when this disorder is contracted by low feeding and poverty of blood, the diet must be mended, and the horse properly indulged with hay and corn. The following ointments are effectually used for this disorder, rubbed into the parts affected every day :

Take powdered brimstone, train oil, and tar, of each equal quantities : to which may be added ginger, or or white hellebore.

Or,

Take sulphur vivum, half a pound ; crude sal ammoniac one ounce ; hogs lard, or oil, a sufficient quantity to form into an ointment.

Or,

Take quicksilver, and oil of vitriol, of each one ounce ; hogs lard, one pound ; sulphur vivum, four ounces ; oil of turpentine, one ounce and a half.

These are both very powerful remedies for this disorder, and can scarce fail of success.

To the two first, occasionally, may be added a third part of mercurial ointment : but as sulphur is in general allowed, to be the specific in the itch, and being found both more safe and efficacious than mercury, so we apprehend it will sufficiently answer the purpose here ; for as this disorder seems best accounted for by Lewenhoeck, from certain small insects he discovered in the pustules, by the microscope, so it seems as if they were destroyed by the steams of brimstone, though only raised by the heat of the body ; for in the human body the itch may be cured by partial sulphureous unctions, on the legs only ; but where the mange proves obstinate in horses, let the parts be washed with sublimate water before the application of the ointment, and subjoin the internal use of sulphur, in order to diffuse the steams more certainly through the skin ; there being reason to believe, as in the itch, that the animalcula may sometimes lie too deep to be thoroughly destroyed by external applications only.

SURVEYING, the art or act of measuring lands ; that is, of taking the dimensions of any field, parcel, or tract of land, laying down the same in a map or draught, and finding the content or area thereof.

As this art is of the utmost importance to all owners and occupiers of land, we shall endeavour to explain it in the easiest and most intelligent manner. And in order to this we shall begin with the principles of the art, and proceed gradually to shew how all the ordinary figures may be measured, protracted, and cast up, with no other instruments than chains, compasses, and scales. We shall afterwards endeavour to explain, in a very easy and concise manner, the use of the plain table, and other instruments used in surveying ; so that any person, of a common capacity, and that understands the four first rules of arithmetic, may be able to survey and parcel out land, plot it, and give up its content with ease and expedition.

Of geometrical definitions, divisions, and remarks.

I. A point is that which hath no parts, either of longitude or latitude, but is indivisible, ordinarily expressed with a small prick, like a period at the end of a sentence.

II. A line hath length, but no breadth nor depth, whose limits or extremities are points. This is either straight or crooked.

III. A right line lies straight, and equal between its extreme points, being the shortest extension between them ; the crooked or circular not so.

IV. A superficies hath length and breadth, but no depth ; of this, lines are the limits.

V. A plain superficies is that which lieth equally (or evenly) between its lines.

VI. An angle is the meeting of two lines in one point, so as not to make one straight line ; and if drawn beyond that point, they will intersect or cross one another. This in vulgar English may be called a corner ; of which there are two sorts, one right, the other oblique.

VII. A right angle is that which is made by two right lines, crossing or touching one another perpendicularly, (or squarely), like an ordinary cross, or carpenter's square.

VIII. An oblique angle is that which is either greater or less than a right angle ; and this is of two sorts, obtuse and acute.

IX. An obtuse angle is greater than a right angle, like the left and right corners of a Roman X.

X. An acute angle is less than a right angle, like the highest and lowest corners of the same letter.

XI. A figure is that which is comprehended under one line or many : of this there are two kinds, a circle, and a right-lined figure.

XII. A circle is a perfect round figure, such as is drawn with a pair of compasses, the one foot being turned round in a point and the other wheeled about it. The point in the precise middle is called the center : the round line, the circumference or periphery ; a line going through the center, that divides the circle into two equal parts, is called the diameter : half of that line is a semi-diameter, or radius ; half the circle is styled a semi-circle ; the quarter, a quadrant ; any portion of it, cut off by a right line not touching the centre, is called a segment.

XIII. Right-lined figures are such as are limited by three right-lines, or more, and are either triangles or triangulate, that is, such as are compounded of, and resolvable into triangles.

XIV. Triangles are figures comprehended under three right lines, and (as Rasmus thinks that for a reason he gives lib. 6. pr. 6.) might be better called trilaterals ; but the name triangle, from the number of the angles, hath obtained.

Also from the nature and quantity of their angles, these triangles are distinguished into three sorts : 1. Rectangled, having one right angle. 2. Obtuse-angled, having one obtuse angle. And 3. Acute-angled, having all acute angles ; for no triangle can have more right or obtuse angles than one, because, by a well known old rule, no triangle upon a plain superficies can consist of three greater angles than such, as being jointly taken, are equal to two right.

These three sorts of triangles may, according to the length and proportion of their sides, be sub-distinguished into seven ; for each of them may have either two equal sides or none ; and the acute-angled may have all three sides or lines equal : but be triangles of what name or kind soever, they are all capable of being exactly measured by one plain rule, as hereafter shall fully appear.

XV. Triangular figures are such as have more angles, and consequently more sides or lines, than three ; and these are either quadrangular or multangular.

XVI. Quadrangular figures are such as have four angles, and as many sides, and these are either parallelograms or trapezias.

XVII. Parallelograms are figures that are bounded with parallel lines, that is, such lines as are every where of the same distance one from another, so as if they were infinitely extended, they would never meet, like the upright lines of the Roman H. These parallelograms are either rectangular or oblique angular.

XVIII. Rectangular parallelograms are such as have four right angles, viz. the square or quadrat, and the long square, otherwise called the oblong.

XIX. The square is that figure that hath four right angles, and four equal sides, like any of the six faces of a die.

XX. The long square hath also four right angles, and the opposite sides are equal, but the adjoining sides meeting at each angle, differ in length. Of this figure is a well-printed page in a book, and the superficies of a well-cut sheet of paper, or an ordinary pane of glass.

XXI. Oblique angled parallelograms are such as have oblique angles, viz. two acute, and two obtuse ; of these there are two kinds, the rhombus and the rhomboides.

XXII. The rhombus is a figure that hath equal sides, but no right angles, like the form of a diamond on the cards, or the most ordinary cut of glass in windows, whose opposite angles are equal.

XXIII. The rhomboides is a defective rhombus ; for if from any side of a rhombus we cut off a part with a parallel line, the remainder will be a rhomboides, which hath neither equal sides nor angles, but yet the opposite sides and angles are equal.

XXIV. The trapezium is a figure that is neither parallelogram, nor, consequently, hath equal sides or angles, but is irregularly quadrangular, as if drawn at adventure. Of this shape most fields prove, that seem to the eye to be squares or oblongs.

XXV. Multangular figures are such as contain more sides and angles than four, and they are either regular or irregular.

XXVI.

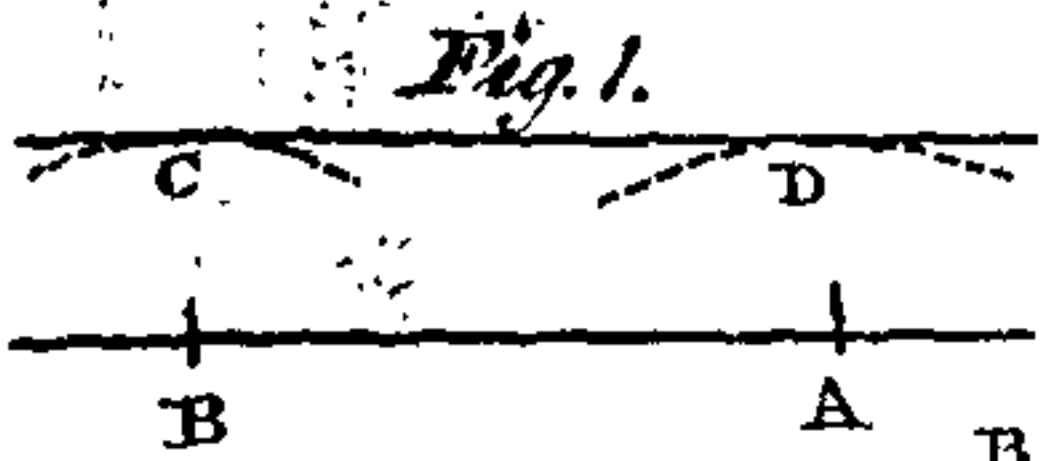


Fig. 2.

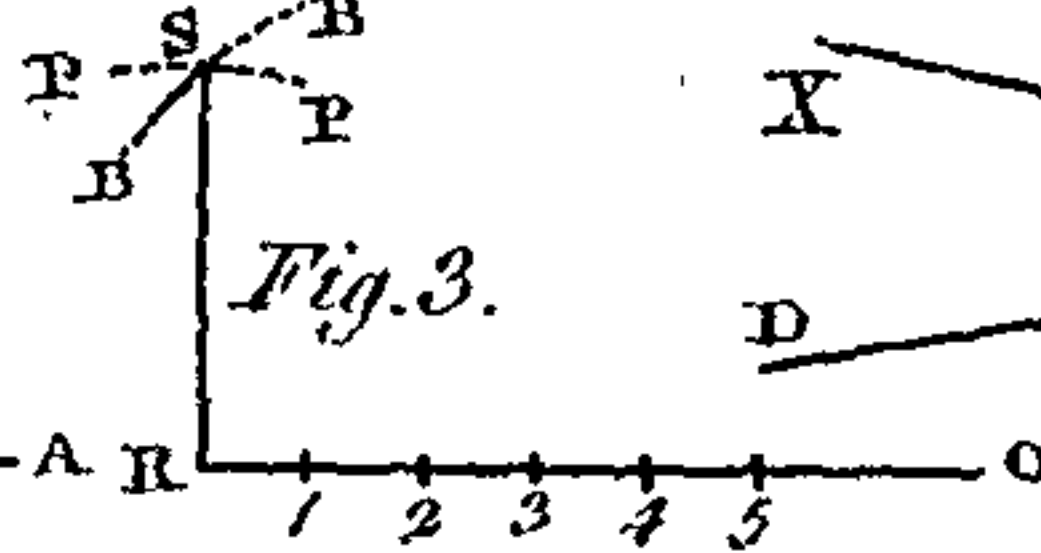


Fig. 3.

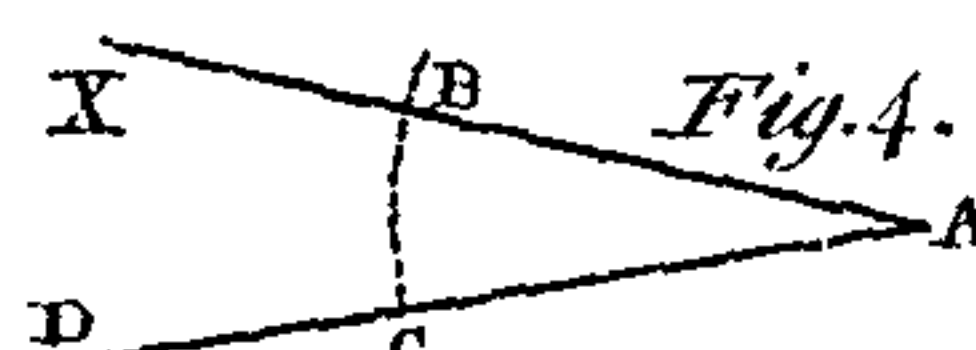


Fig. 4.

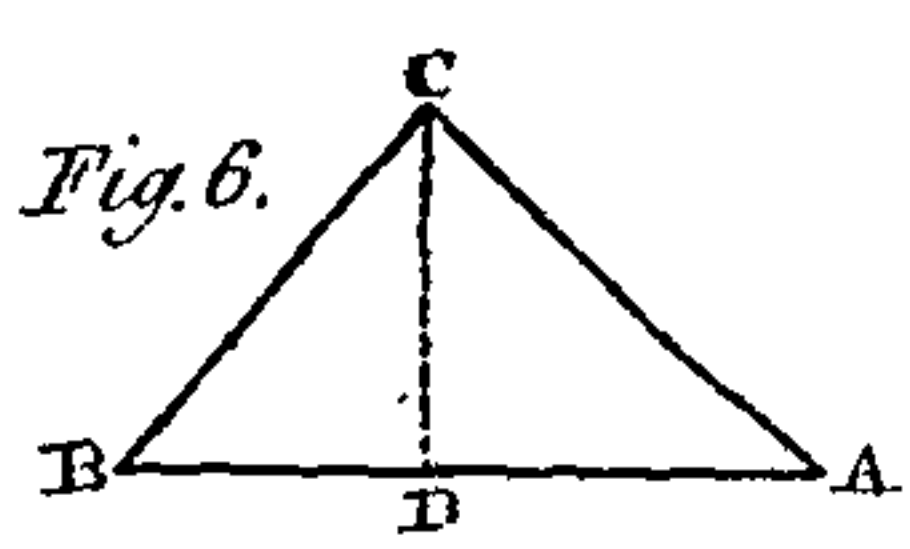


Fig. 6.

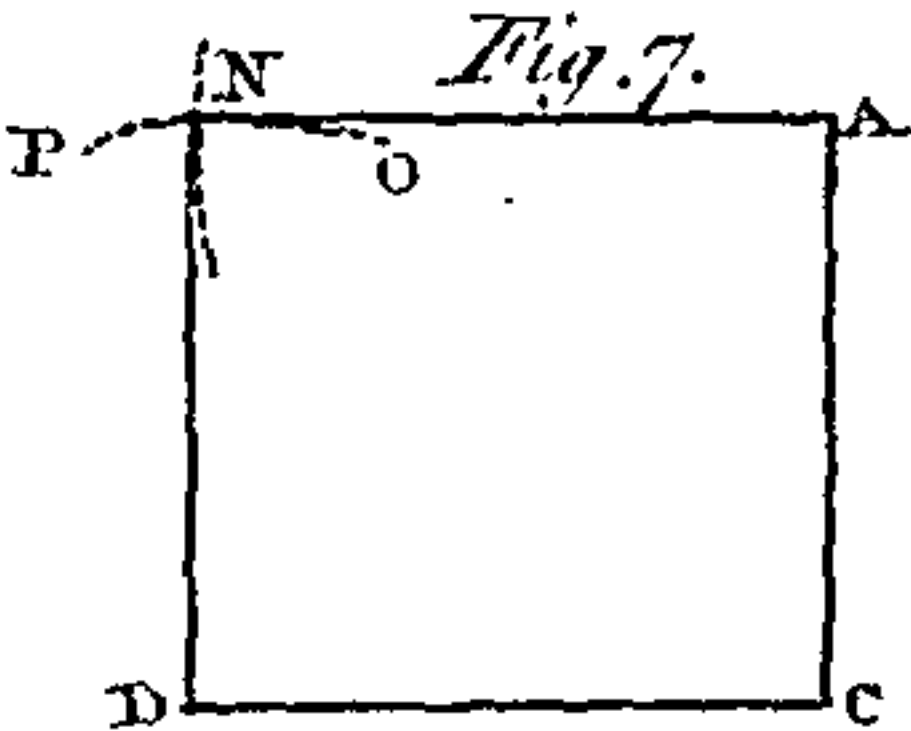


Fig. 7.

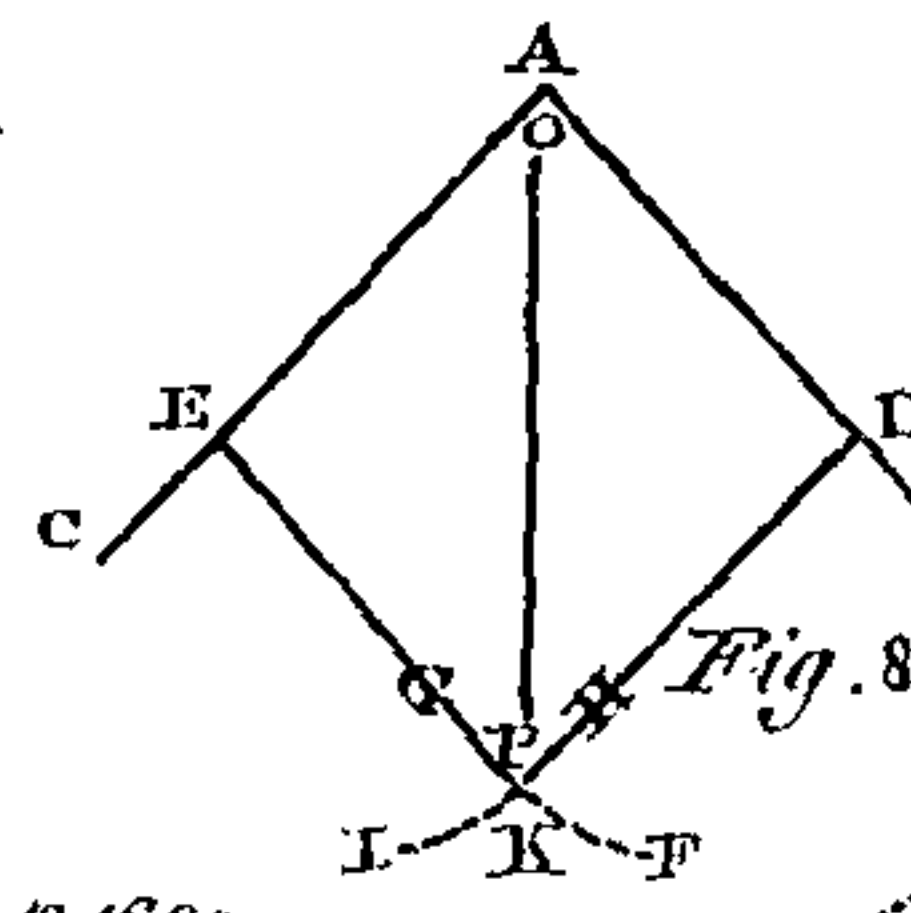


Fig. 8.

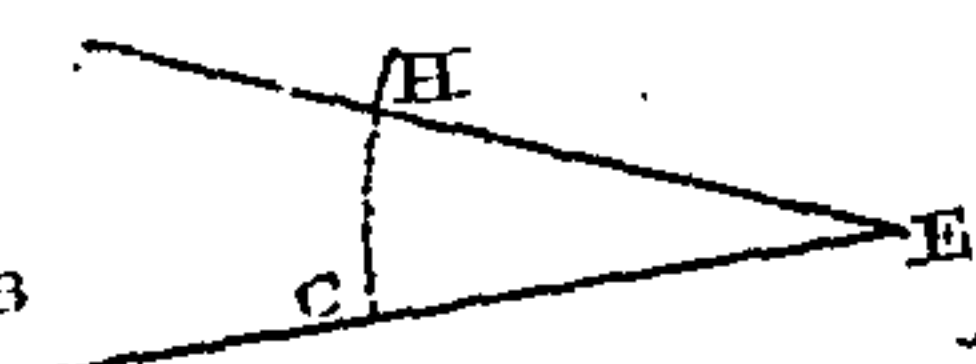


Fig. 10.

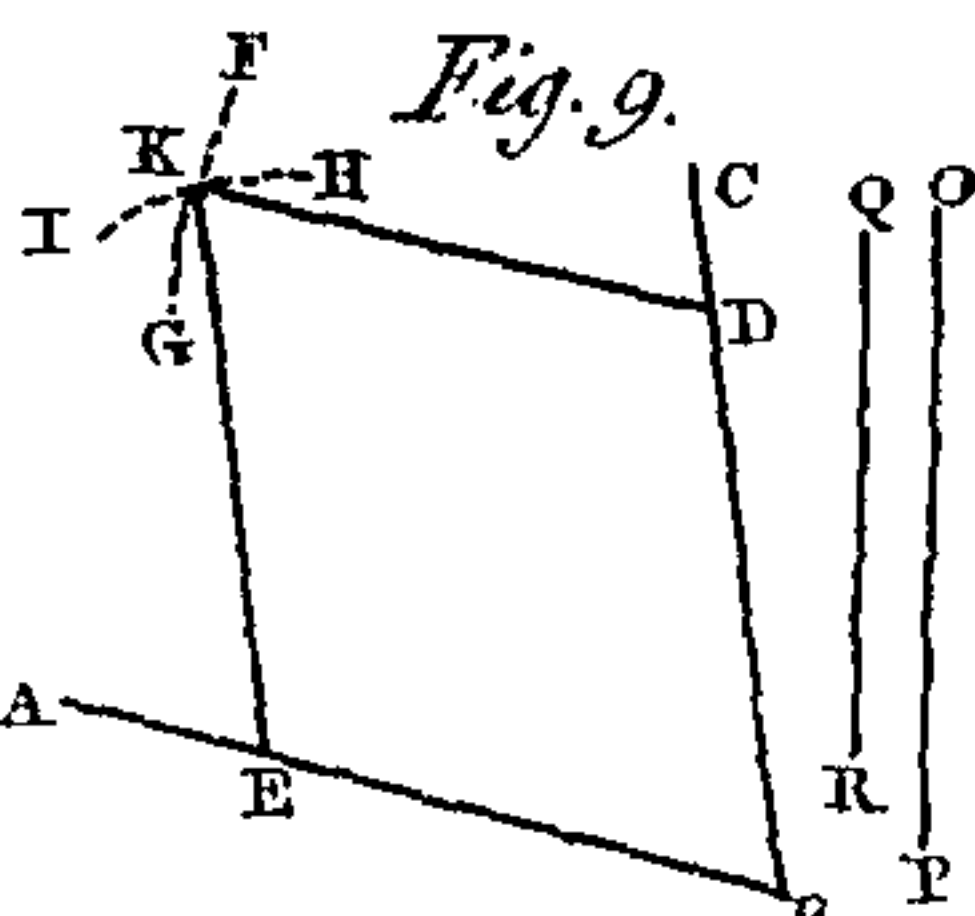


Fig. 9.

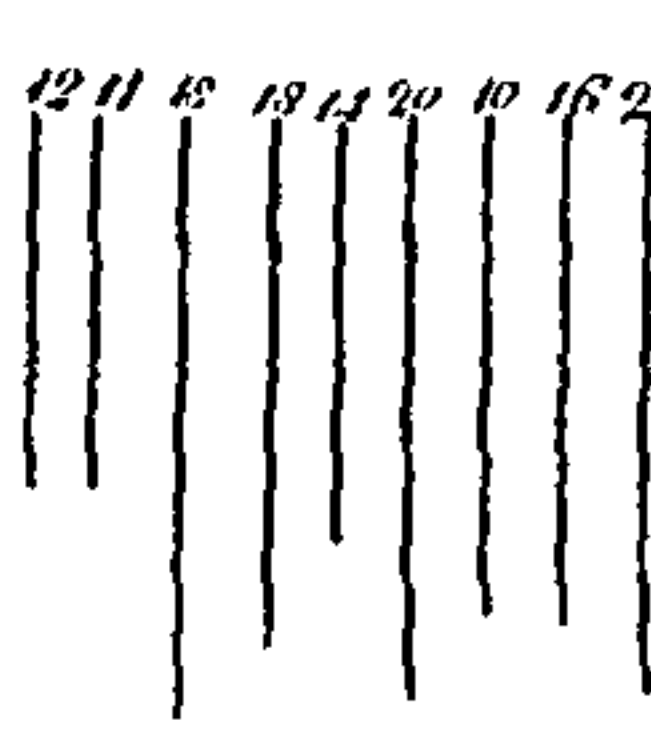


Fig. 12.

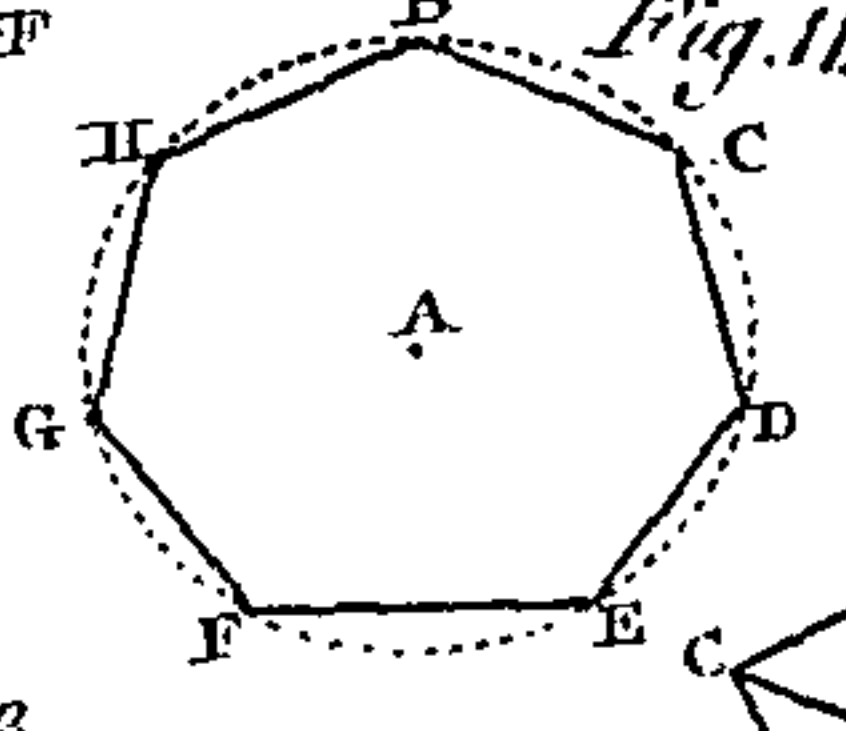


Fig. 11.

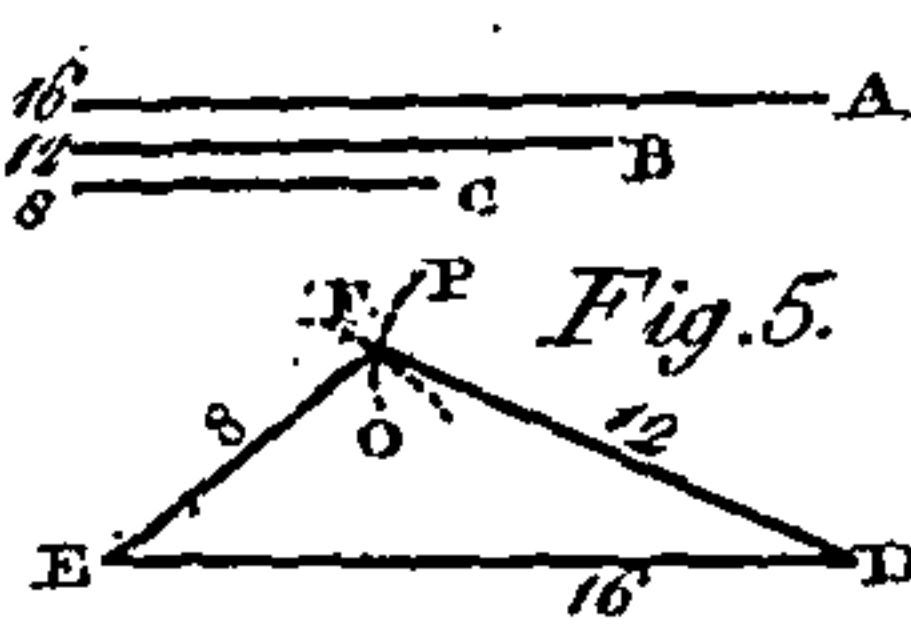


Fig. 5.

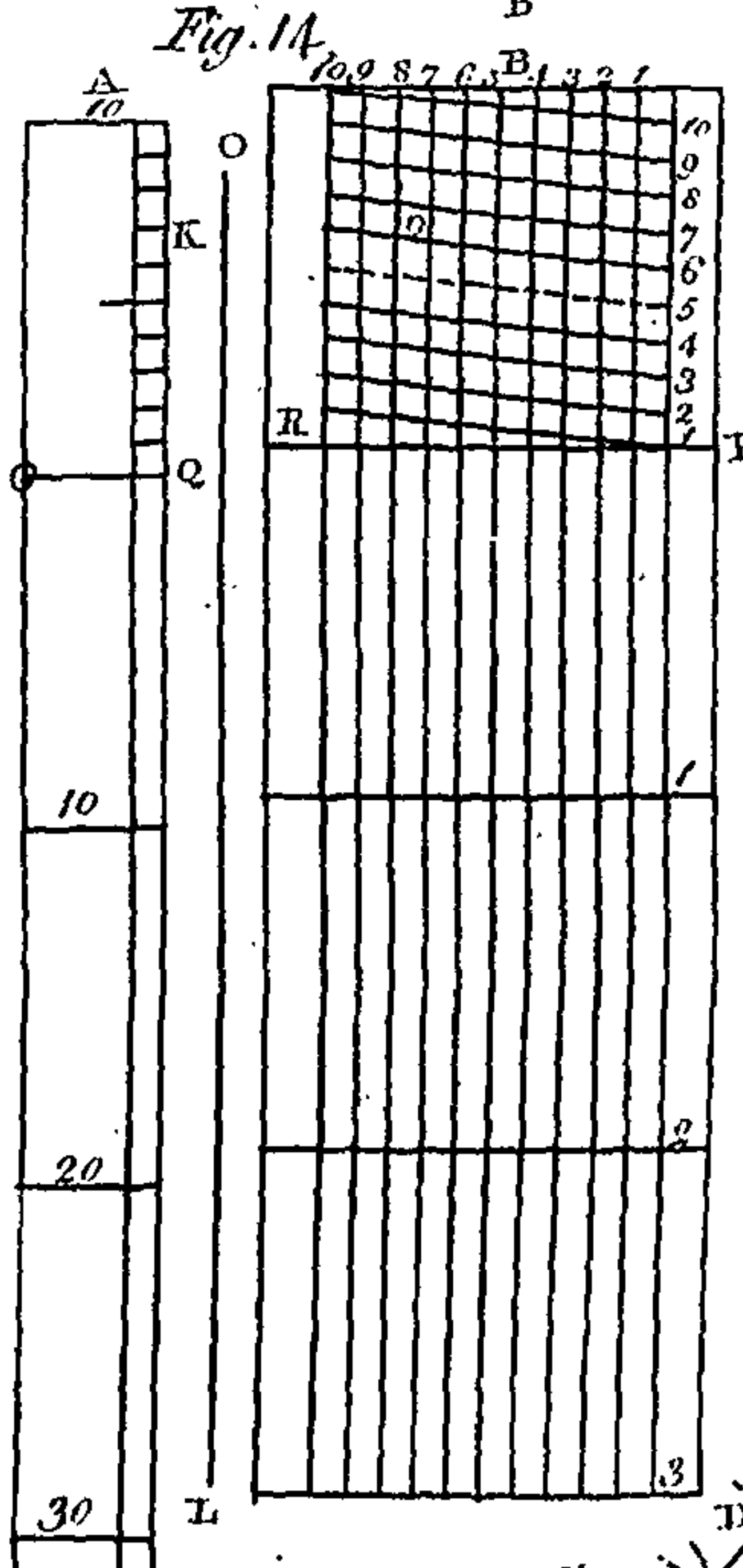


Fig. 14.

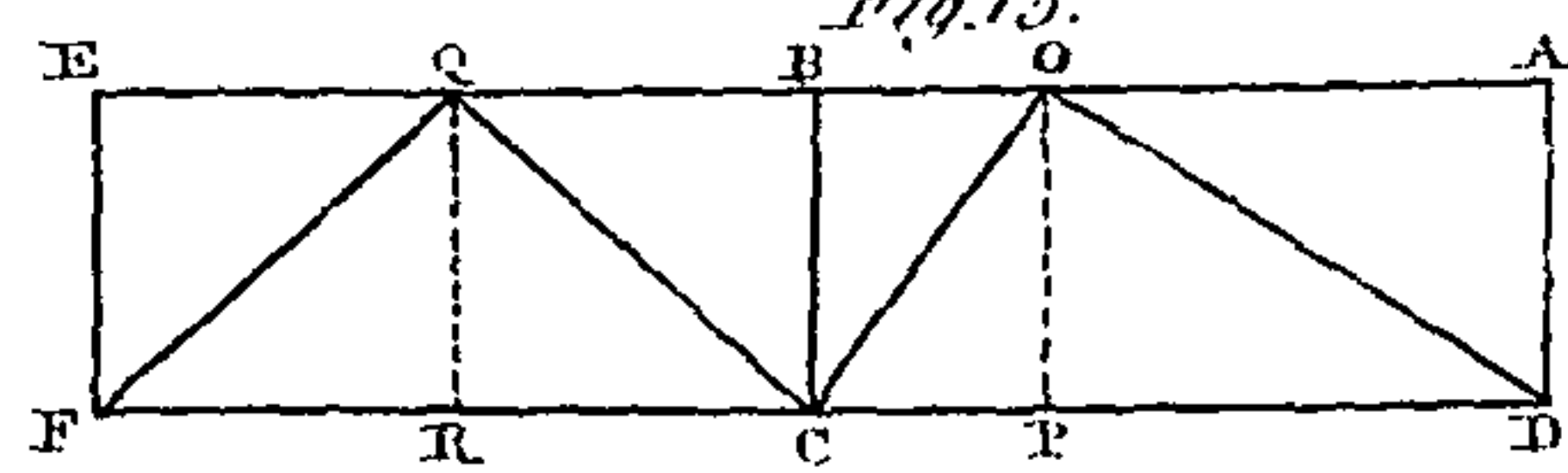


Fig. 13.

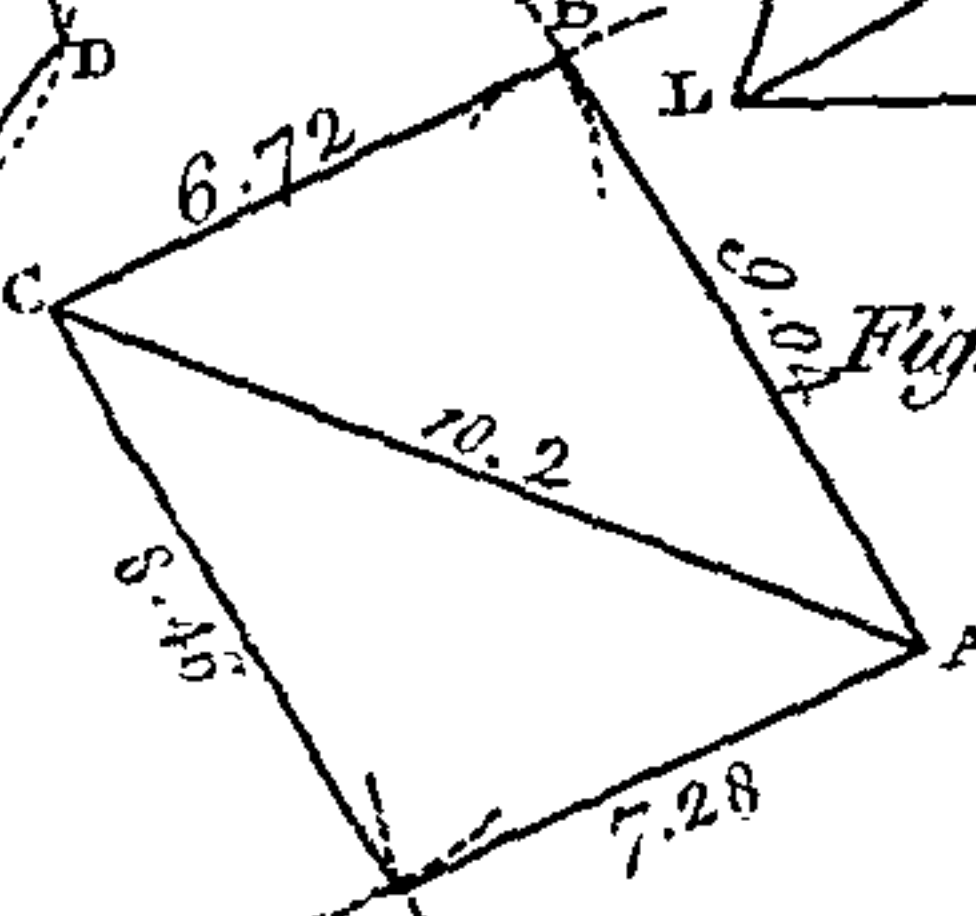


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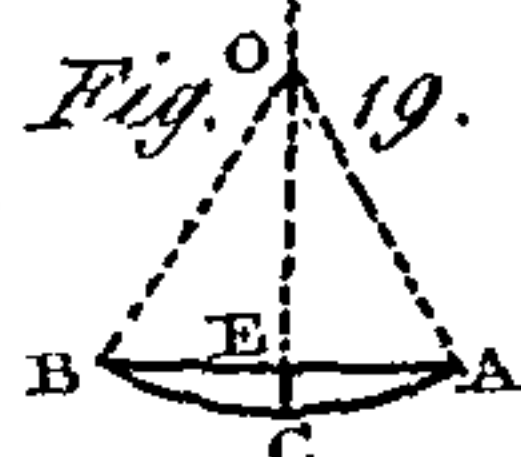


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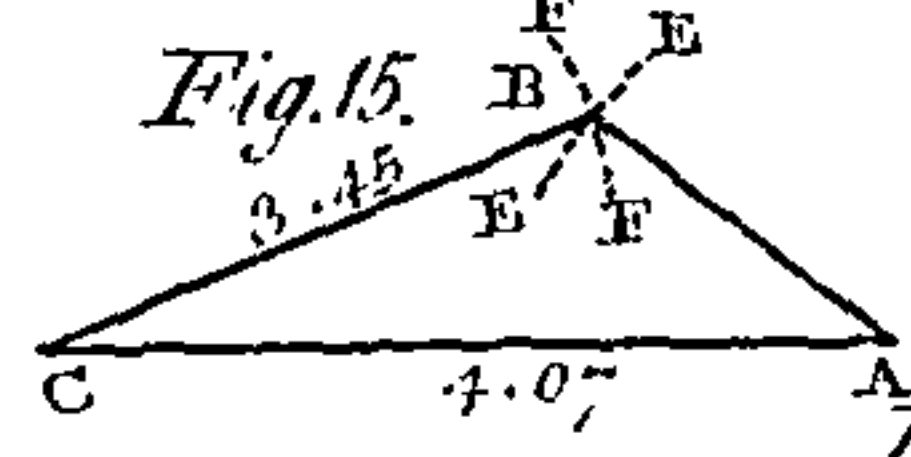


Fig. 15.

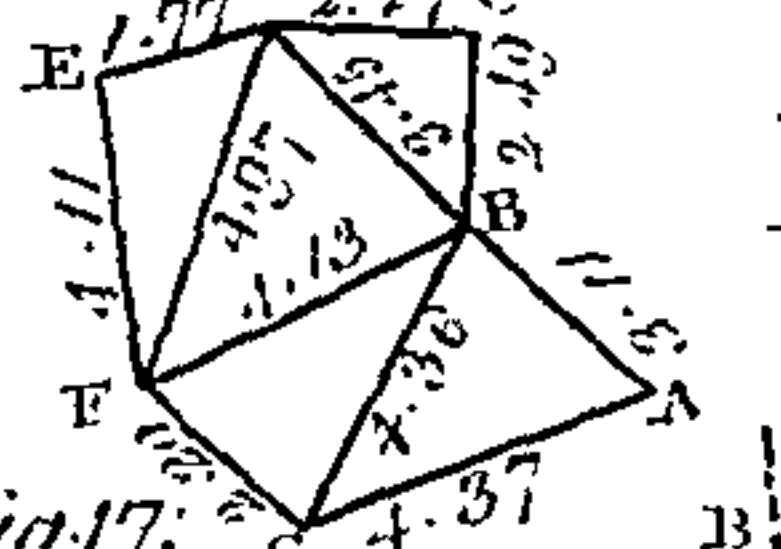


Fig. 17.

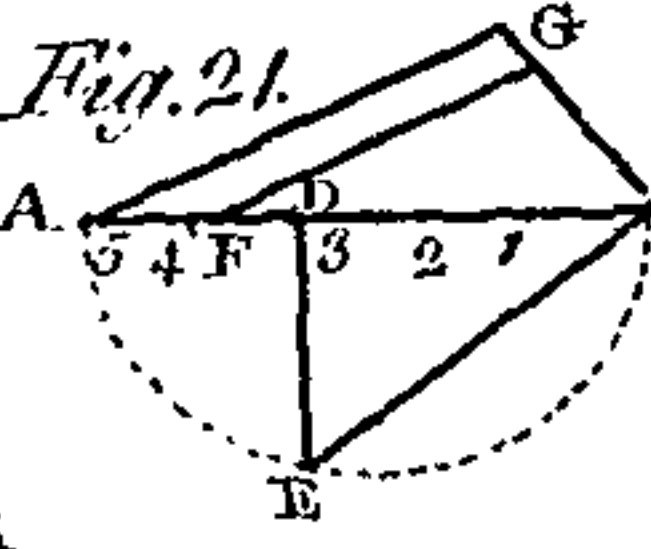


Fig. 21.

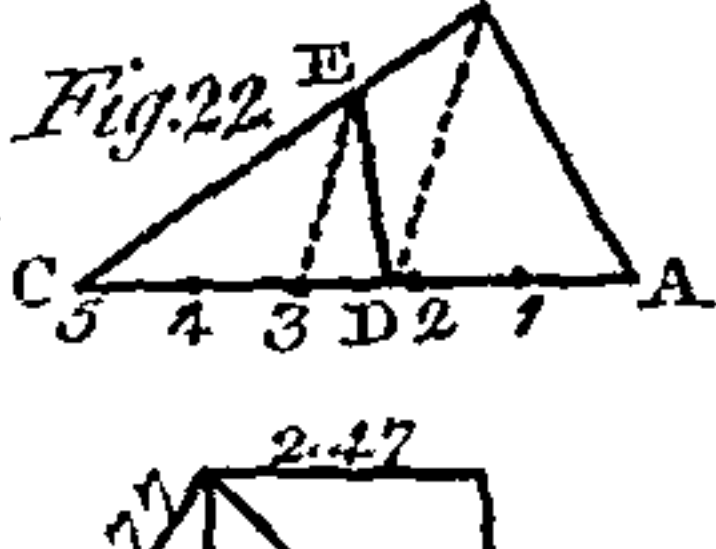


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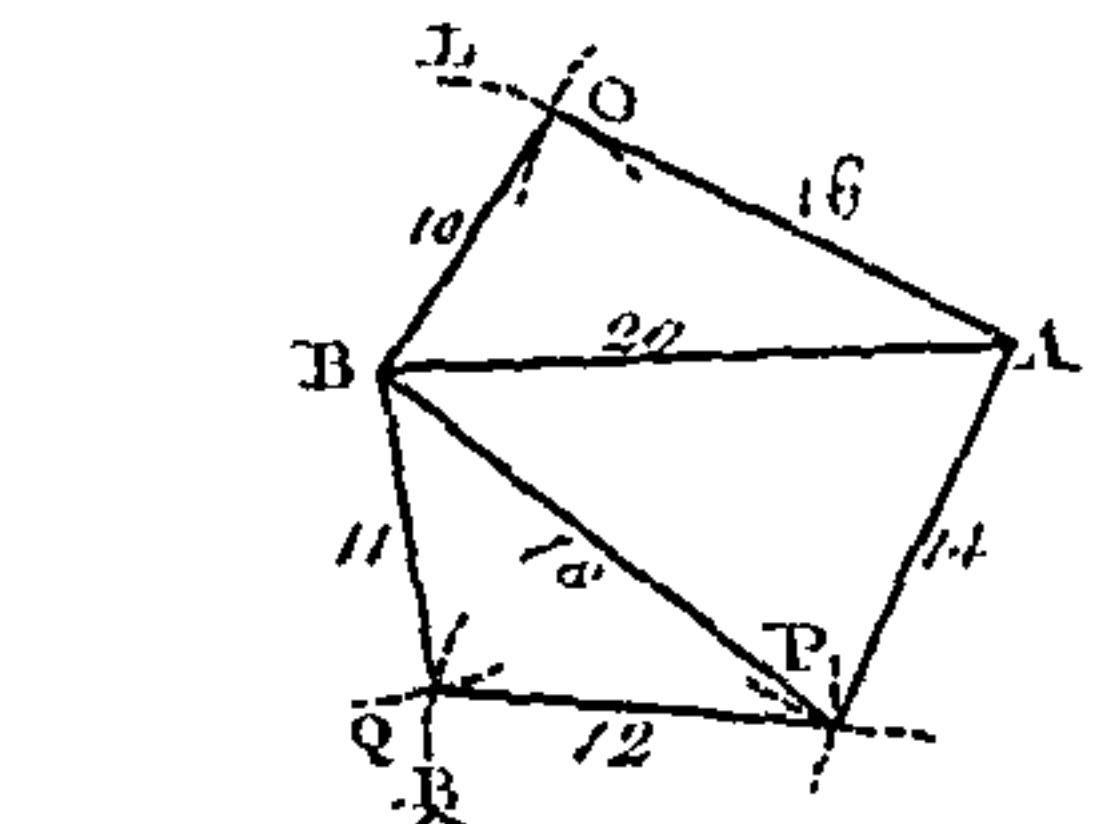


Fig. 20.

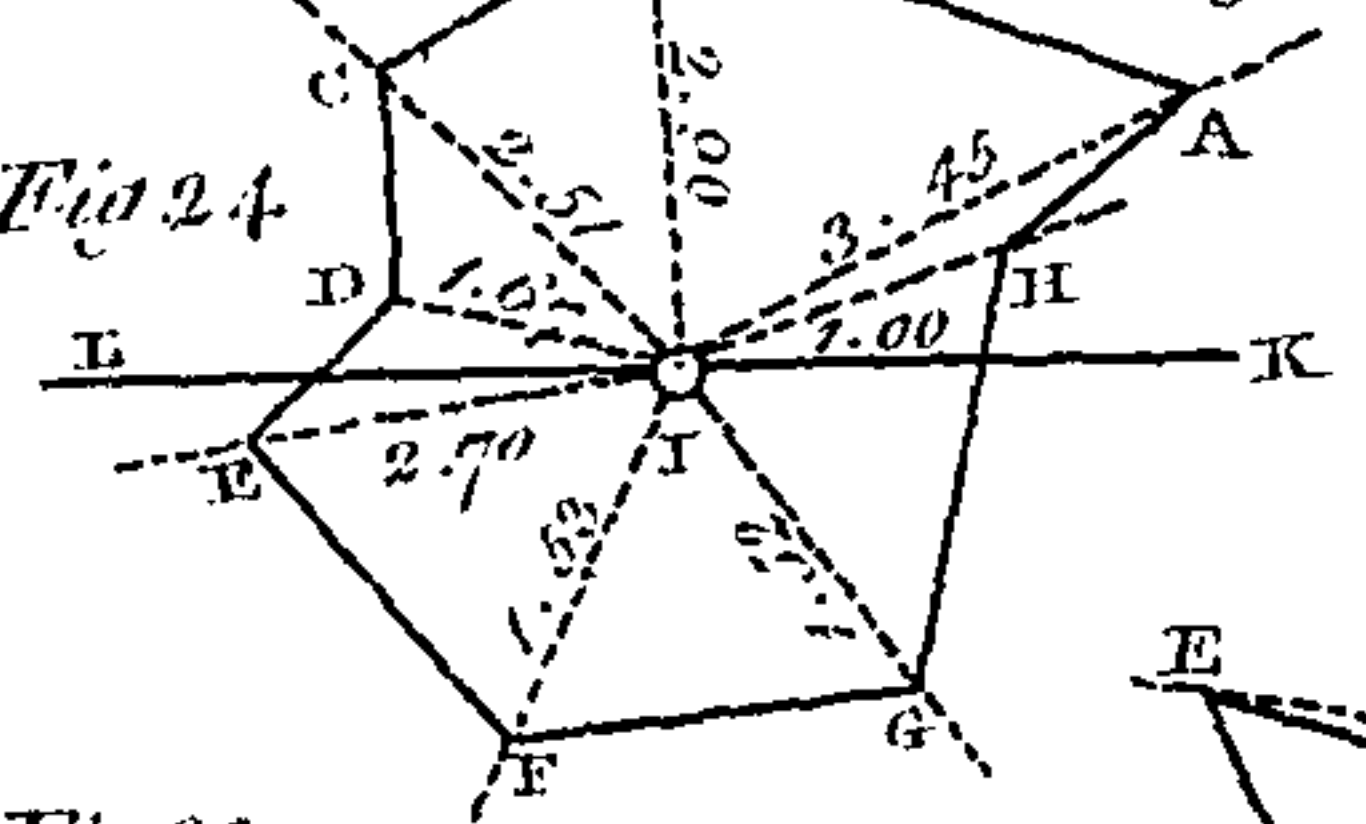


Fig. 24.

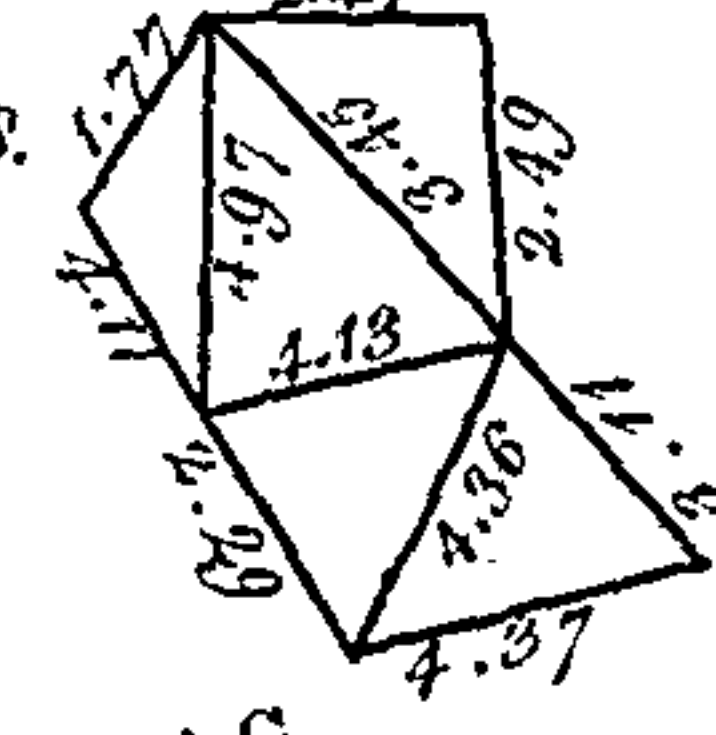


Fig. 18.

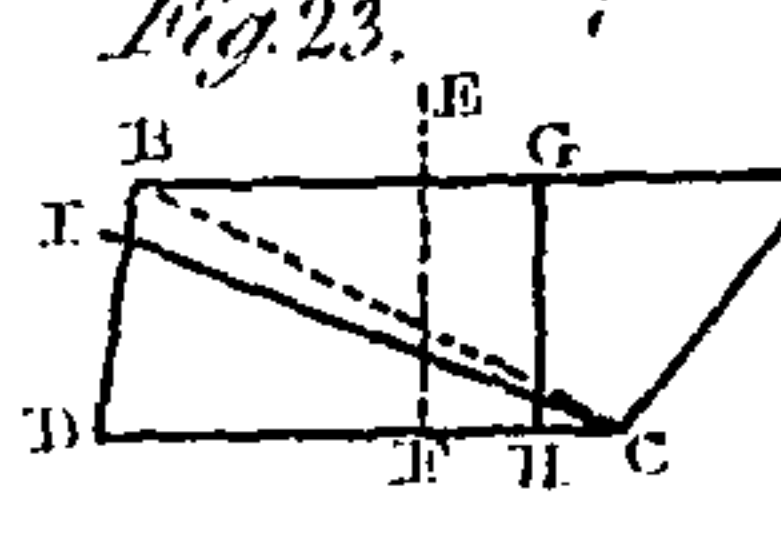


Fig. 23.

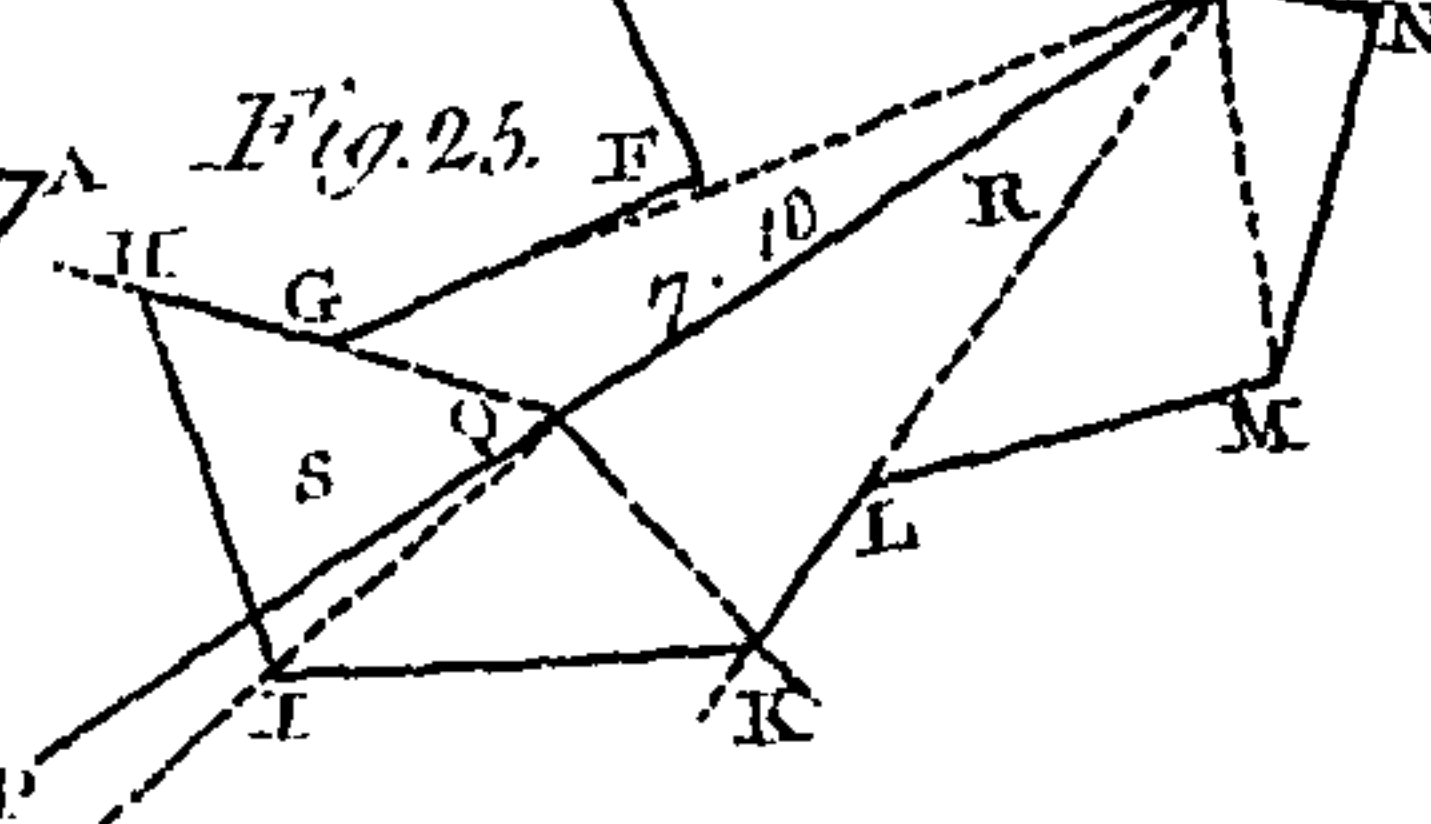


Fig. 25.

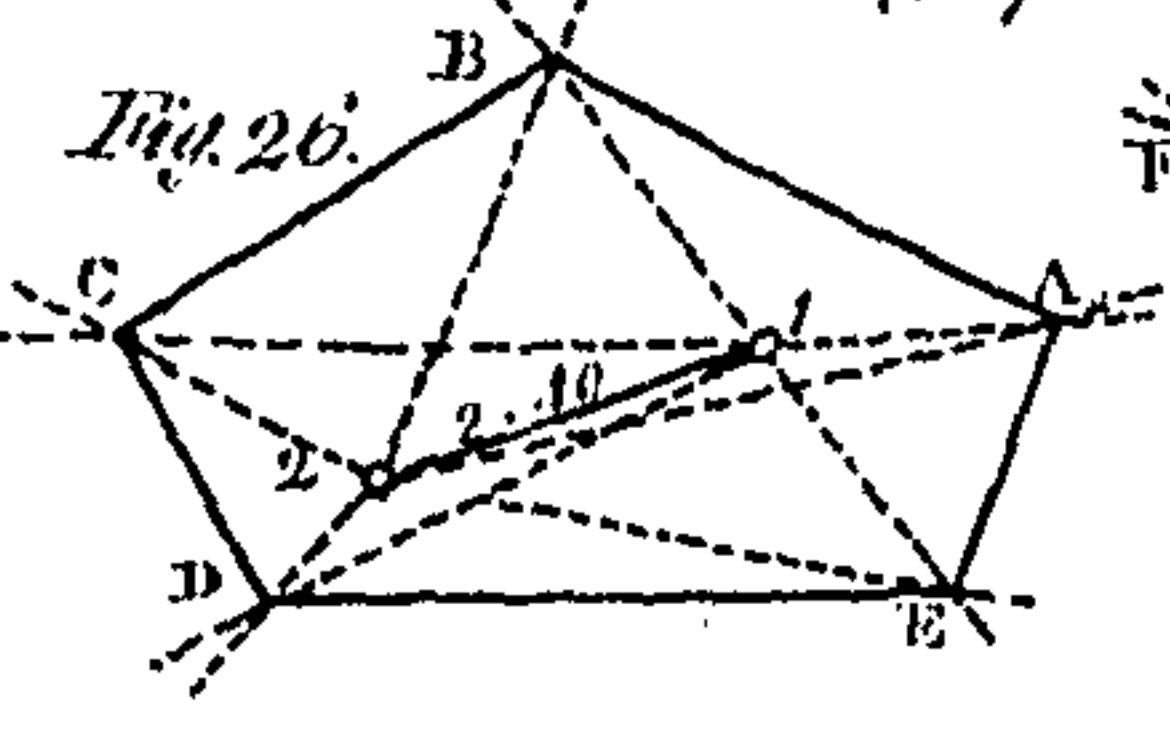


Fig. 26.

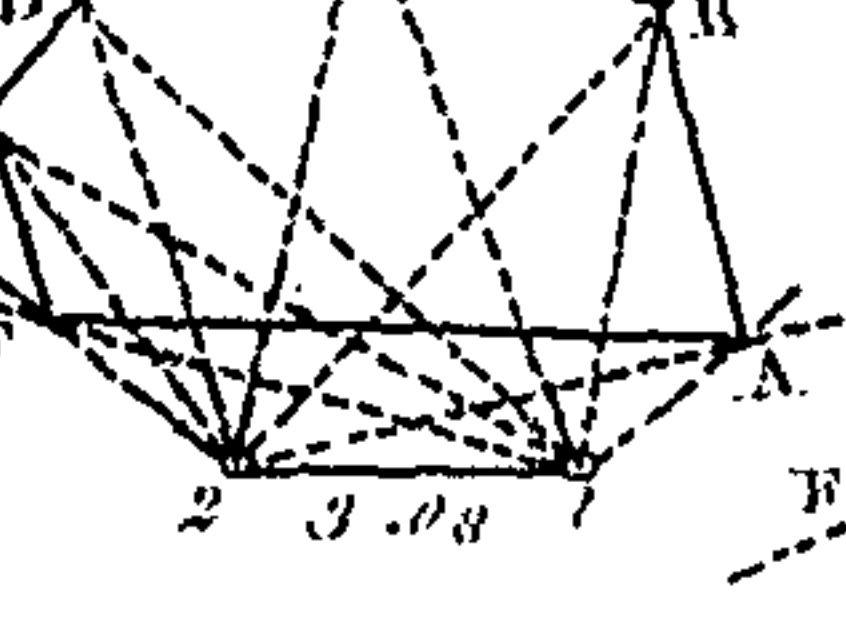


Fig. 27.

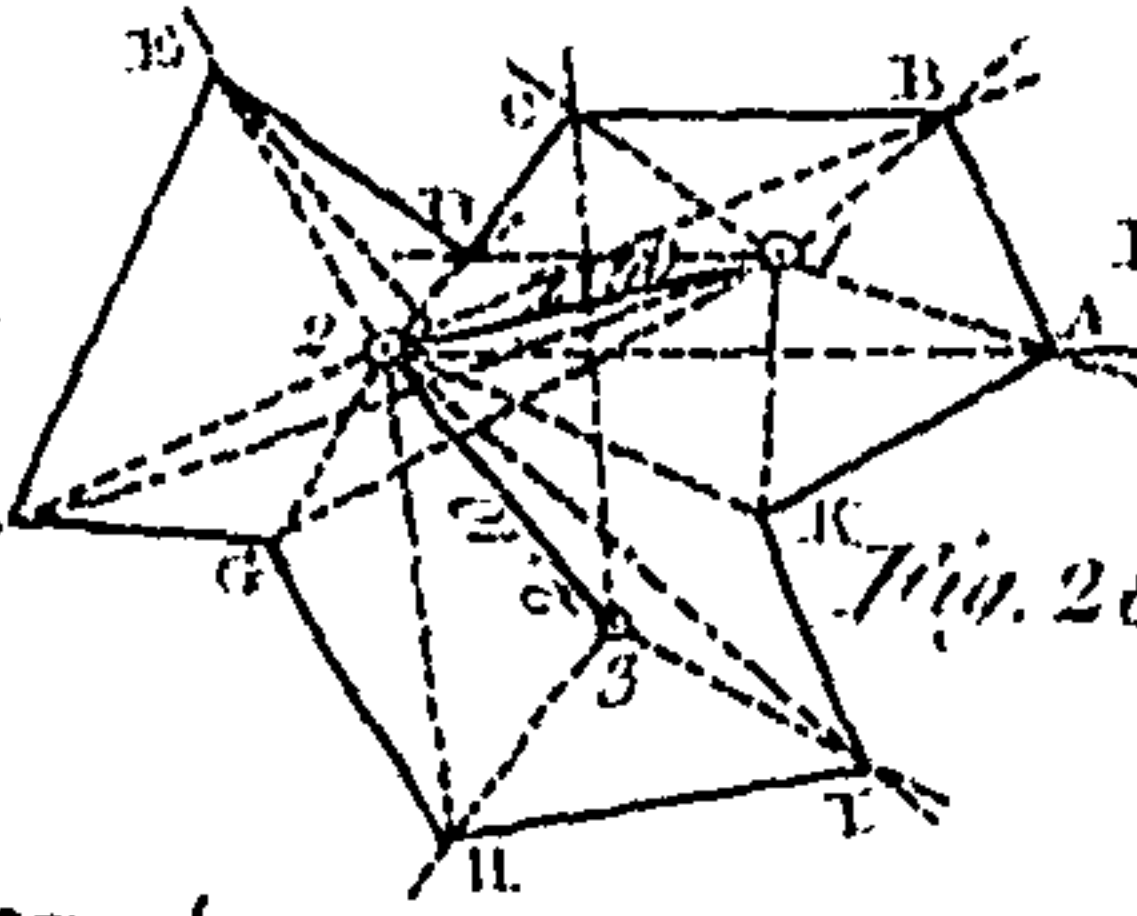


Fig. 28.

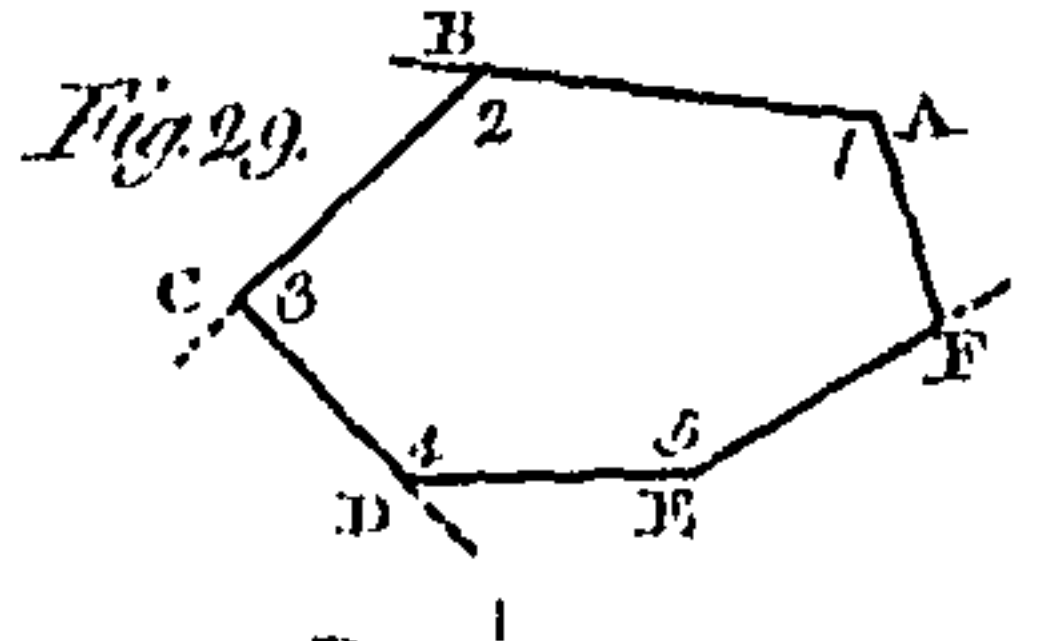


Fig. 29.

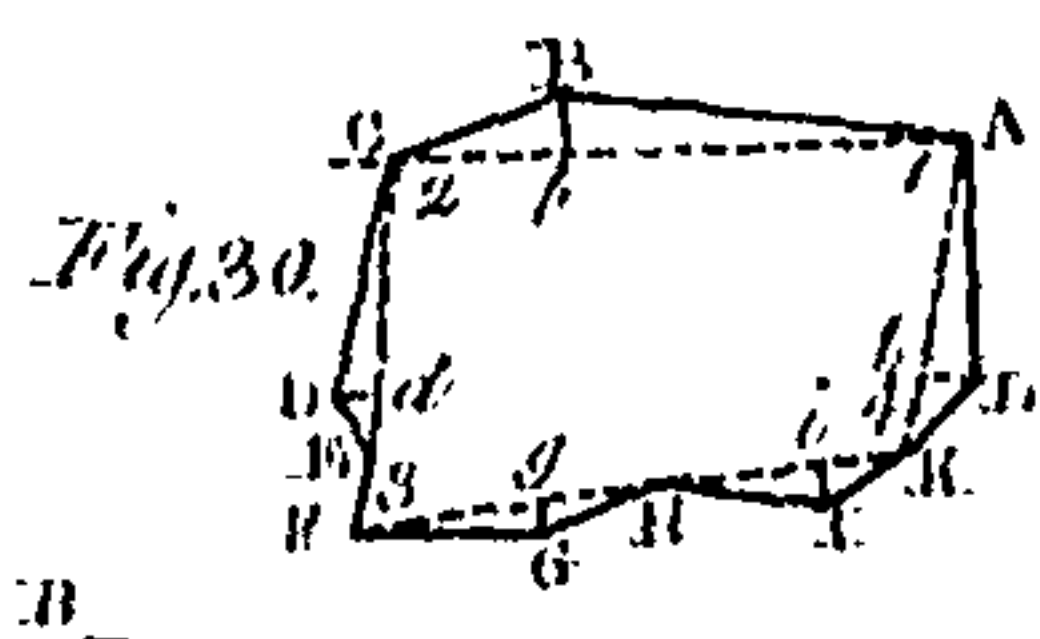


Fig. 30.

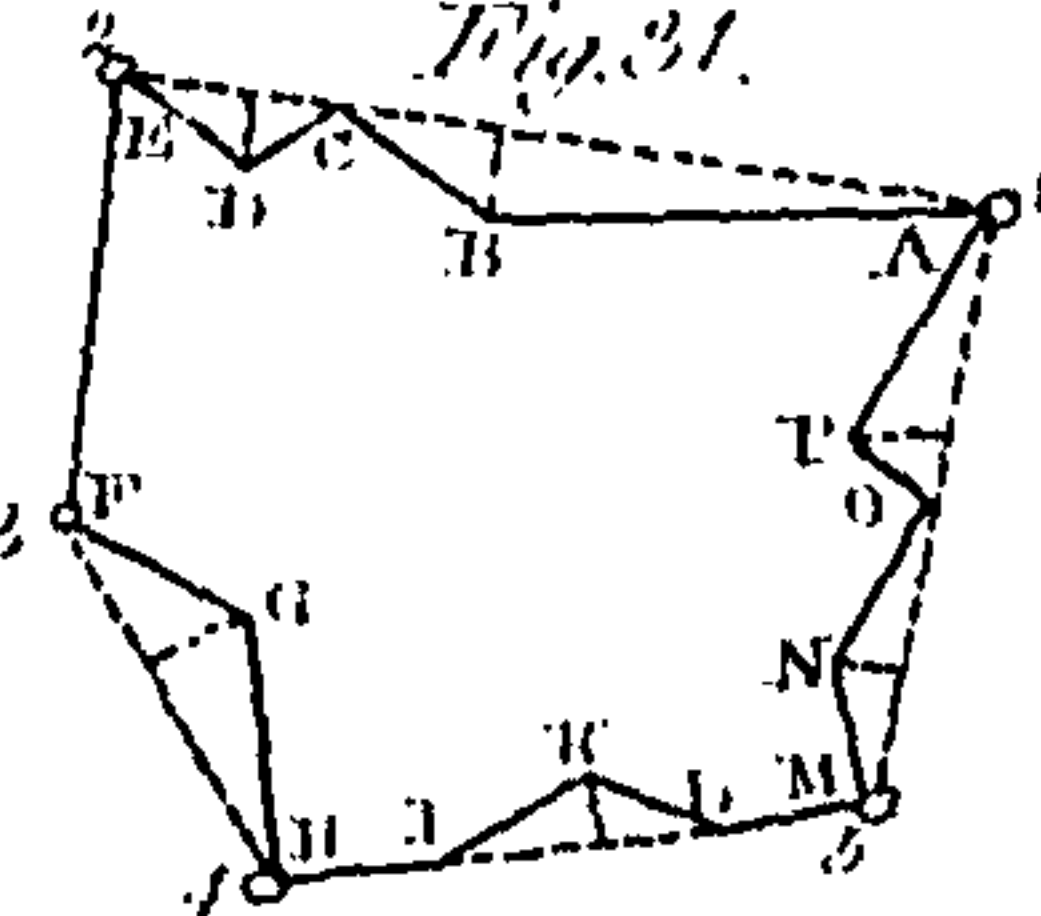


Fig. 31.

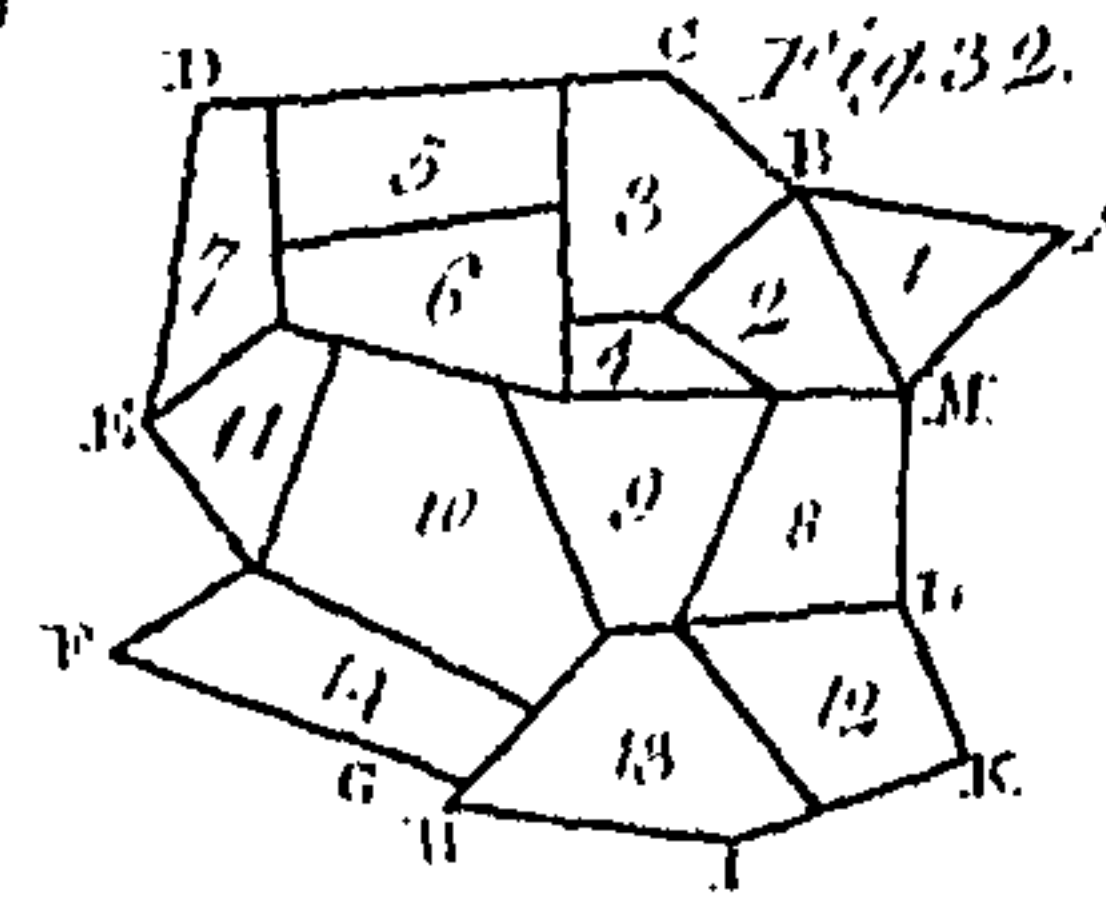


Fig. 32.

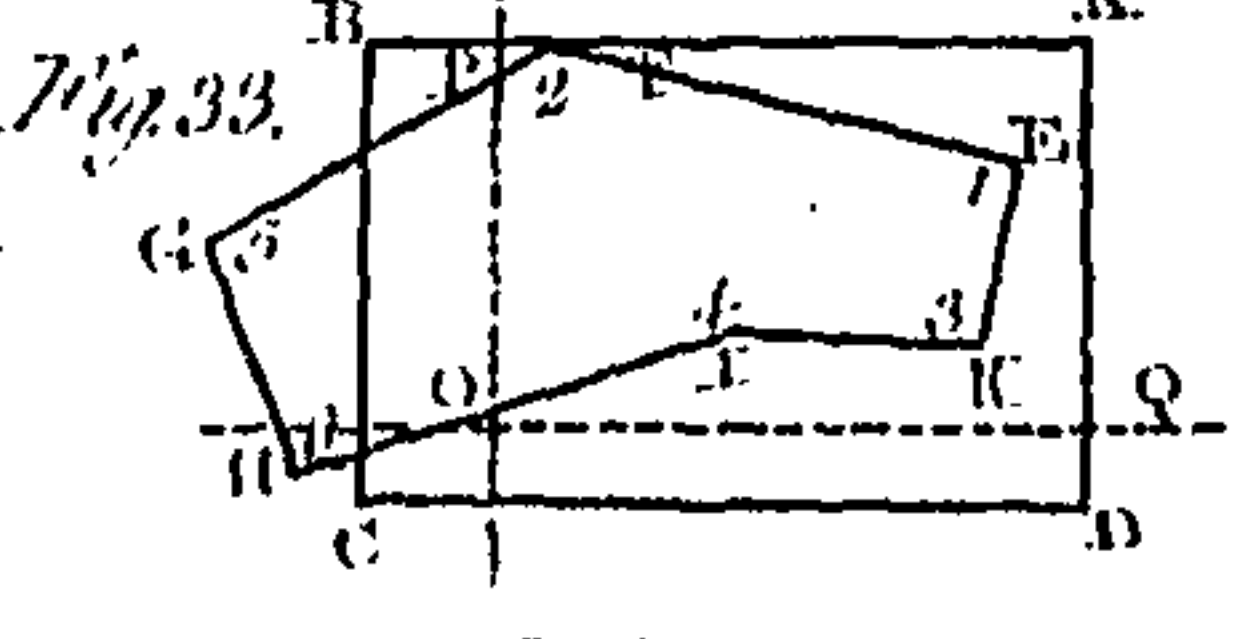


Fig. 33.

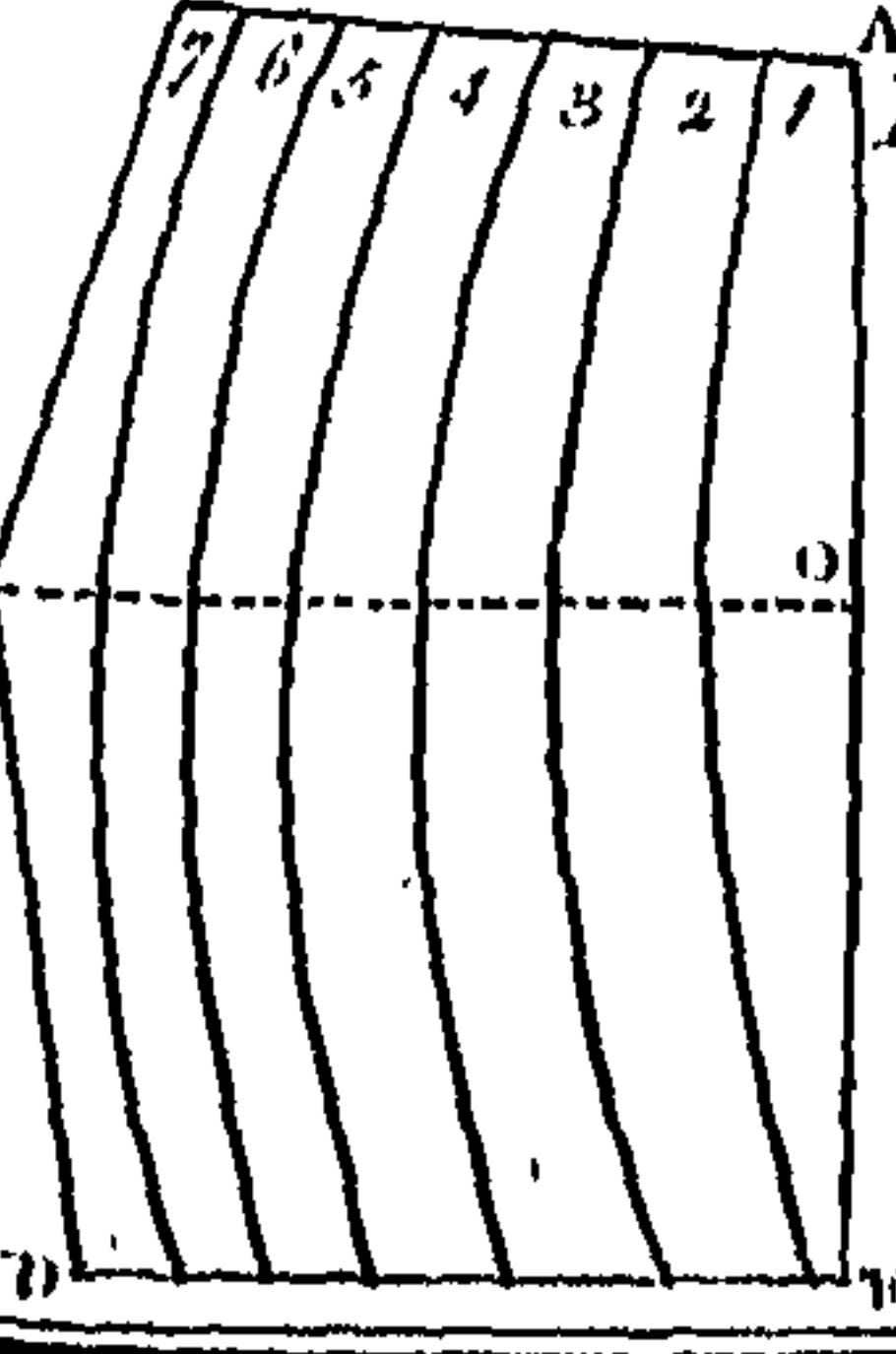


Fig. 35.



Fig. 36.

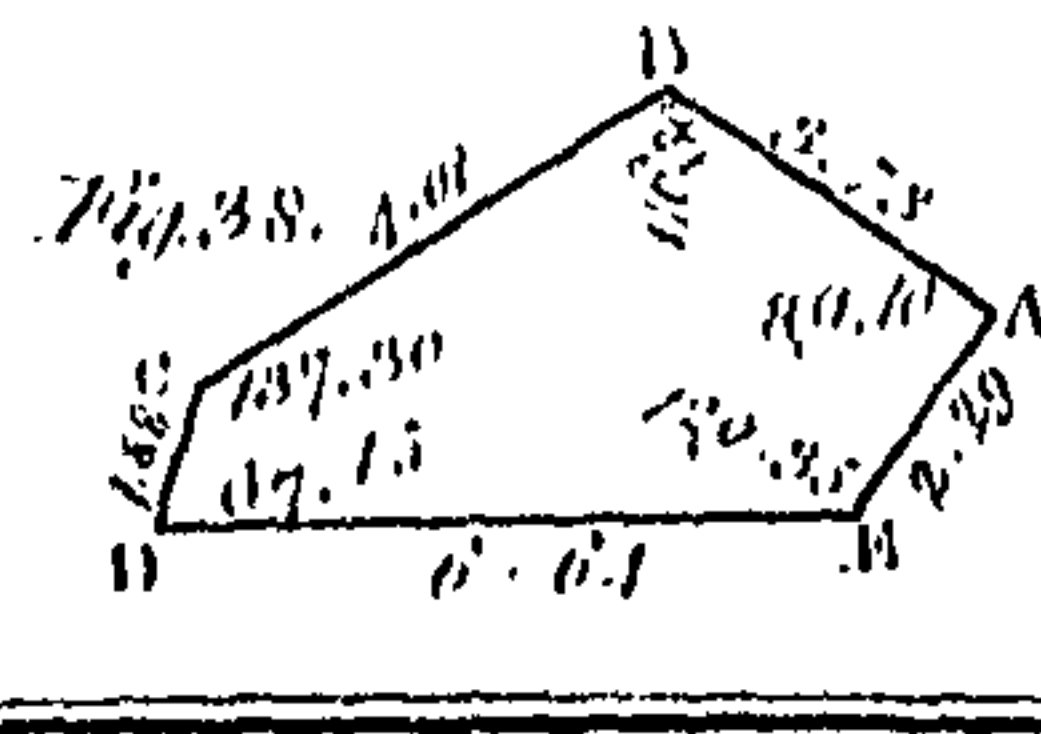


Fig. 38.

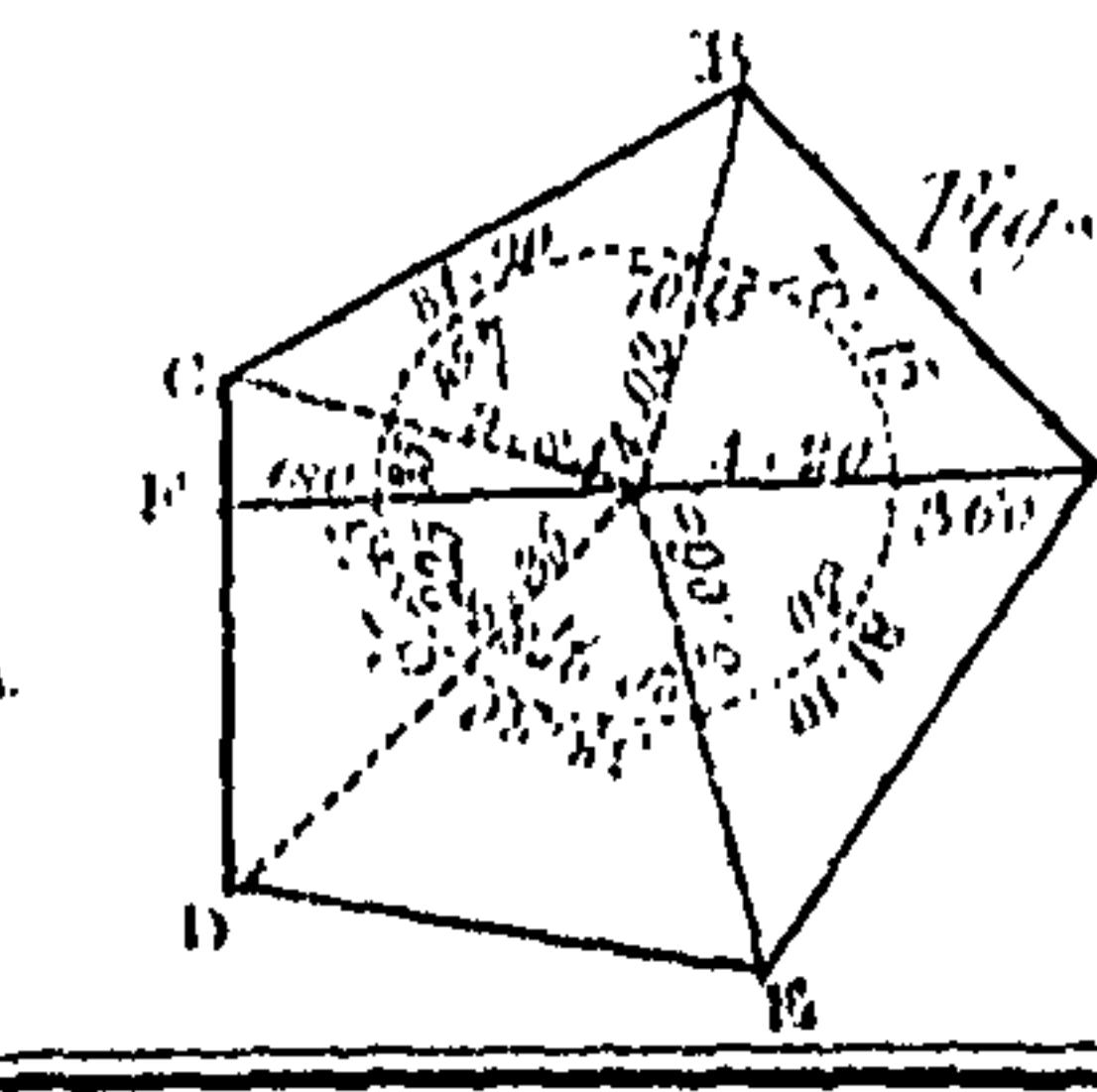


Fig. 37.

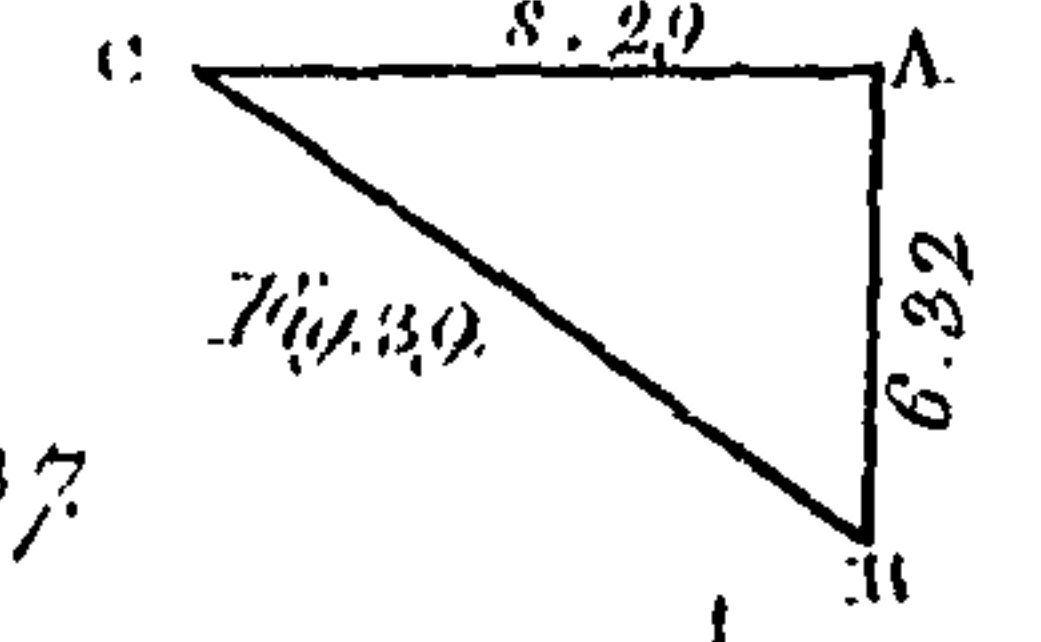


Fig. 39.

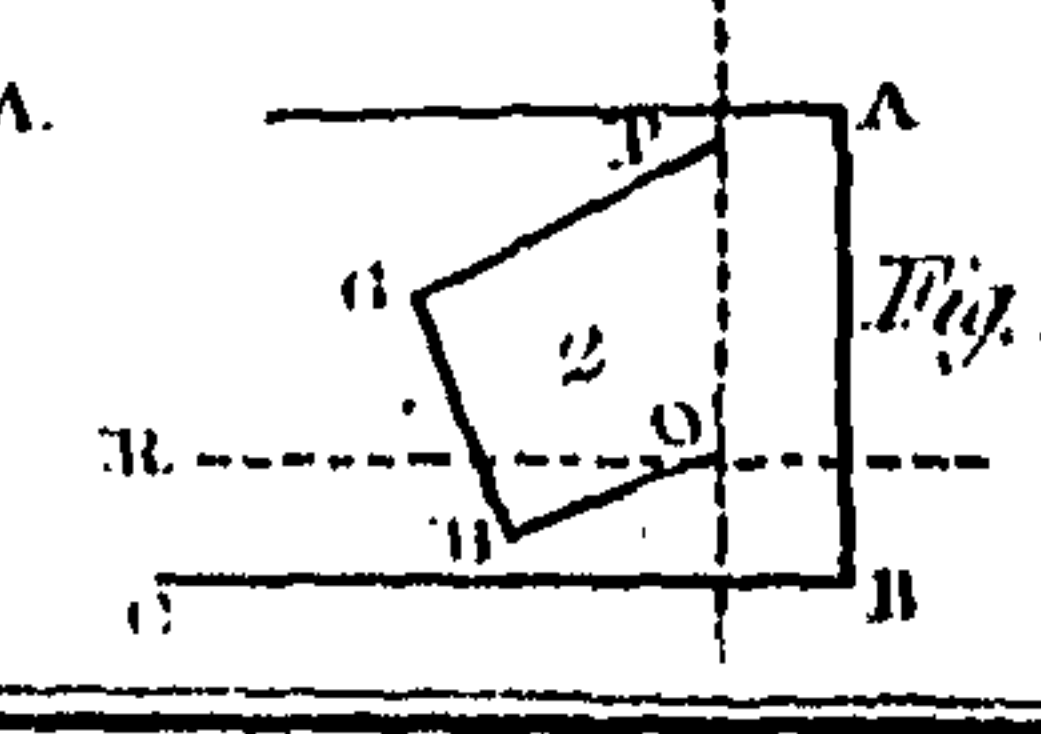


Fig. 34.

XXVI. Regular multangulars take their names from their number of angles; so a pentagon, hexagon, heptagon, octagon; eucagon, decagon, signify multangular figures of five, six, seven, eight, nine, ten angles, and consequently sides.

XXVII. An irregular polygon, or multangular figure, is that which hath more angles and sides than four, the sides and angles being unequal to one another.

Of geometrical problems:

I. *To draw a line parallel to another, at any distance assigned.*

Plate XXV. fig. 1. Open your compasses to the distances given, and chusing two points conveniently distant in the line given, as here at A and B, describe the arches C and D, to whose convexity, if you apply a rule, the parallel line is easily drawn.

II. *To raise a perpendicular upon a line given, or to cross that line at right angles in a point assigned.*

Fig. 2. Suppose the point C in the line A B were assigned for the perpendicular, open the compasses to a convenient distance, and mark out the two points E and F in the line A B, then opening them somewhat wider, you may, by setting one foot in E and F severally, describe the two arches cutting one another at the point D, from which, if you draw a line to the point, C, the work is done for the raising of a perpendicular; but if you be to cross the lines at right angles, you may continue the line from D through C at pleasure.

But if the said line A B had been given to be divided in the precise middle, by another line crossing it at right angles, the way is to set one point of the compasses in A and B severally; and having described two arches above the line intersecting one another at D, do the like below the line A B from the same points, and with the same extent of your compasses, then through the several intersections, a rule being laid upon them, a line may be drawn, cutting the given line exactly in the middle at right angles.

Note, That when one point of your compasses stands in A, you may make both the arches belonging to that center above and below the line; and then removing the compasses to B, you may cross them both.

III. *To raise a perpendicular at the end of a line.*

Fig. 3. Let O R be the line given, then to raise a perpendicular at R, make five little equal divisions, and taking four of them with your compasses, set one foot of your compasses in R, and with the other describe the arch P P; then take the distance from R to 5, and placing one foot in 3, with the other describe the arch B B, intersecting the former in the point S; then shall the line S R (being drawn by a straight rule) be a perpendicular to the line O R.

IV. *To let fall a perpendicular upon a given line from any point assigned.*

Open your compasses so as one foot being set in the assigned point, the other may go clear over the line given, and thereby describe an arch cutting the line at two points; then shall the half distance between those two points be the point to which the perpendicular may be drawn from the point assigned. But if you think it too much pains to find the point of half distance by trial, you may help yourself by the second problem: for if you describe two arches intersecting one another on the farther side of the line from the assigned point, placing (to that purpose) the foot of your compasses first in one of the intersections of the given line, and then in the other; you may, by laying a rule upon the assigned point, and the intersection of the two arches, draw a perpendicular from the said assigned point, cutting the given lines at right angles.

N. B. All in these problems, with regard to perpendiculars, aim at no greater matter than what may be performed in a mechanical way, with exactness enough, by the help of a small square exactly made; for if you apply one leg of such a square to any line, so as the angle of the square may touch the end of the said line, or any other point

where the perpendicular is to be raised, you may by the other leg draw the perpendicular. In the like manner to let fall a perpendicular from a point assigned, you need only to apply one leg of the square to the line, so as the other may touch, at the same time, the assigned point; whence you may draw the perpendicular by that leg that toucheth the point.

If the handle of your square be a little blunt, either through ill making or long using, you must allow for it when you apply to it a point in a line. And when you are drawing a perpendicular, you must stop before you reach the given line, and then by applying the leg of your square to that part of the perpendicular already drawn, so as part of that leg may pass clearly over the given line, you may draw the rest of your perpendicular as exactly as if the angle had been true. This same method is to be taken when a line is to be crossed by another drawn quite through it at right angles.

V. *An angle being given, to make another equal to it.*

Fig. 4. The angle X A D being given; and a line drawn at pleasure, as is the lowest from the point E, open your compasses to any convenient distance, and setting one foot in A, describe the arch B C. Then with the same extent setting one foot in E, with the other describe the arch C H, long enough to equal or exceed the other. Then taking the distance B C between the points of your compasses, set one in C, and with the other mark the point H in the arch C H, through which point H a line being drawn from the point E, will make an angle with the line E C, equal to the angle given.

Note, when we speak of the quantity of angles, their equality or inequality, we never regard the length of the lines; for if you extend or contract them at pleasure, the angle is still the same. But that is the greatest angle whose lines are farthest distant from one another at the same distance from the angular point, or the place where its lines meet.

VI. *Any three lines being given, (equal or unequal) so as no one of them be longer than the other two joined together, to make a triangle of them.*

Fig. 5. The lines A B C being given, set the line A from D to E; then with your compasses take the length of the line B, and setting one foot in D, describe the arch P O. This being done, take with your compasses the length of the line C, and setting one foot in E, with the other cross the former arch at P, from which intersection drawing lines by a rule to D E, the triangle is finished.

Note, that if all the sides, or two of them, be equal, the method is the same; but the labour less, because we need not take the same length twice over with the compasses.

VII. *To find the perpendicular of the triangle, in order to the measuring of it.*

Fig. 6. Let the line A B be accounted the base, and from the angle C, let fall a perpendicular, as was taught Probl. 4. upon that line at D, which is ready for taking off with compasses, and measuring on a scale; of which hereafter, in measuring the content of figures.

But if we have no occasion to draw the perpendicular, but only to know the length of it, (as it most frequently falls out in measuring) no more is needful, but to set one foot of the compasses in the angular point C, and extend the other to the base A B, so as it may touch it, but not go beyond it; then have we the perpendicular between the points of the Compasses.

VIII. *One side being given, to make a square.*

Fig. 7. The line C D being given, raise a perpendicular at C of the length, at least, of the given line; then taking the line C D between the feet of your compasses, set it upon the perpendicular from the angular point C to A: with the same distance, setting one foot in D, describe the arch O P. Lastly, with the same distance or extent, set one foot in A, and with the other describe the arch crossing the arch O P in N, from which intersection a
K line

line drawn by a rule to A, and another to D, finish the geometrical square or quadrat A C D N.

IX. *To make a long square, the length and breadth being given.*

This is so nearly like the former, that a particular figure is not necessary to explain it. Suppose each side of the square in the last problem to consist of 8 small equal parts, and you were to make a long square, whose length must be equal to a side thereof, viz. 8, and the breadth half so much: when you had drawn the line C D, for the length, and raised the perpendicular at C, you must take the shorter line given for the breadth, and set upon the perpendicular from C, upwards to a point, which for distinction we shall call the point E, imagining it so marked: with the same extent of the compasses describe the arch, placing one foot in D. Lastly, extending your compasses to the length of the line C D, set one foot in E, and with the other cross the arch aforesaid. Then a right line drawn from that intersection to E, and another from the same to D, complete the long square.

X. *To make a rhombus, the side being given.*

Fig. 8. If the angles be not limited, draw any oblique angle at pleasure, either acute or obtuse, as here, the angle B A C, which is acute. Then let the line O P be the length of a side, which being taken with your compasses, set it from the angular point A, in both lines to D and E, in which two points, place a foot of your compasses successively without altering them, viz. in D, to describe the arch F G; and in E, to describe the arch H I, crossing one another in the point K, from which right lines drawn to D and E, finish the rhombus D A E K.

Note, If any angle be given together with the side, to limit the shape and content, begin with that, and proceed as before; for you must know, that to make a rhombus (or rhomboides) like to another for figure, or equal to it in content, it is not sufficient to have the same sides: for the more oblique the angles are, the farther will the rhombus differ from a square, and the less will be the content. But you must have an angle given, or else a diagonal line, which is a right line passing through the rhombus from one opposite angle to another, and dividing the figure into two equal triangles. If the former, viz. an angle, be given, we have shewed what use is to be made of it. If the latter, i. e. a diagonal, together with the length of the sides, you may, by taking the length of your sides with your compasses, and setting a foot in the ends of the diagonal line, make a triangle on the one side of the diagonal, by Probl. 6. and then another on the other side by the same problem, the diagonal being a common base to them both; and this will give the figure exactly.

XI. *To make a rhomboides, the sides being given,*

Fig. 9. If neither angle nor diagonal be given, make any angle at adventure, as here A B C. Then supposing the lines given to be O P and O R, set the length of the longer upon the line B C, from B to D, and the shorter on the line B A to E. Then with the compasses extended from B to E, set one foot in D, and describe the arch F G. Likewise, with the compasses extended to the length of the line O P, setting one foot in E, with the other describe the arch H I, intersecting the former arch at K; from which the intersection lines drawn to D and E, finish the rhomboides.

XII. *To make a trapezium, the diagonal and lines in order being given.*

Fig. 10. Let the line H I be the diagonal of a trapezium whose sides are the lines A B C D; the side A being counted the first, as that which takes it, being from the point H, and the rest in the order as they are marked alphabetically.

Then with your compasses set to the length of the line A, place one foot in H, and with the other describe the arch E F. Next taking the length of the line B, with the one foot of your compasses placed in I, with the other make the arch G J, intersecting the former at K;

from which point of intersection, lines drawn to H and L, make the triangle H K L.

Then with the extent of the line C, set one of the feet of your compasses at L, and describe the arch O P. Lastly setting them to the length of the line D, and placing one foot of your compasses in H, with the other make the arch S R, intersecting the former at Q; so shall lines drawn from Q to L and H, make up the triangle L Q H, and finish the trapezium H K L Q.

We could have been much briefer in this problem, by referring to the 6th; but this being of very great and frequent use, we desired to be very plain.

XIII. *To make a regular polygon, otherwise called a regular multangular, or multilateral figure, consisting of many equal sides and angles, viz. above four a piece.*

Being satisfied what shall be the distance between the center and every angle, with that distance describe a circle, which being equally divided into as many parts as the figure must have angles (or sides, for they are equal in number) and lines drawn from the points of division within the circle from point to point, (ordinarily called chords) the polygon is finished, as in this diagram.

Fig. 11. Suppose an heptagon, or multangular figure of seven sides, and as many angles, be to be described, every angle being designed to be distant from the center A, seven eighths, or three quarters and a half of an inch; with that distance describe the circle B C D E F G H, which being divided into seven equal parts, and lines drawn from point to point, the heptagon B C D E F G H will be therein included.

We shall rather leave our reader to find out the points of division by many trials, than to puzzle him with the geometrical way for finding out chords to that purpose.

XIV. *Having the sides of the triangles whereof it consisteth, orderly given, to make an irregular multangular, or multilateral figure.*

This will be more fully handled hereafter, when I come to shew the method of drawing plots of ground. In the interim I will give you a specimen of an irregular pentagon.

Fig. 12. Having the lines of three triangles given, lay down the greatest of the first, viz. 20, from A to B for a base, and by Probl. 6, make a triangle of it, and the other lines 16 and 10, viz. the triangle A B O.

Secondly, You find by the number 20 over the first line of the second triangle, that it is the common base to them both; and therefore, by the same Probl. 6, make the triangle A B P of the lines, 20, 14, 18.

Lastly, finding the base of the third triangle to be the same with 18, one of the sides of the second make the triangle P B Q of the lines 18, 11, 12: so is the quintangular figure finished.

How every line is to be found in its due order in this, or any other sort of multangular figures, so as to give a true and exact account, not only of the superficial content, but also of the figure and situation, is to be taught hereafter in the doctrine and practice of Protraction.

How to find the superficial content of any right-lined figure, the lines being given.

As a foundation to what we shall say upon this subject, there are some few geometrical principles or theorems out of Euclid and Ramus, which we desire may be remembered; and because understanding is a great help to memory, we shall make use of a kind of ocular demonstration; which though not so strict and artificial as that which is to be found in the commentators upon Euclid in the quoted places, will be more serviceable because more easily understood.

Theor. 1. *Every parallelogram being of the same length with the base of a triangle, and of the same height with the perpendicular of that triangle, is double to it.* Euclid 41. 1.

Fig. 13. Here are two equal oblongs, or long squares, A B C D and B E F C, and within them two triangles inscribed, whose bases are of the same length, and their perpendiculars,

pendiculars, O P and Q R, of the same height with the oblongs. Now each of these triangles being parted into two right-angled triangles by their perpendiculars, then it is plain to the eye, and from the nature of diagonals, which ever divide a parallelogram into equal parts, that the two new triangles OPD and OPC, which makes up the first of the given triangles, are equal to the triangles DAO and OBC, which make up the remainder of the parallelogram A B C D. Therefore that parallelogram is double to that triangle which was to be demonstrated.

In like manner it is evident, that the parallelogram BEFC is double to the triangle COF, because C R Q is equal to B Q C, and Q R F is equal to Q E F.

Theor. 2. *All triangles having the same base, and lying between the same parallels, are equal.* Euclid 37. 1.

So in our last diagram, the two given triangles having bases of the same length, and lying between the same parallels, are evidently equal, because they are demonstrated to contain each of them the exact half of the parallelograms wherein they are inscribed; and the parallelograms being equal, their halves must be equal also,

Theor. 3. *The sides of the triangulate (that is, one that hath four or more sides) are ever two more than the triangles of which it is made.* Ram. lib. 10. prop. 2.

Fig. 10, 12. This is plain by inspection, if you view again the figures of the trapezium and irregular pentagon, in the 12th and 14th problems.

These theorems being allowed to be true, the doctrine concerning the superficial content of right-lined figures, might be reduced to a narrow compass; for he that knoweth how to husband these three theorems, may easily take up these corollaries, *ordine inverso*.

1. Any quadrangular figure, regular, or irregular, may by a diagonal be parted into two triangles; any five-sided figure by two diagonals into three triangles: and six-sided figures into four by three diagonals, &c. by Theor. 3.

2. It is no matter of what shape the triangle is, as to the rule for measuring; for whether it be right-angled, acute angled, or obtuse-angled, and whether it have three, two, or no lines equal, it is only the length of the base, and height of the perpendicular and is considerable by Theor. 2.

3. The true measure or content of any triangle, whether alone, or as part of any triangulate figure of 4, 5, 6, or more sides, (and consequently of the whole figure, by summing up the content of all the several triangles) is found by multiplying the whole base of the triangle by half the perpendicular, or the whole perpendicular by half the base; which being a rule of such infinite use in surveying, we desire it may be remembered; and that it may be understood, we shall give a plain example.

Fig. 6. Suppose A B the base of the triangle belonging to the 7th problem, to be 44, and the perpendicular C D to be 20: whether you multiply 44, the whole base by 10, the half of the perpendicular, or 20, the whole perpendicular by 22, the half base, the product gives the content 440, as is here apparent.

Having thus given a general method how all right-lined figures may be reduced to triangles, and so their contents found, we might pass to the next head concerning instruments, and their use; but because there are newer ways in measuring particular kinds of triangulate figures proper to those kinds, we shall briefly mention them.

I. To find the contents of a square, or long square.

Multiply the length by the breadth, the product gives the area or content.

$$\begin{array}{r} \text{Example of a square,} \left\{ \begin{array}{l} 17 \text{ inches length.} \\ 17 \text{ inches breadth.} \\ \hline 119 \\ 17 \\ \hline 289 \text{ square inches.} \end{array} \right. \end{array}$$

$$\begin{array}{r} \text{Example of an oblong,} \left\{ \begin{array}{l} 25 \text{ feet long.} \\ 13 \text{ feet broad.} \\ \hline 75 \\ 25 \\ \hline 325 \text{ square feet.} \end{array} \right. \end{array}$$

II. To find the area or content in measure of a rhombus

Let fall a perpendicular from one of the obtuse angles upon the opposite side; that side multiplied by the perpendicular, gives the area.

20 yards the side.

14 yards the perpendicular.

$$\begin{array}{r} 80 \\ 20 \\ \hline 280 \end{array}$$

III. To find the area of a rhomboides.

Divide it into two triangles by a diagonal drawn between either pair of the opposite angles, then from either of the other angles let fall a perpendicular upon that diagonal, then shall that diagonal, being multiplied by that perpendicular, give the area.

Example.

19 rods the diagonal.

5 rods the perpendicular.

$$\begin{array}{r} 95 \text{ square rods the content.} \end{array}$$

IV. To find the content of a trapezium.

Fig. 10. Divide it by a diagonal into two parts from angle to angle, as the trapezium, Probl. 12. is divided by the diagonal H L; then from the other two angles, which in that figure are marked with K and Q, let fall perpendiculars upon the diagonal, half the sum of those perpendiculars being multiplied by the diagonal, or common base, gives the superficial content.

Example.

Suppose in the trapezium before-mentioned the diagonal is 33, the perpendicular from K 13, and that from Q 15, the area or superficial content is thus computed:

13 chains the first perpendicular.

15 the second perpendicular.

28 the sum of both perpendiculars.

14 their half sum.

33 the diagonal.

$$\begin{array}{r} 42 \\ 42 \\ \hline 462 \text{ square chains the area.} \end{array}$$

V. To find the content of a regular polygonal, or multangular figure, otherwise called multilateral.

Draw a line from the center to the middle of any side; half of the perimeter, or of all the sides, being multiplied by that line before-mentioned, gives the content.

VI. To find the content of an irregular polygon; or many-sided figure.

Divide it into trapezia and triangles by diagonals, then find their content severally, and sum up all together.

Fig. 12. Suppose the polygon belonging to the last problem were given without the diagonals A B and B P; then by drawing those diagonals, the figure is divided into three triangles whereof two being upon the same base A B, make up a trapezium, whose content may be found just in the same manner as was taught even now in the fourth rule, having found the perpendiculars from O and P falling upon the line A B. Then there remains the triangle B Q P, whose content may be found by the general rule concerning triangles, having found the perpendicular falling from Q on the line B P; and then having added the content

content of that triangle to the content of the trapezium, you have the area of the whole polygonal figure.

Concerning chains, compasses, and scales.

I. Amongst the many sorts of my chains used for measuring land, three are most famous, bearing the names of their inventors, Mr. Rathborne, Mr. Gunter, and Mr. Wing, all of them ingeniously divided, and useful in their kind; but brevity will give us leave only to describe one, and that shall be Mr. Gunter's, being most in use, and easy to be procured.

This chain contains in length 4 statute-poles or perches, each perch containing 16 feet and a half, or five yards and a half; so that the whole chain is 66 feet, or 22 yards long.

The whole chain is divided into 100 equal parts or links, whereof 25 are a just pole or perch; and for ready counting, there is usually a remarkable distinction by some plate or largening at the end of every 25 links, but especially at the precise middle of the chain, which should differ from the rest in greatness and conspicuousness. Also at the end of every tenth link, it is usual to hang a small curtain ring; and if there be at every five links end a piece of wire made like the bow of a link, with a little shank an inch or less long, or some such distinction, it is still better.

When you are to measure any line by this chain, you need to regard no other denomination but only chains and links, set down with a prick of your pen between them; e.g. If you found the side of a cloie to be 6 chains and 35 links long, it is thus to be put down, 6.35.

But if the links be under 10, a cypher must be prefixed; so 7 chains 9 links must be thus set, 7.09.

In the using of this, or indeed of any chain, care must be taken both to go straight, and to keep a true account; for which purpose, it is good that he who goeth before, carry in his hand a bundle of rods, to stick down one at the end of the chain which leads, having first stretched it well, and that he who follows do not only gather up the rods to keep the account, but also at every remove, mark whether he sees the leader directly between his eye and the angle, or other mark he aims to measure to; and if need be, call to the leader to move towards the right or left hand, till he sees him in a direct line it.

II. Compasses are so well known, that we need not describe them; only they should be of brass, with steel points, small and neatly wrought, nine or ten inches long from the joint to the points, turning so truly upon the rivet, that they may be easily opened, and yet stand so firmly, that an arch or circle may be, without their shrinking, described upon a large radius.

III. Scales are certain lines divided into equal parts, upon plates or broad rules of brass or box, and they are of two sorts: 1. Plain. 2. Diagonal.

1. Plain scales are made up of two small lines parallel to one another at a little distance, and these are divided into great equal parts, which signify tens, and are noted 10, 20, 30, 40, 50, &c. according to the length of the lines.

They may be of any convenient length, but these great divisions are seldom more than inches, or less than third parts a piece.

Again, one of the great divisions is subdivided into ten equal parts by short lines, whereof that in the middle standing for 5, is longer than the rest.

Fig. 13. According to the numbers of these little parts contained in an inch, the scale is named, A, scale of 10, 11, 12, 16, 20, 24, 30, &c. in an inch. That short one which we give you the figure of A, is of 10 in an inch, so noted at the top, according as is usual upon the rules, and indexes of plain tables. The line marked O Q, separates units and tens; units being taken upward from that line, and tens downward; mixt numbers both ways.

As for example.

7 Is the extent of the compasses upon the scale A from the line O Q to K; 30 is their extent from the line so marked to O Q; and 27 is their extent from the line 20, to the short line K aforesaid.

Here note, that you must not expect to find the letters O Q or K upon the scales which you buy, being only marks used at pleasure, to make our meaning plain; and likewise that this scale of 10 in an inch, and others that are smaller are usually made, for more convenient use, so long as to con-

tain nine or ten of the great divisions, signifying tens; though the figure at A being designed for no other use than to help our conceptions, extends but a little beyond 30, that length being sufficient for my purpose in this place.

Fig. 14. These plain scales, especially the smaller sorts of them, such as 24 or 30 in an inch, are very proper for drawing figures upon paper, where the numbers represented by the lines are not above 100, for then every division may be counted as it is upon the scale, or above upon a long scale.

Also in the surveying of forests, chafes, and great commons, where the lines are vastly long, and the mistake of a few lines is not considerable, they may be conveniently used, accounting the tens and units to signify so many whole chains, and so estimating the parts of a chain with the compasses upon the small divisions, which a sagacious man may do very near upon one of the larger scales. But it would be much better for ordinary measuring, if the grand divisions of the scale were two inches apiece, for then the smaller divisions being of five in an inch, would be so large as to be sub-divided into five a-piece, which represents 20 links; and then the half one of those smaller divisions signifying 10 links, and the quarter 5, a very ordinary judgment may come very near to the truth by estimation.

2. But the diagonal scale is so well known to every mathematical-instrument-maker, so easy to be procured, and every way so fitted to Gunter's chain, that we cannot but highly commend it.

It is made, as appears by the figure B, upon eleven parallel lines equidistant, so as to include ten equal spaces, which are all cut at right angles by transverse lines dividing them all into four equal parts.

One of these transverse lines, viz. P R, where it toucheth the first and last lines, separates between the hundreds, or whole chains, and the tens representing 10 links apiece, the chains being numbered downwards on the left hand from P only to 3, but on the instrument itself they may go on to 9 or 10, but the tens upward from P to 10.

From the points of division into tens upon the first line, beginning at P, to the like points beginning at R in the last line are nine diagonal lines drawn, the first beginning at P, and ending at the first division above R. The second beginning at the first division above P, and ending at the second above R. In a word, they are all drawn from one division less from P, to one more from R; by which it comes to pass that every diagonal, by that time it hath passed from the first line to the eleventh, is a whole tenth part of an inch, which answers to ten links of the chain, farther distant from the line P R than at the points upon the first line whence it was drawn.

Every one of those diagonals is divided into ten equal parts by the long parallel lines running through the whole scale, and numbered on the top from 1 to 9. Whereby it is evident that the intersection of any of the nine parallel lines that are numbered at the head with any diagonal, must be farther distant from the line P R than the intersection of the line next before it with the same diagonal by $\frac{1}{10}$ of $\frac{1}{10}$, that is, by $\frac{1}{100}$, which answereth to a single link of your chain.

From what has been said, and inspection of the figure B, these things plainly follow; which, as so many clear instances, will help you to understand it fully.

The distance from P R, to the second division below it, answereth to two chains.

The distance from P R, to the eighth division upward, being taken (with compasses) upon the first line of the eleven from P to 8, answereth to 80 links.

Consequently the extent of the compasses from the second grand division below P, to the eighth of the less divisions upward, is proportionable to 2 chains 80 links.

The distance from P R to the first diagonal being taken upon the parallel line, noted with 9 above, answereth to 9 links: where note, that the first diagonal is not that which is noted with 1, but that which is drawn from the point P.

The distance upon the same line from P R to the diagonal that is marked with 7, is answerable to 79 links.

The extent of the compasses from the bottom of the figure upon the same line to the same diagonal, answereth to 3 chains 79 links.

In short, whole chains may be measured upon any line from P R, to the grand division noted with the given number,

number, decads alone, or chains and decads upon the first line of the eleven where the diagonals begin. Links alone, decads with links, and chains and decads with links, always upon that line upon which the number of the odd links stands at the head of the scale.

N. B. These directions will as well fit, if half an inch be only allowed for a chain, and consequently all the diagonals drawn within that extent, as is usual upon the other end of the same rule, the grand division for chains going the contrary way, and noted with numeral figures in order. It is therefore proper when you furnish yourself with scales, to have diagonal scales of both dimensions on the fore-side of your rule, and upon the back-side many plain scales of equal parts, with a line of chords.

How to cast up the content of a figure, the lines being given in chains and links.

Having described these plain instruments, and in some measure shewed the use of them in several instances, it were very proper in the next place to teach their joint use in measuring and protracting; but because we would have our young surveyor, before we take him into the field, able to perform his whole work together, we intend to shew him,

1. How he ought to make his computations; 2. The grounds or principles that will justify him in so doing.

For the first, take these rules:

1. Put down your length and breadth of squares and oblongs, and your base and half perpendicular of triangles directly under one another, expressed by chains and links with a prick betwixt them, as was taught before.

2. If the odd links were under ten, put a cypher before the numeral figure expressing them, (as there also was shewed) and if there be no odd links, but all even chains, put two cyphers after the prick.

3. Multiply length by breadth, and base by the half perpendicular, according to the rules for finding the content of figures.

4. From their product cut off five figures, accounting cyphers also for such, reckoned from the right-hand backward, with a dash of your pen, so shall those to the left hand signify acres.

5. If those five cut off were not all cyphers, multiply them by four, and cutting off five towards the right hand again, the rest will be roods or quarters.

6. If amongst these five figures towards the right hand that were cut off at the second multiplication, there be any figures besides cyphers, multiply all the five by forty, and cutting off five again by a dash of your pen, those on the left hand signify square perches, poles or roods.

A few examples will make all plain.

Quest. 1. *What is the content of a square, whose sides are every one of them 7 chains, 25 links?*

Length	7. 25.
Breadth	7. 25.
	<u>36. 5</u>
	1450
	<u>5075</u>
	5,25625
	<u>4</u>
	1,02500
	<u>40</u>
	1,00000

Ans. 5 acres, 1 rood, and 1 perch, as here appears.

Quest. 2. *In a long square whose length is 14 chains, and the breadth 6 chains 5 links, what is contained?*

Length	14.00
Breadth	6.05
	<u>7000</u>
	84000
	<u>8147000</u>
	4
	<u>188000</u>
	40
	<u>3520008</u>

Ans. 8 acres, 1 rood, and 35 perches, as the work makes it evident.

Quest. 3. *In a triangle, whose base is 3 chains, and half the perpendicular 98 links, what is the content?*

The base	3.00
Half perpend.	0.98

	<u>2400</u>
	2700
	<u>129400</u>
	4
	<u>117600</u>
	40
	<u>7104000</u>

Ans. 0 acres, 1 rood, 7 perches.

There are other ways of computation by scales, tables, &c. But that this is demonstrative, will appear by the following steps:

1. It is evident, that in this way of multiplication, the product is square links; for every chain being 100 links, it is all one to multiply 7.25 by 7.25, or 725 by 725 without pricks; for the pricks signify something as to conceptions, but nothing at all in operation. The product therefore of the first example was really 525625 links.

2. Every chain being 4 perches long, it follows that 5 chains, or 20 perches in length, and 2 chains, or 8 perches in breadth, make an acre, or 160 square perches; for 20 being multiplied by 8, gives 160.

3. From hence it plainly follows that there are exactly 100000 square links in an acre; for 5 chains multiplied by 2, is the same with 500 links by 200, which makes 100000. And he does not deserve the name of an arithmetician, that is ignorant of this old plain rule, when the divisor consists of 1 and cyphers, as 10, 100, 1000, 10000, 100000, &c. cut off from the right hand so many figures of the dividend as the divisor hath cyphers, accounting them the remainder; so shall the rest on the left side be the quotient. It is plain then that 525625 square links, make 5 acres, and 25625 square links over.

Thus we have made it clear to a very ordinary capacity, that as far as concern acres, the rules for computation are good. Now for roods and perches, though it might be sufficient to mention that known rule in decimal arithmetic, multiplying decimal fractions by known parts, gives those known parts in integers, due regard being had to the separation, we shall proceed thus: if 25625 square links, which remain above an acre, contain any quarter or quarters of an acre, then, if they be multiplied by 4, and divided by 100000, that is, five cut off from the product, they will contain so many acres as now they do quarters, or roods; for any number of quarters multiplied by 4, must needs produce the like number of units or integers, and the division only reduces them into the right denomination. Now, 25625 being multiplied by 4, and five figures being cut off from the product, the result is, 1,02500, that is an acre and above; which shews it was above a quarter before it was multiplied by 4.

And to find how much, that is, how many square perches are contained in this last remainder, you must consider this 2500, not as square links remaining above the rood or quarter, but as four parts or quarters of square links, or, which is all one, as the true number of square links multiplied by 4, and consequently being multiplied by 40, the fourth part of square perches in an acre, it must as often contain 100000 square links, or an acre, as the quarter of this number 2500, viz. 625, signifying square links, containing square perches; and so for 100000 divided by 160, the number of perches in an acre, gives 625, answering to one perch; and 2500 multiplied by 40, gives 100000, or one acre, the five cyphers being cut off.

2500	160	100 000625
<u>40</u>		<u>960</u>
100000		400
		<u>320</u>
		800
		<u>800</u>

How to measure a close, or parcel of land, and to protract it, and give up the content.

Hitherto we have been like children learning to spell, now let us set our syllables together : that is, let us make use of the instructions before given to measure a piece of land, to plot it, and to cast up the content.

All closes, or parcels of land, are either such as need not be plotted for finding their true measure, but the chain alone doth the work ; or such as cannot be conveniently measured without plotting or protraction.

Of the first sort are the square and long square, known before-hand to be such, or found so to be by such instruments as are not yet described, or by measuring all the sides and diagonals. These squares and long squares need no protracting ; for you need only to multiply the chains and links of the length by the chains and links of the breadth, and so proceed as in the first and second examples : but all others, whether triangles or triangulate, are to be protracted. We shall give examples therefore in the three sorts of figures, triangular, quadrangular, and multangular.

But before we proceed to particular instances, let the young practitioner remember,

1. To begin at some notable angle of the field where there is some house, gate, stile, well, or the like ; or if there be none, then to dig up a clod, drive down a stake, or at least, to observe what quarter of the heavens it pointeth towards, whether east, west, north, or south, and on your paper mark it with the letter A, or any other.

2. To go parallel to the side of the field, if pits, bushes, or the like, hinder not, and if they do, to allow for it, accustoming yourself to go either with your left hand towards the hedges, walls, or pales ; or with your right hand towards them : and when you go contrary to your usual custom, note it on your paper by some mark known to yourself.

3. To set down the chains and links of every side as you measure them, and trust not your memory. A black lead pencil will be very proper for this purpose.

4. To take care, if you have more scales than one upon your rule, lest you confound yourself by taking lines off of several scales, or measuring perpendiculars upon wrong ones ; for every line of the same figure must be made by the same scale, and the perpendiculars measured by it.

5. To make use of a scale of larger divisions when you measure small closes, and of smaller when you measure great ones.

6. To make your lines and points where angles meet, small, pure and neat.

7. To set on your chains and links at twice, when any line is too long for your scale.

These things being premised, proceed thus :

I. Suppose a triangular field is to be measured with the chain, beginning at the eastern angle A, fig. 15, and find the sides in their order and measure to be severally thus ; 2.29, 3.54, 4.07.

Making use of the less diagonal scale, because the other would make the figure too large, otherwise it were more proper for so small a close, with your compasses to take off the scale 4 chains and 7 links, and setting them from A to C, draw that line for the base, because the longest of the three ; then take 2 chains 29 links off the same scale, and set them in the eastern point, A, and turning the loose foot of the compasses above the line A C, describe, at that distance 2.29, the arch E E.

Next taking with your compasses upon the same scale the extent of 3 chains 45 links, place one foot in the point C, and with the other make the arch F F, intersecting the former in the point B ; and drawing the lines A B and B C, the triangle A B C is the plot of the triangular field measured.

But before you can give the content, you must find the length of the perpendicular, which is done by setting one foot of the compasses in B, and extending the other to the base A C, so as to touch it, and pass not over it, for then the length of the perpendicular is between the points of the compasses, and being applied to the same scale by which the triangle A B C was made, it appears to be 1 chain 42 links. With the half whereof multiply 4.07, the length of the base, the content appears to be 0 acres, 1 rood, 6 perches.

The base 4.07
Half perpend. 0.71

4.07
2849
28897
4
115588
40
6.23520

II. Suppose you are to measure a quadrangular or four-cornered field, begin as before at some remarkable angle ; and going round the close, find the sides to be 9.04, 6.72, 8.46, 7.28, and the diagonal from that remarkable angle to the opposite angle to be 10.02 ; we begin to protract it thus :

Fig. 16. Having by the help of your scale and compasses drawn the diagonal 10.02, from the remarkable angle A to C, the opposite angle, make a triangle of it, and the first and second sides 9.04 and 6.72, and another after the same method of that diagonal, and the third and fourth sides 8.46 and 7.28, so you have the trapezium ABCD.

Then by the help of your scale and compasses, you find the perpendicular of the triangle A B C to be 6.02, and of the other, viz. CDA 6.01, which added, are 12.03, whereof the half sum is 6.01 ; by which, multiplying the base 10.02, the content of the field will be 6 acres, 0 roods, 3 perches.

The base 10.02
Half perpend. 6.01

1002
60120
602202
4
108808
40
3152320

Before we pass any farther, let it be remembered,

1. Any quadrangular close, or parcel of ground whatsoever, having right lines, may be thus measured, protracted, and computed.

2. The odd measure above perches, is not valuable here, nor in the former computations, being always under a square perch ; but in multangulars, where there be many remainders, they must be summed up, and the perches contained in them added to the content before found.

3. This last, and the following figures, are made, that they might not be too large, by a scale of 400 in an inch, i. e. by the less diagonal scale, each chain and link being counted two.

III. Fig. 17. If this multangular figure be conceived to represent a close of seven sides, which is to be measured, begin at the remarkable angle A, and going round the close, find the sides will be 3.11, 2.49, 2.47, 1.77, 4.11, 2.29, 4.37.

Then measure the four diagonals, B D, D F, F B, and B G, in the order you will find them to be 3.45, 4.97, 4.13, and 4.36, which is as short a way as can be taken, to prevent unnecessary walks.

But when you come to protract by the help of your scale and compasses, first make the triangle B C D of the first diagonal, and the second and third sides. Then the triangle D E F upon the second diagonal, and fourth and fifth sides ; and upon same diagonal as a common base the triangle B D F of the first, second, and third diagonals.

Next of the same third diagonal, together with the 4th and 6th sides, make the triangle B F G, and upon the 4th diagonal, as upon a common base with the first and last sides, the triangle A B G. So is the whole close plotted.

And now it stands visibly reduced into two trapezias A B F G and B D E F, together with the triangle B C D, which we shall not now cast up, having so often shewn how such work is to be done.

But

But it must be acknowledged that this method of plotting parcels of land that have many angles, requires not only more care and pains, but greater skill and memory than to draw diagonals upon paper, when the plot is already taken by the plain table, or other standing instrument. We shall therefore, to help our young practitioner in this case, advertise him of two easy ways to help himself, so as to be out of danger of mistakes.

One way is, to divide the multangular field into two or more parts, as the last might have been by the diagonal B F; then might each part have been measured severally, as if they had been separated by a pale, or where sundry men's lands parted by a boundary.

Another way that much helps both the understanding and memory is, to draw a rude draught of the figure of the land you intend to measure, not only as to the sides, but also necessary diagonals. Then measuring the lines upon the ground correspondent to those on the paper, set the lines as you measure them upon the lines of the draught, as if it were the true ones, and when you have finished your measuring, protract it truly. Such as you see here, but it is better larger, to do your business; for it is not a pin matter how rude or false the lines or angles be, resemblance being all that is desired.

Concerning the measuring of circles, and their parts.

We have hitherto purposely abstained from the meddling with the circle and its parts, that we might lay those things close together without unnecessary mixtures, that are of greatest use.

It is very rare if a land-meter ever has occasion to measure any field or parcel of land, that will prove either circle, semi-circle, quadrant, or sector. Sometimes indeed there will be a little crook in an old hedge bowing like an arch; but we have never seen any offer to measure it as a segment, but always take it as an angle or angles.

Yet because it may be expected we should say somewhat of those things, we shall briefly do it.

I. To measure a circle in the more exact way, is, to square the diameter, and to multiply that square by 7854; so shall the content be in integers and decimals.

But the more usual and quick way, (and near enough for any use we shall make of it) is, to multiply the half of the periphery or circumference by the semi-diameter.

In like manner to find the content of a semicircle, quadrant, or sector, made up of semi-diameters, and arched lines, multiplying the half arch by the semi-diameter, gives the content.

Fig. 19. But that which falls out most frequently in mensuration, though seldom much regarded, except where a curious exactness is required, is that particular sort of segment which we call a section, less than a semi-circle, such as the figure A B C. And to find the content of it, the center of the circle, whereof this is a section, must be first found, as here at O, from which lines drawn to A and B, make up the sector A O B C: which being measured according to the last rule, and from the content thereof, the content of the triangle A O B subtracted, the difference or residue is the content of the section A B C.

But two questions may be here demanded:

1. How may the center be found? 2. How may such a portion of land be truly protracted and computed?

To the first we answer, that the most exact and artificial way is, by making a mark any where in the arch.

As for Example.

At the point C, and then, by a problem known not only to every surveyor, but to ordinary carpenters and joiners, for finding the center of a circle, whose circumference will pass through 3 given points that are not in a right line, as A C B, to find the center O. But if you know not how to do it so, cross the line A B in the middle, as here it is done by the perpendicular O C; so you may by a few trials find both the true extent of your compasses, and the point in the perpendicular that will fit your purpose near enough; for if a little error be committed in making up the sector, the most of it goes off again in the subtraction of the triangle.

II. For the latter, you may take this ready course: measure the length of both your lines, the chord and the arch, and their distance at the middle of them both; then when you come to protract, first take the length of your right line from the scale, and having laid it down, cross it

in the middle at right angles with a dry line, as in the last figure, so shall it intersect the line A B in the point E; then from the same scale take the measured distance between the two lines in the middle, and set it upon that dry line from the intersection at E, to the point C. Then, by trials, find a due place in the dry line O E C, and such a distance with you compasses, that the one foot resting in the line, the other may be described the arch A C B, and the section is protracted.

Concerning customary-measure, and how it may be reduced to statute-measure, &c contra, either by the rule of three, or a more compendious way by multiplication only.

Though the statute-perch or pole is 16 feet and a half, and no more, yet there are poles of larger measure used in many places, as of 18, 20, 21, 24, and 28 feet; nay, in some 22 feet and a half. It were therefore very convenient that our young surveyor were furnished with a chain fitted to the customary measure of the country where he lives. But because these are too large and cumbersome for small closes, it is very convenient, instead of one chain of 100 links, to make two of 2 poles a piece, each pole divided into 25 links, as that of 100 is; which two half chains may, in measuring large fields, be tied together by the loops with pack-thread, or joined by a buttoning key-ring for more speedy dispatch; but in smaller we may use the half chain of 50 links, only taking care that we count not half chains for whole ones.

And in these cases where the poles are large, and the closes small, it were still more convenient if you had a chain of 2 poles only, divided into 100 links. Only you must then take notice, that whereas working by whole chains and links, the first multiplication, after five cut off, gives the content in acres and parts. The like work by half chains and half links, will give the content in roods or quarters of acres, and parts of such roods.

But though it is no hard matter, for one that can find out the length of a link by dividing the number of feet in a chain by 100, and provide himself of good iron wire and curtain-rings to make it of, and a sharp edged-file, and round nosed plyers to make it with, to be furnished with such a chain; yet because every one cannot do this, we shall shew how you may easily, and yet very truly, reduce statute-measure into customary, that so the chain before described may do your business all England over.

Know therefore, for a ground to go upon, that acres bear proportion to one another as the square of their poles; and therefore if you multiply 33, the number of half feet in the statute-pole, by itself, which gives 1089, and also multiply the number of half feet contained in a pole of that measure you would reduce into; in the same manner you may, by the rule of three reverse, obtain your desire, making to that purpose 1089 the first number, the statute-measure the second, and the squared half feet of the pole given the third. As for example: suppose of a close measured by the statute pole, the length and breadth, and their product be as here

9.33L.
7.21B.

933
1866
6531

prod. 672693

represented in the margin. And it is desired that the content may be cast up according to the large Cheshire measure of eight yards, or 24 feet to the pole or rod. Then before you cut off any figures, consider that in the statute-pole are 33 half feet, and in the Cheshire pole 48; multiply therefore 33 by 33, and 48 by 48, and you will have 1089, and 2304, which, together with the said product, may be thus placed: 1089, 672693:: 2304, and so multiplying 672693 by 1189 and dividing their product, being 732562677 by 2304, the quotient is 317952; from which, if 5 figures towards the right hand be cut off, the content, by this customary-measure of 24 feet to the pole, will be 3 acres, 0 roods, 28 perches, as here appears:

3|17952

4

171808

40

28|72320

But if the lines on the land had been measured according to that custom of 24 feet to the pole, and the content must have

have been found according to statute-measure, then we must have multiplied the product by 2304, and have divided that latter product by 1089. And in the same method you may proceed in all or any of the rest. But the truth is, that though this may be very exact, plain, and comprehensive, suiting all the customary measures before-mentioned without fractions, it is something tedious, except the practitioner knows how to relieve himself by a large table of logarithms, which we cannot stand here to treat of. Therefore, to contract the work a little, take notice, that all the customary poles being mentioned, saving only those of 20 and 28 feet, which we suppose are somewhat rarely used, having never heard nor read of them, but in Mr. Holwell; all the rest are capable of being divided into half yards: and therefore, if instead of squaring the half feet, you square the half yards of both poles, and work with them, you will attain the same end without any regardable difference, the small diversity that there is, being generally in the useless remainders, not at all affecting the desired quotient that gives the answer near enough for use.

As for Example.

If we had squared 11, the number of half yards 11 in the statute-pole, which would make 121, and also 16 the number of half yards in the Cheshire pole, which would make 256, and then multiplied the first product 672693 by 121, the second product would have been 81319853, which being divided by 256, the quotient would have been as before 317952. And this way is in a manner co-incident with Mr. Holwell's first method.

Take notice also once for all, that whether you use either of these or the following methods, you need not reduce the particular squares, triangles, or trapezia's severally; but sum up all their products together and then reduce all at once.

But if you would reduce statute-measure into customary by multiplication only, take notice of this present table following:

The content by the statute-pole being multiplied by	$\left\{ \begin{array}{l} .84027 \\ .68062 \\ .61734 \\ .53777 \\ .47265 \\ .34725 \end{array} \right\}$	Gives the content by the pole of	$\left\{ \begin{array}{l} 18 \\ 20 \\ 21\frac{1}{2} \\ 22 \\ 24 \\ 28 \end{array} \right\}$	Feet
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The use of this Table.

When you have multiplied lengths by breadths, or bases by half perpendiculars, multiply these products by the decimal fractions answering to the customary-measure, into which you would reduce statute-measure, and from that latter product, first cut off five places towards the right hand, as not to be regarded, being only parts of a square link, then cutting off five more, and proceeding to multiply by 4, and then by 40, as hath been often shewn, you will have the content by that customary-measure.

Example.

Suppose the length of a close measured by Gunter's chain and multiplied by the breadth measured also by the same, produced 672693 square links; and it is desired that the content may be given in Cheshire measure of 24 to the pole; you must multiply 672693 by 47265, 317948 the decimal fraction answering to 24 feet, and 4 from that product, being 31794834645, cut off and cast away 5 places, and the rest being 171792 317948, are in the usual way easily reducible 40 into 3 acres, 0 roods, and 28 perches, as here appears, agreeable to what it amounted to in 2871680 the former method.

But if you measured by a chain of customary-poles, and desire to know what the content is in statute-measure, this following table is for your purpose.

Feet.	18	1.19008
The content measured by the pole of	$\left\{ \begin{array}{l} 20 \\ 21 \\ 22\frac{1}{2} \\ 24 \\ 26 \end{array} \right\}$	being multiplied by $\left\{ \begin{array}{l} 1.46921 \\ 1.61983 \\ 1.85950 \\ 2.11570 \\ 2.87970 \end{array} \right\}$ gives the content by the statute-pole.

To understand which, take this example.

Suppose the length and breadth of a long square being measured by a chain of 24 feet to the pole, and multiplied together, make their product 317952, let this be multiplied by 2.11570, which answereth to 24 feet, and the latter product will be 67269104640; from which, if you cut off and cast away 5 places towards the right hand, the remainder is 672691; which, in the usual way, is easily reduced to 6 acres, 2 roods, and 36 perches.

One thing more, and we have done with this business of reduction. If the content to be reduced be cast up into acres, roods, and perches, reduce all into perches, and then in other respects work as before, either by the Rule of Three, or by this last method of multiplication only. So shall you have the content in square perches, according to the measure desired, which you may reduce into acres by dividing them by 160; and if any thing remain, that remainder being divided by 40, will give you the roods in the quotient, and the latter remainder the number of square perches.

For trial of which rules, remember the answer of these two following questions wrought all three ways.

Quest. 1. How many acres, roods, and perches according to the pole of 18 feet, contained in 5 acres, 3 roods, and 11 perches statute-measure?

Ans. 4 acres, 3 roods, and 22 perches, as here appears.

I. Method.

A.	R.	P.
33	36	5 : 3 : 11
33	36	4
99	216	23
99	108	40
1089	1296	423
1089 . 931 :: 1296		
1089		
8379		
7448		
9310		
1013859		
1296)1013859(782		
2072		
10665	160) 982 (4	
10368	640	
2979	40) 142 (3	
2592	120	
387	22	

II. Method.

11	12	121 . 931 :: 144
11	12	121
11	24	931
11	12	1862
121	144	931
144)		112651 (782
		1008
		1185
		1152
		331
		288

160) 782 (4	Or, thus	43
640		40) 782 (19
40) 142 (3		40
120		382 4) 19 (4
22		360 16
		22 3

III. Method.

SUR

III. Method.

84027
931
84027
252081
756243
782.29137

160) 782 (4
640
40) 142 (3
120
22

Quest. 2. How many acres, roods, and perches of statute-measure, are contained in 8 acres, 3 roods, or (or quarters) and 21 perches of 21 feet to the pole?

Ans. 14 acres, 1 rood, and 21 perches, as appears by the three following works in the several methods.

I. Method.

A. R. P.		
8 : 3 : 21	42	33
4	42	33
35	84	99
40	168	99
1421	1764	1089
1764 : 1421 :: 1089		
1764		
5684		
8526		
9947		
1421		
1089) 2506644 (2301		
2178		
3286		
3267		
1944		
1089		
855		
160) 2301 (14		
160		
701		
640		
40) 61 (1		
40		
21		

II. Method.

14	11	196 : 1421 :: 121
14	11	196
56	11	8526
54	11	12789
196	121	1421
		221) 278516 (2391
		242
		365
		363
		216
		121
		160) 2301 (14 95
		160
		701
		640
		61
		40) 61 (1
		40
		21

SUR

III. Method.

1.61983	160) 2301 (14
1421	160
161983	701
323966	640
647932	40) 61 (1
161983	40
2301.77843	21

How to measure a piece of land with any chain of what length soever and howsoever divided; even with a cord or cart-rope, being a good expedient when instruments are not at hand of a more artificial make.

If you can procure a chain, and find it is not divided as before hath been shewn, but into feet or quarters of yards, or any such vulgar divisions, make no reckoning of the divisions at all, but measure it as exactly as you can find out the true length of the whole chain; and if it fit none of those lengths mentioned before, nor any of their halves, make it fit by taking off a link or two, or piecing it out with a string; then dividing the length of that chain by 100, or the half of it by 50, find the true length of a link according to our artificial divisions, and having got a long stick or rod, set as many of those link-lengths upon it as it will hold; then may you measure all the whole chains by your regulated chain, and the odd links of every line by your divided stick or rod, as is manifest in this example following.

Being far from any instrument, and requested by a friend to measure him a close, you must procure a pair of compasses, an ordinary carpenter's rule of two feet, divided into inches and quarters, and also with a piece of an old chain seemingly divided into feet, measure it by the rule, and finding it to be 45 feet long, and some odd measure, piece it out with a pretty strong cord that will not stretch much, to 48 feet exactly; then will it serve for half a chain of 24 feet to the pole: this 48 multiply by 12, the number of inches in a foot, and that product being 576, divided by 50, the number of links in half a decimal chain, and the quotient is 11.52 inches, or 11 inches and an half, and a trifle over: dividing therefore a long stick throughout into such parts, each containing 11 inches and a half, besides the breadth of the nicks, you are provided of tools to measure lines to a link with exactness enough.

In like manner you proceed with a cord or rope, having fitted them to some known length or other: and then for protracting, it were easy with the compasses to make a plain scale of a large sort, either upon paper or an even piece of wood. This for once may serve a man's turn well enough.

Besides, there is a way of measuring the perpendiculars of triangles and trapezias upon the ground itself, so as prevent the necessity of a scale; for if you have a little square with a hole in it to turn upon the head of a little stick, which you may fix where you please, as you are measuring the base of a triangle, or the diagonal of a trapezium, you may by a very few trials find the place where the one leg will be just in the line you are measuring, and the other point at the angle from which the perpendicular falls on it; and then the space between your stick and that angle, truly measured, is the perpendicular.

If you have not such a square, a square trencher, or any end of a board that hath one right angle, and two true sides, will supply the want of it.

And we shall make bold to add, that this is a good way to measure a trapezium, though it be protracted afterwards; for by measuring the perpendiculars as aforesaid, and observing at how many chains and links end the said perpendiculars meet the common base, the whole trapezium may be truly protracted without going about it; this little square competently supplying the place of a instrument, which is usually called a cross or square, made up, as it were, of two small indices, like those for a plain table, but much less, with four-sights and back-sights; and cutting one another at right angles put together; and having an hole in the center.

Concerning dividing of land artificially and mechanically.

I. To divide a triangle into any parts required; divide
7 M the

the base as the demand imports, then shall lines drawn from the points of division to the opposite angle, finish the division of the triangle.

Example.

Fig. 20. A C, the base of the triangle A B C, being divided on 12 equal parts, a line drawn from the angular point B to the point 6, divides the triangle into two equal parts; 2 lines drawn to 4 and 8, divide it into three equal parts; two lines drawn to the points noted with 3, 6, and 9, divide it into four equal parts; and so lines drawn to 2, 4, 6, 8, and 10, divide it into six equal parts.

Also it is very obvious, that if the same triangle were so to be divided, that the one part should be double to the other, a line drawn from B to 4 or 8, doth the work, or if it be required to divide into two parts, so as the one shall be triple to the other, a line drawn from B to 3 or 9, completes the work. So also a line from B to 2 or 10, divides it into two parts, whereof the one is quintuple, or five-fold, to the other, and a line from B to one or 11, divides it into two parts, whereof the one is 11 times as large as the other.

Farther yet, if it were required this triangle should be so divided that the two parts should in quantity bear proportion as 5 and 7, a line from B to 5 or 7, will answer the intention.

The divisions will indeed be sometimes a little more intricate than this, yet no such, but that the seeming difficulty may be easily overcome by observing the following method:

Suppose a large triangle of common land to be divided amongst three tenants, A, B, and C, according to the quantity of their tenements, A, having 19 acres of land to his tenement, B 13, and C 7, the base of the triangle being found by measure to be 17 chains and 17 links; and the demand is, where the point of the division must be placed in the base, so as lines drawn from thence to the opposite angle, shall truly limit each man's part.

To answer this, let us add 13 and 07 to 19, and they give 39, so is the work plainly reduced to the rule of fellowship; and therefore to find every man's distinct portion, we need only to multiply the base by his particular number; and divide that product by 39, the sum of all their numbers.

$$\begin{array}{r} \text{A} \\ 29 \cdot 17.27 :: 19. \\ \hline 19 \end{array}$$

$$\begin{array}{r} 15543 \\ 172 \\ \hline \end{array}$$

$$\begin{array}{r} 39) 32813 (841\frac{1}{3} \\ 312 \\ \hline \end{array}$$

$$\begin{array}{r} 161 \\ 156 \\ \hline \end{array}$$

$$\begin{array}{r} 53 \\ 39 \\ \hline \end{array}$$

$$\begin{array}{r} 14 \end{array}$$

$$\begin{array}{r} \text{C} \\ 39 \cdot 17.27 :: 7 \\ \hline 7 \end{array}$$

$$\begin{array}{r} 39) 12086 (309\frac{1}{3} \\ 117 \\ \hline \end{array}$$

$$\begin{array}{r} 389 \\ 351 \\ \hline \end{array}$$

$$\begin{array}{r} 38 \end{array}$$

From these operations it is plain that if we set off from the angular point where the base begins, 8 chains, 41 links, and a little above the third part of a link upon the base for A, and were that ends, 5 chains and 75 links and $\frac{1}{3}$ of a link for B, and consequently leave between this second division and the other end of the base 3 chains and almost 10 links for C; lines drawn from those points of division to the opposite angle, will give each man his due.

What has been said touching the division of triangles upon their bases, will, with a little variation, serve for the

dividing of all sorts of parallelograms, whether squares, long squares, rhombuses, or rhomboides; all the difference is, that, instead of drawing lines from points in the base to the opposite angle, you must draw parallel lines from points in one opposite side to another, as will be sufficiently plain by this one instance.

Fig. 7. Suppose the square figure to represent a close of six acres, and you are to cut off an acre at the side A C; having set off the 6th part of the line C D, from C towards D, and also from A towards N, a parallel drawn between those points, take off exactly a 6th part of an acre.

If it be not thought convenient, as in some cases it is not, to cut off a piece so long and narrow, you may by the Rule of Three find what other length of any greater breadth will limit an equal quantity to it. Or you may multiply the breadth by 2, 3, or any other, and divide the length by the same number that you multiplied the breadth by. Or lastly, if you set out a double proportion that is $\frac{2}{3}$ or $\frac{3}{2}$, from C towards D, and from the point where it falleth draw a line to the angle A, you will have a triangle equal to $\frac{1}{6}$ of the square A C D N.

But to return to triangles, the most simple and primitive of all rectilinears, and therefore the most considerable in this case of partition, as giving laws often to the rest, it may fall out that a triangle must be divided, by a line from some point in a side, so as that line may either be parallel to some other side, or not parallel to any.

Fig. 21. Let A B C be a triangle given, and it is required to cut off $\frac{1}{3}$ by a line parallel to A B. First, on the line A C describe the semi-circle A E C, whose diameter C A divided into five equal parts according to the greater term, upon three of those parts, the lesser term, erect the perpendicular D E, which cutteth the arch line in E, then let the line from C E from C to F, and from thence draw the line E G parallel to A B; so will the triangle C G F contain $\frac{1}{3}$ of the triangle A B C, as was required.

Fig. 22. Now, for the latter case, when the line of partition goes not parallel with any side, take this example:

Let A B C be a triangle given to be divided into two parts, which shall bear proportion to one another, as 3 and 2, by a line drawn from the point D in the base, or line A C.

From the limited point D, draw a line to the angle B; then divide the base A C into five equal parts, and from the third point of the division draw the line to E parallel to B D. Lastly, from E draw the line E D. So shall the trapezium A B E D be in content as 3 to 2, to the new triangle D E C.

We shall have now done with the division of triangles, when we have added the three following advertisements:

1. You must be sure to take very exactly the distance of every point, where a dividing line cutteth any side, to one of the ends of the same side, as in this last figure, the distances B E and A D; which distances being applied to the scale by which the triangle was protracted, will shew at how many chains and links end you are to make your dividing line on the field itself.

2. The proportions by which you are to divide, are not always so formally given as in the former examples, but are sometimes to be found out by arithmetical working, as in this case.

Suppose a triangular field of 6 acres, 2 roods, and 31 perches, must be divided so as the one of the two parts shall be 4 acres, 3 roods, and 5 perches, and the other, consequently, 1 acre, 3 roods, and 26 perches; reduce both measures, into perches, and the one will be 705, and the other 306. Their sum is 1011, which, by their common measure, being reduced into their lowest terms of proportion in whole numbers, will be 5, 2, and 7, which shews that the triangle being divided into 7 equal parts, the one must have 5 of those 7 parts, and the other 2. And observe that it be sufficient to find the common measure between the sum of your terms, and either of the terms; the method whereof is shewn in every arithmetic-book for reducing fractions into their lowest terms.

But the reader may multiply either of the parts; as suppose 705, by the length of the base, which we will suppose to be 8 chains and 75 links, or 87 links; and that product divided by 1011, the content of the whole close in perches, gives the rule of three direct, 625 links, or 6 chains and 1 pole, the true distance from either end of the base, that his mind or occasions may direct him to begin with, to the point of division; for the division must be not only for pro-

proportion or quantity, but also as to position or situation of parts upon the paper, as it is required to be on the ground.

3. In these and all other divisions of land, where a strict proportion in quantity is to be observed, you must have respect to the rules given hereafter concerning measuring of uneven ground, especially if one part prove much more uneven than another: and if there be any useful pond, or well, to draw your line of divisions through it; but if it be an useless pond, lake, or puddle, or if there be any boggy or barren ground, that must be cast out in the divisions, measure that first, and subtract it from the content of the whole close, and then lay the just proportion of the remainder on that side that is free from it, that the other may have its just part also, besides that which is useless.

What hath been said, with an ordinary measure of discretion, may sufficiently instruct a young artist to divide triangles, parallelograms, and regular polygonals, in an artificial way; but because many closes and open grounds are trapezias, and many irregular polygons, and even those that are regular enough, may fall under an irregular division, in regard to the quality of the land, woods upon it, or quarries in it, or the conveniences of ways, currents of water, situation in respect of adjacent lands, &c. we shall propose a method, which, though it hath somewhat of the mechanic in it, will be singularly useful in such cases.

Let A B C D be a trapezium to be divided betwixt a young heir and his mother, so as his part may be double to her's. Having by the diagonal B C divided it into two triangles, you will find the content of the triangle A B C to be 138550 square links, and the triangle B C D to contain 103468, in all 242018 square links, which, if reduced, as hath been formerly taught, would amount to 2 acres, 1 rood, and 27 perches.

But for the present work, they are in a better order already. Dividing then 242018 into three parts, each of them is 80676 and $\frac{2}{3}$, two therefore of those third parts must contain 161353 and $\frac{1}{3}$, which $\frac{1}{3}$ being inconsiderable, regard them not.

Then if you resolve to lay out the double part towards the line B D, strike at adventures the line E F, and measuring the trapezium bounded by that line, and the opposite side B D, together with the interjacent parts of the line A B and C D, which you will find to contain 119140 square links: but because it should have been 161353, subtract 119140, out of 161353, and their difference is 42214, and perceiving that the lines A B and C D are very near parallel, and finding their distance where they are cut by the line E F, to be 326 links, or 3 chains and 26 links, divide 42214 by 326, and the quotient is 129 links, and almost half, at which distance draw the line G H parallel to E F; so shall the trapezium G B D H be the heir's part.

Another way whereby the same thing may be performed is this. Finding the triangle A B C to contain 138650 square links, subtract it out of the heir's part, viz. 161353, the difference 22803, shews how many square links must be taken out of the triangle B C D, and added to the triangle A B C; which to perform with all necessary exactness, suppose the side or line B D to be the base which by measure proves to be 344 links, or 3 chains and 44 links. Say by the Rule of Three direct, if the whole content of the lesser triangle, viz. 103468, give 344, what shall 22803 give? So will the result be 75 links, and somewhat more than $\frac{1}{2}$, or a link, for 22803 multiplied by 344, gives 7844232, which being divided by 103468, the quotient is 75 $\frac{181132}{103468}$; or according to decimal division, 75.8131, which is somewhat more than 75 links and $\frac{1}{2}$, wherefore extending your compasses upon the scale to almost 76 links, set that distance upon the line B D, from B to I, and draw the line C I: so shall the trapezium A B I C be double to the triangle I C D, within so small a matter as is not worth regarding, though the land were a rich meadow.

We hope it will be unnecessary to tell any man of sense, that if he please he may begin with the less part, and take out that; or if there be many partners, he may divide betwixt any one and all the rest, putting their parts together, and then by the same method sub-divide amongst them till each hath his due share; not to spend many words in telling him he must subtract where he hath, by separating a line at adventures, or by choosing out a triangle, taken too much, as we added when we took too little. Nor lastly, that these methods are not only applicable to tra-

pezias, but to any triangular figure whatsoever, whether regular or irregular.

Concerning the boundaries of land, where the lines to be measured must begin and end.

If there be no agreement between the parties concerned, for if there be, that must be observed, reason and custom are the surveyor's guide.

The farmers speak loudly, that when a piece of arable or meadow land, is let for a year to be sown or mown, no more should be measured, nor expected to be paid for, either to the letter or workmen, than the plough or scythe can go over. So also when a parcel of land is let for pasture by measure to a farmer, it seems very reasonable, that all, and only so much should be measured, as is useful to that purpose.

But commons to be inclosed are usually measured, except it be otherwise agreed, to the uttermost bounds of every man's particular proportion, without any allowance for ditch or fence, every man being to make them upon his own of what breadth he pleases. Nor is this unreasonable, for it is as good for one as another, and the rate paid to the lord is usually very little, sometimes nothing.

It is also very usual in measuring betwixt lord and tenant, in cases of leases for lives, and long terms of years, to extend the lines to the utmost bounds of the tenant's claim, taking in the very walls, hedges, and ditches: but this is accounted very hard, and oft proves very unequal among the tenants of a lordship, some being forced to make much more waste of their ground this way, than others that hold as much or more. But where the custom obtains, the surveyor must observe it; for it is others work to appoint what must be measured, and his only to measure truly what is so appointed. A good landlord may, and will be apt to consider it in his rates, and a bad one it is like will be tenacious of a custom to his own advantage.

Lastly, in case of a sale by measure at a rate agreed upon per acre, no boundaries being specified in the bargain, the rule is to extend the lines to the quick wood-row, that is, to the place where the quick wood actually groweth, or where, according to custom, it ought to be set.

Containing a description of the plain table, the protractor, and lines of chords.

Though what hath been already said, may competently suffice to instruct the young artist in measuring a close of land, yet to advance him a degree higher in useful knowledge, we shall take occasion to describe unto him the plain table, which consists of several parts.

1. The table itself which is a parallelogram of wood fourteen inches and a half long, and eleven inches broad, or thereabouts, and for necessity may be made by an ordinary countryman workman of one board; but for a neatness, convenience of carriage, and freedom from warping, it is usually made of three little boards, joined together sideways, with a ledge at each end to hold them fast together; and upon the middle board a socket of brass fixed with three screws, and with a fourth to be fastened on the head of a three-legged staff; of which anon.

2. A frame of wood fixed to it, so as a sheet of paper being laid on the table, the frame being forced down upon it squeezeth in all the edges, and makes it lie firm and even so as a plot may be very conveniently drawn upon it. This is usually made with joints for more easy carriage, but a plain one may suffice. Upon one side of this frame should be equal divisions, for drawing upon parallel lines both long-wise and cross-wise; as occasion may require, over your paper, and on the other side the 360 degrees of a circle projected from a centre of brass conveniently placed in the table.

3. A box with a needle and card, to be fixed with two screws to the table, very useful for placing the instrument in the same position upon every remove.

4. A three-legged staff to support the head being made so as to fill the socket of the table, yet so as the table may be easily turned round upon it, when it is not fixed by the screw.

5. An index, which is a large ruler of wood, or rather brass, at the least sixteen inches long and two inches broad, and so thick as to make it strong and firm, having a sloped edge

edge, by which we draw the lines, called usually the fiducial edge, and two sights of one height, whereof the one hath a slit above, and a thread below, and the other, a head above, and a slit below, so set in the ruler as to be perfectly of the same distance from the fiducial edge. Upon this index it is usual to have many scales of equal parts, and there might be a diagonal scale if the instrument-maker please; and lines of chords of sundry length; but if you have such a scale as before described, you need not to have them here.

The protractor is an instrument so well known and so easy to be made and procured, that we shall be very brief in the description of it. As it is usually made, it consists of two parts, a scale and a semi-circle, but the scale is no necessary part of it, but serving, if you be not otherwise provided, for other uses before-mentioned in the case of plain scales.

But the semi-circle is more essential, and it may be made of brass, or other metal of any convenient size, as four inches, more or less, for the straight side, this semi-circle being bounded as all others are by two lines, the one right or straight, the other circular.

The right line is divided in the precise middle, by a point which is in the center, upon which the circular boundary is drawn, and two other arches concentric with it.

The center when the semi-circle goes alone without the scale, should be guarded with two little lips, on each side one, or a little loop, for more convenient turning the instrument about upon a pin fixed in a paper.

The arched or circular edge is divided into 180 degrees, or equal parts, numbered by tens, upon the upper concentric arch from 0 to 180, and in the lower from 180 to 360. So that by applying the straight edge of the protractor twice to any line keeping the center right upon a pin fixed in the line, that is, with the semi-circle first above it, and then below it, contrarily you may draw a whole circle by the guidance of the arch, or set out any number of degrees, as will appear more plainly hereafter.

A line of chords is a line divided into 90 unequal parts, whereof 60, and the radius upon which the circle was drawn, are equal, and the divisions upon that line are equal to the next extent in a right line, of so many degrees from the beginning of the quadrant, as answer thereunto.

When lines of cords are cut upon wood, it is both usual and necessary that there be two studs of brass, the one at the beginning and the other at 60 degrees, with little holes for the feet of the compasses, when you take the extent of the radius to preserve the line, from being wounded by the compasses; and being thus fenced, it will for need do the work of a protractor, but not altogether so commodiously.

How to take the true plot of a field by the plain table, upon the paper that covers it, at one or more stations.

There are three ways or methods for doing this work, two more usual and ordinary, the third more unusual and extraordinary, though now pretty well known to most surveyors, and in late books published. The first performs the work by measuring every line from the instrument to every angle, and is a very sure substantial way where it can be done, as it ordinarily may in most closes.

The second doth it by measuring only the station or the distances, and it is very quick, but not sure and exact as the other; yet if managed by a skilful artist, that knows how to plant this instrument, so as to avoid making acute angles unnecessarily, it will come near enough the matter in many places; as in measuring for workmen, that take the mowing or reaping the fields by the acre, or when tythes are let a small value per acre, as in poor barren parishes they usually are.

The third is the way of circulation or perambulation, the instrument being oft to be planted, and the plot to be measured about; by which not only difficult closes, but even the thickest woods, yea, bogs, meers, and pools of water, may be plotted, which by neither of the other methods can be performed.

In all these methods, two things are to be performed.

1. At every angle where there is no perspicuous mark already, as a tree, bush, stile, &c. one must be placed, as white paper, or such like; or else some one must go from angle to angle, and remain there as your mark to look at, till you bid him remove to another; only when angles are near you, this labour may be spared.

2. Whenever you have occasion to plant your instrument more than once, as it will often fall out in the first method, and ever in the two latter, you must be sure it stand just as it did the first time for situation; for which your needle, if well touched and hung, will be a good direction, but is not thought sufficient without back-sight and fore-sight. The first method is this.

1. When you go about to plot your parcels of land, find such a place in it, if possible, from whence you can see all the angles, and in that place plant your instrument covered with a sheet of paper, and turning it about till the needle playing at liberty, hang over the flower-de-luce, or any other notable place that you make choice of, screw it fast. Then choosing any convenient place in your paper for a center; and to represent your station, or place where you fix your instrument, make a prick with the small point of your compasses; to which prick applying the fiducial edge of the index, which is easily done if you keep the point of your compasses resting in it, direct the index, by the sight to all the angles; and when through the slit, or long sight, you see the opposite thread, cut the mark in the angle, draw a neat dry line along the fiducial edge, to or from the center; then measuring from the instrument to every angle, set the measure by a scale and compasses from the center towards the angle upon the line that points at it, making a prick in the line where the chains and links, reckoned from the center, truly end; then shall lines drawn by a straight line from prick to prick, give you the perfect plot upon your paper, which you may divide, as hath been before shewed, into trapezias and triangles, and so find the true content. To make which plain, mark this example:

Fig. 24. Suppose *ABCDEFGH* to be a field, having planted the plain table, as before directed, at a convenient advantage, so as to see all the angles, as at *I*, a prick to represent the station in the little circle \odot marked with *I*, upon which laying the fiducial edge of my index, and directing the sights to all the angles, draw dry lines towards *A*, and all the rest of the angles in order from the center; and then measuring upon the ground from the instrument to the angle *A*, and find it to be 3.45, which set from the center to the point *A*, and so upon all the rest, according to their due measures, and then black lines drawn from point to point, as from *A* to *B*, from *B* to *C*, &c. limit the true figure of the field according to the scale used, viz. of 400 in an inch.

And now before we pass to farther varieties, let the reader take notice of these following things.

1. From henceforth we shall forbear to take any notice of the measures of lines measured from the instrument to the several angles, having so often shewed how to measure by a scale.

2. When we speak of measuring from or to the instrument, we always mean from or to that part of ground that is perpendicularly under the head of the instrument where you are to draw your plot, which will ever be enclosed with the three legs of your staff.

3. That it is usually the quickest way to measure first from the instrument to the first angle, and then back from the second angle to the instrument, and so the rest in order, still one from the instrument, and the other to it.

4. It is no matter at all whether your plain table be placed towards the middle of a field, as was represented in this figure, or at an angle, as will appear hereafter.

5. In all workings by this instrument, you must have a care that the instrument be not moved out of its due place, till you have finished the work of the present station; for which purpose, cast your eye now and then upon your needle, observing whether it continue to hang directly over the same point you set it at when you began your work, and to rectify your instrument if you see cause. But because all tables have not needles, and where needles are, they are not accounted very accurate, make use of the following help.

When you have planted your instrument, and made a point or prick in your paper, representing your station, set the fiducial edge of your index to it, and turning it softly about till you find one remarkable thing or other upon one side of the close, and another on the opposite side, as you look through the sights of your index, which we call fore-sight and back-sight, draw a remarkable line with ink, or rather with a black-lead pen quite over your paper, which in this figure is represented by the black line *K L*; and then if you suspect that by any accidental jog, or other casualty

casualty, the instrument is any thing removed, you may easily try, and rectify it by applying the fiducial edge to the same line, and making use of fore-sights and back-sights again, upon the same marks which you before observed upon upon the opposite sides of the close.

But if there be no convenient place for the placing of your instrument, whence you may see all the angles of the field, more stations must be made use of: thus,

Fig. 25. Let A B C D E F G H I K L M N be a field whose angles cannot be all seen from any one angle, or other place in it. Plant your instrument at the angle A; and if it have a needle, mark what degree of the chord it cuts, or turn about the table on the head of the staff, till the needle hang over some remarkable place, as suppose the flower-de-luce, and screw it fast; then setting up a stick with a white paper or cloth on the head of it, where you intend your second station, as here at Q, make a prick or point in your paper, to signify the point A upon the paper on the table: to which point you must apply the fiducial edge of the index, and when you see the white at Q, so as looking through the slit you see the thread cut it, draw the line O P quite through the paper with a black-lead pen, and then keeping the fiducial edge still upon the same point, and turning it round by degrees, look at the angles B C D E F L M N, still drawing dry lines with the points of your compasses, and setting on the measures from the station A, to every angle measured to or from, as in the last example.

Then remove your instrument to the place of your second station, having set up a mark at A, and laying the fiducial edge to the line O P, turn about the table upon the head of the staff, till, through the slit of the back-sight, you see the thread cutting the mark at A, and then screw it fast; so will the needle, if a good one, hang directly over the same point that it did at the first station: but however that be, fore-sight and back-sight will do the business; for which purpose it is good to take back-marks as well as fore-marks at every station, as was taught in the example of a single station, only taking notice that the back-mark, when the instrument is planted in an angle, must needs be out of the field; as suppose here at O.

Having measured the distance between the first and second station, and finding it to be 7, 10, set it upon the line O P, from A to Q; where make another point to represent the second station, and turning about the index with the fiducial edge upon that point, and so looking through the sights at the angles G H I K, draw lines towards them on your paper, and having measured between every one of those four angles, and the instrument, set those measures, as you did the other, with your scale and compasses, from Q towards every angle upon its proper line; and then having the drawn black bounding lines from A to B, from B to C, and so round about the close, the protraction is finished.

But here to make this figure yet more advantageous, remember the following advertisements.

1. Sometimes a station is so taken, that you may measure towards two angles at once, as here from Q to G and H, in which case you are to set down the chains and links where the first angle falleth, but still be proceeding to the farther angle, causing the remainder of the chains at the fore-end to advance beyond the former angles; so going on with whole chains so far as you can, to which the odd links at the end are to be added.

2. If at any of your stations, as suppose A, you can see an angle, for example E, to which you cannot measure in a direct line without passing the boundaries of your parcel of land given to be measured, you may notwithstanding take in that angle by a straight measured line, as we have done, provided it may be lawfully done without trespass, and conveniently without troublesome passing of fences, otherwise it must be taken from another station.

3. One of your stations was here taken at an angle, and the other within the body of the field, to shew the variety of working taught by other authors, and that it is no great matter where you make your stations, so you can see the angles; else it has been full as convenient to have taken the first station also within the body of the field, as suppose at R.

4. Though this figure represents to your eye only two stations, A and Q, your fancy may multiply them at pleasure; for suppose the angle H could not have been seen from A to Q, how easy had it been to have set up a mark at S, and then to have removed the instrument thi-

ther, observing the same directions that were given at the removing from A to Q?

II. In the second method the instrument is to be planted twice, or oftener, as occasion requires, the rules for removal of the instrument fore-sight and back-sight, and measuring the distance of stations, being the same as formerly taught; but instead of measuring to and from every angle, we only view each angle through the sights from two stations, having applied the fiducial edge to the points representing those stations, and having drawn lines with the point of your compasses, or a protracting needle, the intersections represent the angles, from which the boundary-lines may be drawn; so is the field protracted. Which, that the reader may understand, let him note these three figures:

Fig. 26, 27, 28. In these three figures the angles are marked alphabetically, A B C D E F, &c. and the stations by a small point in a small circle numbered, 1, 2, or 1, 2, 3, according to their number and order.

Fig. 26. The first of these figures represents the plotting of a field at two stations within it, from both which all the angles may be seen.

Fig. 27. The second performs the same work by two stations taken without the field, by which art a close may be measured, though the present possessor will not give us leave to come into it.

Fig. 28. The third shews how the work may be performed at three stations or more, when two such places cannot be found whence to view all the angles; which last having more of difficulty than the two former, though indeed not very much, and the explanation of that will sufficiently help to the understanding of them, we shall a little explain the meaning of it in these particulars.

1. From the first station, taken according to the former directions, you see the angles A B C D F G K, and accordingly draw lines upon your paper towards them from the point representing that station, by the fiducial edge of your index with the point of your compasses.

2. Having removed the instrument to the second station, and in so doing, observed the rules before given, you will thence see the angles A B C D E F G H I K, and draw lines upon your paper towards them from the point representing the second station. And now viewing your work, you find upon your paper intersections for the angles A B, D F, G K, but only single lines towards the angles, C E H I; therefore,

3. Removing the instrument regularly as before, to a third station, you will thence see those four angles C E H I; and drawing lines towards them, you will have intersections for them also; so that having drawn the lines A B, B C, &c. from one intersection to another, you have the field perfectly protracted. For these bounding lines from angle to angle, do not only signify the boundaries of a piece of land given to be measured, limiting the figure or shape thereof, and are to that purpose given in this and all other surveying-books, but also are the true distance by a scale from angle to angle for the plot upon the paper; we mean by the same scale by which the stationary distances were laid down upon their own lines. And this holds true in all kinds of true plotting, whether in this method or any other.

III. The third method is that of circulation; and this hath several varieties, according to these three following cases:

1. When the distance from angle to angle, without any exception, is measured quite round the plot, either within or without.

2. When the distance is taken only between some more notable angles, and the perpendiculars of the rest measured as you pass along their bases, within the plot, proper for plain solid ground.

3. When the like is done without the plot, as in case of plotting thick woods, meers, pools, bogs, &c.

The first of these are very easy, consisting in nothing but planting the instrument at every angle, either within or without, as necessity and convenience determine it, observing the former directions for planting and removing the instrument, and also for measuring the stationary lines on the ground, and protracting them on the paper, as is manifest in this example.

Fig. 29. Let A B C D E F be a park, pond, or close, to be protracted, first plant your instrument at A, and direct the sights to a mark in the angle B, drawing a dry line from a convenient point on your paper towards B, on the ground,

ground, then having measured by your chain the distance AB, set it by a scale upon the correspondent line from A to B, drawing a black line between them with ink or a lead pen, the extremities whereof are the points A and B on the paper, and the little pricked line that goes beyond B, represents the remainder of the dry line drawn at random, as to length, with the point of the compasses.

Then setting up a mark at A, if there was none before, remove your instrument to B, and laying the fiducial edge to the line A B, turn about the instrument upon the staff, till, through the sight, you perceive the thread cutting the mark at A, and the needle directly over the same point that it was when it was planted at A; and so screw it fast.

Your next work is to lay the fiducial edge to the point B, and direct the sights to C, drawing a dry line towards it, and setting the distance B C, measured by the chain from B to C.

In this manner you are to proceed, surrounding the close till you come at last to A, where you begin, by planting the instrument at every angle, using the help of back-sight, and your needle, as at B, and then from the point representing your present station, directing the sight to the next angle, as you did from B to C.

In the second case, we do not plant the instrument at every angle, but at the more considerable, taking in the smaller by their perpendiculars from the base as we pass along; of which the following figure may be an instance.

Fig. 30. Let A B C D E F G H I K L be a close to be measured; by planting the instrument only at A C F and K, we have the main substance of the close in the trapezium ACFK: and for the five small triangles which must be added to the trapezium, they may be easily protracted by the help of such a little square as was formerly mentioned; for by finding at how many chains and links distance from A upon the ground, the perpendicular B b falleth upon the line AC; and having measured the length of that perpendicular, and taken in between the compass-points of the scale, we erect a perpendicular of that length at b, which is the point upon the paper, where so many chains and links determine, as were measured upon the ground, from the angles A, to the place where the perpendiculars fell on A c, viz. at b. Just in the same manner we raise the perpendiculars D d, and G g, I i; and then by the help of the perpendiculars, we draw the boundary lines AB, BC, CD, DE, FG, GH, HI, IL, KL, LA: which, together with the line EF between the angles E and F, give the true plot of the field in one large trapezium, and five small triangles ready for casting up.

The third case is like the second, so that there needs no new direction concerning it, but to annex one plain diagram; all the difference consisting in this, that because we cannot go within it, being supposed to be some pool, bog, or thicket, we must of necessity go on the out-side, and consequently all the triangles made by inward angles, and their lines upon the measured bases, must be excluded, by the boundary-lines, from being any parts of the plot.

Fig. 31. Supposing A B C D E F G H I K L M N O P to be a great pool, though here be fifteen angles, plant your table only five times, viz. at A E F H and M, and upon the dry lines AE, FH, HM, and MA, raise their perpendiculars in their proper places, and also of a right height, by which, and the five stationary angles, we may draw the bounding-lines of the plot, excluding all the triangles as foreign to it, they being no resemblances of any part of the pool, but of land adjacent.

Concerning the plotting of many closes together, whether the ground be even or uneven.

Though we do not design to make the reader able to survey lordships and forests, much less to draw maps of countries, but to measure a parcel of land with truth and judgment, yet we would have him so expert, as not to be puzzled, if any should desire him to draw a true map of a tenement or small demesne, consisting of several closes; for which purpose, let him observe the following method:

Fig. 32. Suppose A B C D E F G H I K L M to be a tenement or small demesne, divided into fourteen closes, to be measured and protracted according to their several shapes

and situation; first draw the plot of the whole by the method of circulation, planting your instrument either at every angle, or only at the most considerable, either within or without, as you find most convenient. This being done, a line from B to M gives the triangle ABM from the first close. In the next place go round the second close beginning at M, then to B, and so about to M again: and then for the third close, plant your table at C, and go round to B, the line B C being protracted already, and so of all the rest, still observing which are common lines belonging to several closes, representing the fences, that you may avoid the trouble of measuring those lines oftener than once, and lay every part of every close in its due place; and be sure to keep the instrument throughout the whole work to its true position, by needle, fore-sight, and back-sight.

There are divers other ways of doing this work, but none more sure or plain, especially if the ground be uneven; for in that case, if you protract according to the length of lines measured from your station to the angles, you will put your closes into unproportionable shapes, except you reduce hypotenusal lines to horizontal, by instruments, or otherwise, which is somewhat troublesome; and the like may be said when you plot with the chain only. Indeed the method of measuring only the stationary distances were very proper for setting out the figure of each particular close, provided the distance of the stations be large, and taken, if possible, upon pretty even ground, which sometimes may be done, though most of the close be uneven; and the work so ordered, as not to make too acute angles; but because this requires skill and care, we advise the young artist to use the circling way, as generally most commodious.

It is convenient when you plant your table, that the needle hang just over the north point of the compass under it in the box; then may you by the lines overthwart the frame of the table, easily draw two lines quite through the plot, cutting one another at right angles, the one pointing at north and south, and the other at east and west. And if you mark the two and thirty points of the compass upon the place where they intersect, and draw the forms of the houses, woods, and other remarkable things upon the demesne, and the course of brooks and rivers running through it, it will add to your commendation.

And so it will also, if you take in such parcels of land bounding it, whether common or peculiar to other men, as will make your plot look handsomely, like a perfect square or oblong. But however that be, you must be sure to protract truly all lanes going into it, or through it, and all closes of other men's mixed with it; and also all considerable ponds, ways, and out-lets, with the names of the closes, and quality of the ground, whether meadow, pasture, arable, &c.

Concerning shifting of paper.

In work of this kind, it sometimes happens through the multitude and largeness of fields, that one sheet will not hold your whole plot; in which case you may help yourself by shifting paper, as we call it: thus,

Fig. 33. Let A B C D represent the sheet of paper that covers the table, upon which the plot of the large piece of land E F G H I K should be drawn: having finished your first station at E, and the second at F, and find your paper will not receive the line F G, draw it so far as it will go to the edge of the paper, and planting your table again at E, proceed in your circulation the contrary way to K and I, where you will find yourself again at a loss for your line I H, but draw it also to the edge of the paper; then with the point of your compasses striking the line P O parallel to the edge of the paper B C, and the line Q O parallel to D C, and cutting P O in Q, throw it aside for a while, covering the instrument with a new one, which mark with the figure (2) for your second sheet.

Fig. 34. Upon which second sheet, the leading part whereof is represented by the three lines meeting in the angular points, A and B, draw P O parallel to A B the leading edge of the paper, and crossing it at right angles in the point O, by a parallel to B C, viz. the line O R, being of the same distance from B C that Q O in the former sheet was from D C; then with a rule and a sharp pen-knife

knife cut off the end of the first sheet at the line P O, and applying the edge of it to the line P O of the second sheet, so as it may touch that line all along, and the line Q O of the former touch the line O R in the latter, so as to make one line with it, draw the lines P G, being the remainder of the line F G, and the line O H, being the remainder of the line I H, and from their extremities the line G H. And if the plot required it, you might proceed on in the second sheet, and annex a third and a fourth, &c. as there is occasion.

These sheets may be pieced together with mouth-glew or fine paste, applying the edge of the former as you did upon the table, to the line P O of the latter.

And note here once for all, that when we speak of applying the edge of the paper to a line, we mean the precise edge cut by the line P O; but when we speak of drawing lines to the edge of the paper upon the table, we hope none will think us so absurd as to mean the edge that is concealed under the frame; but that the meaning is, that the lines must be continued on the paper till they touch the frame.

Concerning the plotting of a town-field, where the several lands, butts, or doles, are very crooked: with a note concerning hypothecusul, or sloping boundaries.

Fig. 35. Suppose A B C D E divided, in the manner of a common field, into seven parts or doles, belonging to seven several men: first, plot the whole, as before hath been taught, then measuring from A to B upon the land, note down, as you go along, at how many chains or links, or both, the division is between dole and dole, and accordingly mark them out by the help of scale and compasses in the line A B on the paper-plot. In the very same manner you must measure and mark out the lines O C and E D; which being done, take the paper from the instrument, and laying it before you on a table, with the side A E towards you, the compasses must be so opened and placed, as by a few trials they may, that one foot resting upon the table, the other may pass through the points of division upon all the three lines, viz. A B, O C, and E D, as in this figure they do.

If the content of any one or more of these parts, butts, or doles, be desired without plotting, it may easily be done, without your plain table, thus: take the breadth by your chain at the head, middle, and lower end, and adding these numbers together, the third part of their sum is the equated breadth; by which multiplying the length measured down the ridge or middle, the product gives the content.

But both in this case, and that mentioned before, the figure of a plot may be somewhat disordered, not only by the unevenness of the ground within, but also by the great declivity of the ground where the boundary lines go, either of the whole plot, or particular parcels. For whereas in plotting, every line is presumed to be horizontal or level, that it may pass from angle to angle the shortest way, and that every part may be duly situated, and none thrust another out of its right place, if it be not level, but falling down towards a valley, or rising up hill, or compounded of both, a line over such ground will be false as to the plot, and therefore must be reduced to a level, and so taken off the scale, and protracted. For the doing of this, there are several instruments very proper, especially Mr. Rathburn's quadrant upon the head of his peracter, and divers others. But suppose our country friend to have no other but such as we have already described, we shall shew him a plain easy way much used by practical surveyors.

Fig. 36. Suppose A B C to be a part of a hill falling within your plot, your boundary line going crookedly from A to B, following the surface of the ground. To find the horizontal line, equal to A C, cause one to stand at the point A, the foot of the hill, and to hold up the end of the chain to a convenient height, and gently ascending the hill, you must draw it level, and make a mark where it toucheth the hill, observing the number of links betwixt your assistant's hand, and that place where he must take his second standing, and hold it up as before, and so draw it out level again, till it touch the place where he must take his third standing, noting the links as before, and so proceed, till at last, from his fifth standing, you draw the chain level to the highest point within your plot, viz. the point B. And now as the pricked lines of this figure put together are evidently equal to the line A C, so are the links noted down at every station, when sum-

med up, equal to the horizontal line of that part of the hill.

In the very same manner, only inverting the order, you may find the horizontal lines going down hill, where that is most convenient: and if there be both ascents and descents in one line betwixt two angles, the horizontal lines of both must be found and joined together in protraction.

All this concerning declivities of rising or falling ground, is to be understood when they are considerable, and a very exact plot required; for small ones, especially when much exactness is not expected, are not regardable.

Concerning plotting a piece of ground by the degrees upon the frame of the plain table several ways, and protracting the same.

Hitherto we have shewn the use of the plain table as such; and our directions have been near as plain as the instrument itself. We will now shew how the plot of a field may be taken by the degrees on the frame by two methods, whereof the one is proper for an ordinary close; where all the angles may be seen from one station within it, the other fitting any parcel of land, though much larger, whatever be the figure of it.

For the former, take this example.

Fig. 37. Let A B C D E represent the figure of a field to be plotted by the plain table in rainy weather, put on the frame without a paper, the graduated side upwards, and plant it in some convenient place, whence you can see all the angles, as at O; then placing the index upon the table, so as the fiducial edge may, at the same time, go through the center upon the table, and the lines upon the frame of the table cutting it perpendicularly at 360, where the degrees begin and end, and 180, the exact half, turn about the table upon the staff-head, till through the sights, the side marked with 180 being next your eye, see the angle A, and then screw it fast, observing where the needle cutteth, and by back-sight causing a mark to be set up in the line C D at the point F, that the instrument may be kept firm from moving, or be rectified if it be moved, during the work. And now the line A O F passing upon the land from the angle A, directly under the sights of the instrument to the mark at F, is, as it were, the prime diameter whence the degrees of the angles are to be numbered, and accordingly you must mark the angle A in the table hereafter to be exemplified with 360 degrees. Then turning the index with the fiducial edge upon the center, till you see the thread cutting the mark at B, the said edge will cut upon the frame at 76 deg. 15 min. which note down for that angle. The like must be done, turning the sight to C D and D, but not to F, for there is no angle; but only a mark in the boundary, and you will find the index to cut for every angle as we have marked them within the pricked circle of the last figure, viz. 157 deg. 35 min. for C, 225 deg. 20 min. for D, and 278 deg. and 50 min. for E.

Then measure, or cause to be strictly measured by others, the distances betwixt the place where the instrument

stands, and every angle, and you will find them to be as set down upon the pricked lines in the little circle, viz. A 4 chains, 20 links, B 4 chains, 3 links, C 3 chains, 84 links, D 5 chains, 35 links, E 5 chains, 6 links. And now your table both for lines and angles is thus perfected, and the work is ready for protraction within doors.

	D	M	C	L
A	360	00	4	20
B	76	15	4	03
C	157	35	3	84
D	225	20	5	35
E	278	50	6	06

Your judgment will easily inform you, that in such weather we shall hardly stand to make our table neat and formal, but any thing, how rude soever, that we can understand, doth the feat. A Welsh slate with a sharp stile, or for want thereof, a black-lead pen, and a smooth end of an hard board like a trencher, is more convenient at such a season, than pen, ink, and paper. But of all, we would commend for expedition a red-lead pen, whereby you may mark out every angle neatly with one touch upon the table itself, just where it toucheth the frame by help of the fiducial edge, and close by it the length of the line from the center to that angle: all which may be easily cleared off by a wet sponge or cloth so soon as you have protracted.

Fig. 37. Now to protract our observation; draw upon a paper the line A F at adventure, so it be long enough, and stick a pin in it at pleasure for the center O, upon which place the center of the protractor, so as the straight side may just lie upon the line A F, the limb or arch-side being upwards towards B; by help whereof make a prick or point on the paper 76 degrees 15 minutes for B, and at 157 degrees 35 minutes for C, according to the number nearest to the limb.

Then turning the protractor about on the pin with the arch or limb down towards D and E, till the diameter lie again just upon the line A F, number downwards from the right hand towards the left, by that rank of figures that are nearer to the center, beginning 190, 200, &c. and over against the places where 225 degrees 20 minutes and 278 degrees 50 minutes fall, prick the paper at the side of the limb, and through those four points draw so many several lines, upon which, and also upon the line A O, mark out by what points the true measure of every line, by a scale, from the center, and from those points drawing the lines A B, B C, C D, D E, and E A, you have the true plot of the field.

Having proceeded in the field as before, and made your table for lines and angles, or done that which is equivalent by a red-lead pen, draw the line A F, and having extended the compasses to the radius, or 60 degrees, on a line of chords, set one foot towards the middle of the line A F, and with the other describe a circle like that in this figure of a five-angled field, but much larger, according to the length of the radius: then extending the compasses from the beginning of the line to 76 degrees 15 minutes, set one foot in the intersection of the circle by the line A, and with the other foot make a mark in the circumference of the circle upwards, towards the right hand, and through it draw the dry line B O.

In the next place subtract the angle 76.15 from 157.35, where the index cut for the angle C, and there remains 81 degrees 20 minutes, which take off the line as before, and set it upon the circumference from the intersection by B O, toward the end of the diameter marked with F, and through the point where it falls, draw the dry line C O.

In like manner subtract 157 degrees 35 minutes from 225 degrees 20 minutes, and the difference is 67 degrees 45 minutes, which set from the intersection by the line C O, downwards past the prime diameter A F, and through the point where it falleth, draw the line D O.

Lastly, having subtracted 225 degrees 20 minutes from 278 degrees 50 minutes, there remains 53 degrees 30 minutes, which must be set downward towards the left-hand from the intersection by D O; and through the point where that falleth, draw the line E O. And now having set the particular measures upon every line, and drawn the boundary lines, as you must have done if you had used a protractor, the plot is finished.

But for better assurance that you have done your work well, take the measure of the remaining angle A O E upon its proper arch, viz from the intersection of the circumference by A F, to the intersection by E O, and applying it to the line of chords, you will find it to be 81 degree 10 minutes, as it ought to be, for it should be the complement of 276 degrees 50 minutes to 360.

And for farther satisfaction, sum up the degrees and minutes of all the five angles, which for plainness-sake we have noted in every one of them on the outside of the circle in the figure so often referred to, and their sum is 360, as it ought to be,

76. 15
81. 20
67. 45
53. 30
81. 10
—————
360.000

The reader may now expect that we should teach him how to take a plot at two or more stations, when all the angles cannot be seen from one: but because this is so easy from the principles already laid down, to any that is ingenious, and in part rendered unnecessary by the method presently following, we shall only give this general hint.

When you have from one station taken in all the angles you can see from thence, and then are to remove to your second station, do just as you would do if the table were covered with a paper; only it is at your choice, whether you would guide yourself for back-sight by a line that may be rubbed off, drawn upon the table itself, from the center to the degrees, on the frame along the fiducial edge, or by noting only what degrees it cuts on either side of the

center, the edge passing through it, that by the help thereof and the needle, the instrument may be placed in the same line and situation as before, for taking in the rest of the angles, if it can be; if not, another station must be taken after the same manner.

Fig. 38. Let A B C D E be the figure of a field to be plotted, the weather being bad; send your assistants to find the length of every side, beginning at A, who return you such an account of every side, in chains and links, as are noted upon the figure, and in the table following, viz. A B 3 chains 73 links, B C 4 chains 91 links, &c. In the mean time you are to find the angles; in order to which plant the instrument at B, and laying the index on the center, look at C, and find the index cutting 10 degrees 15 minutes, and looking at A, it cuts 126 degrees 45 minutes; out of which if you subtract 10 degrees 15 minutes, there remains 116 degrees 30 minutes for the angle A; but because it will not be so convenient to subtract there, you may set them down thus:

B A 126. 45 the meaning whereof is, that B notes the angle, and C A the lines meeting there, cutting such degrees on the frame; and the reason why A is set above, is for more ready subtracting afterwards; then removing to the angle C, and thence looking at B and D, you will find the index is cut as it is here expressed. C B 153. 10.
D 15. 40.

In like manner at D thus, C 96. 05.
E 28. 50.

At E thus, E D 141. 20.
A 11. 45.

And lastly, at A thus, A E 98. 30
B 9. 20

This being done, you may retire under covert, and by subtraction find 116 degrees 30 minutes for the angle B, 137 degrees 30 minutes for C, 67 degrees 15 minutes for D, 129 degrees 35 minutes for E, and 89 degrees 10 minutes for A, as you will find them on the figure, and in this table, together with the length of the lines.

An.	D.	M.	Side.	Ch.	L.
A	89	10	A B	3	73
B	116	30	B C	4	91
C	137	30	C D	4	88
D	67	15	D E	9	64
E	129	35	E F	2	29

Note, that there is a way to find the angles without subtraction, if at every station you lay the fiducial edge over the center, and the divisions 180 and 360, turning about the head of the instrument upon the staff, till through the sights you see one of the neighbouring angles, for the index turned upon the center to the other angle, will give you the quantity of the angle you are at, but this exact planting at every angle is more tedious than the other, and therefore not so fit for wet weather. But now to protract this plot:

First, by your scale, rule, and compasses, draw the line A B in length 3 chains 73 links, ending at the point B; then laying the center of your protractor upon the line A B, so as the center of it be upon the point A, and that end of the diameter from which the numbers are reckoned on the arch or limb towards B, make a point for the angle A at 89 degrees 10 minutes, by the direction whereof, and the point A, draw the line A E, which according to your scale, must be two chains 29 links.

In like manner placing the diameter upon A E, just as it was upon A B, and the center upon the point E, mark, out by the limb, for the angle E, 129 degrees 35 minutes by which draw the line E D, 6 chains 64 links.

In the next place, bring the center of the protractor to the point D; its diameter lying on the line E D, and its limb towards A, by which prick out 67 degrees 15 minutes for the angle at D, and draw the line 1 chain 88 links.

Lastly, The center being at C and the diameter upon the line D C, in such manner as before at other angles, prick out by the limb or arch 137 degrees 30 minutes, and draw the line C B, for at B your plot should close; and if rightly done, the angle at B will be 116 degrees 30 minutes, and the side B C 4 chains 91 links, which you will find it to be by measure.

But if you plot by a line of chords, you are not bound to this order, but may go from A to B, and so round that way if you please, which you could not so well do with a protractor, without reckoning the numbers backward, yet it must be granted that a line of chords neither doth

doth the work so quickly nor conveniently: this is the way.

When you have drawn the line A B of a proper length, set the compasses to the radius, and placing one foot of the compasses in the point B, and with the other describe an arch of a competent length, beginning at that side of the line A B that is designed not to be the inward side, and upon this arch, 116 degrees 30 minutes must be set; but because the line of the chords give only 90, set them first on from the line A B, and then take off the remainder 26 degrees 30 minutes, joining them to the 90 upon the arch, making a point, through which the line B must be drawn of a due length. In the like manner you must do at C E, but the angles at A and D need no such piecing, being capable of being measured out by a line of chords at once.

Nor do your angles only give you trouble in this kind of work, but your lines also will be often found too short to receive the touch of an arch upon the radius, especially if the line of chords be large, and your scale little; and so it may often fall out when you use the protractor upon such short lines as A E and C D of this last figure: in which case a rule must be applied to them, and they must be extended to a due length, that the arches may meet them without the figure. And if those extensions of lines, and describing of arches, spoil the beauty of your plot, the matter is not great, it is so easy to be retrieved; for if you lay on a clean paper, and prick through every angle, lines drawn between those points will give you the plot neat and perfect.

The artist sometimes loseth his labour of protraction through some error in the field, so that his plot will not close; it is therefore proper to know before you begin that work, whether it will or no; for which purpose if we take a number less by two than the number of angles in the plot, and thereby multiply 180, that product being found to be equal to all the angles, the plot will close: this appears by our plot in the present work; the multiplier being 3, because the angles are 5, and the multiplier must be two less than the number of angles.

	Deg. Min.
180	89 . 10
3	116 . 30
540	137 . 30
	67 . 15
	129 . 38
	540

This kind of trial is grounded upon two principles of Euclid and Ramus, mentioned in the beginning of this article, shewing that in all plain triangles, all the angles taken together are equal to the right angles, and that the sides, consequently the angle also, of every triangle figure, are more by two than the triangles of which it consisteth.

Concerning taking inaccessible distances by the plain table, and accessible altitudes by the protractor.

Fig. 39. The substance of what is to be said for the first of these, is gathered from the instructions given for plotting a field, by measuring only to stationary distance: but to make the case more plain to an ordinary capacity, suppose the line A C to be the unknown breadth of a river, over which a bridge of boats is to be laid, and the general, that the may in form himself what number of boats and planks is necessary to be brought down, commands you to tell him the true distance from A, where he is at present, to C, a little boat-house on the other side of the water.

To satisfy his demand, plant your table covered with a paper at A, causing one to set up a mark at B, at a good distance from you, along the bank of the river, the farther the better, if distance do not hinder sight: then having chosen a point to represent A, and laid the fiducial edge upon it, direct your sights towards C and B, and strike lines towards them. Which done, set up a mark at A, and from thence measure to B, 6 chains 32 links, and so plant your instrument at B, laying the fiducial edge to the line A B, and turning about the head of the instrument upon the staff, till through the sights you see the mark at A, and then screw it fast.

In the last place take 6 chains 32 links off your scale and set it on the line A B, from A to B, and laying the fiducial edge to the point B, from thence direct the sights to C, and draw the line B C, meeting or cutting the line A C in C; so shall the space A C measured on the scales viz: 8 chains 29 links, be the distance desired, and because the chain is 22 yards long, if you multiply 8.29 by 22, the product is 182 yards and $\frac{3}{8}$ of a yard, which by reduction is some little more than 13 inches and $\frac{3}{4}$ of an inch.

Now, to take the height of a tree tower, or steeple by a protractor, without any arithmetical operation, hang a plummet with a fine silk thread at the center of it, and hold it steadfastly with that end to your eye, where the numbers begin, then look straight along the diameter, still removing backward and forward as there is occasion, till you see the top of the tree, tower, or steeple, and the thread at the same time fall upon 45 degrees, so shall the distance from your eye to the tree, tower, or steeple, measured in an horizontal or level line, together with the height of your eye above the bottom of it, be equal to the height of the object.

If either for convenience of sight, or any other reason, you think proper to set the other end of the diameter to your eye, then the thread for the above trial must fall upon 135 deg. instead of 45.

Of casting up the content of land by a table.

Links	R.	P.
100000	4	00
90000	3	24
80000	3	08
70000	2	32
60000	2	16
50000	2	00
40000	1	24
30000	1	08
20000	0	32
10000	0	16
8750	0	14
8125	0	13
7500	0	12
6875	0	11
6250	0	10
5625	0	09
5000	0	08
4375	0	07
3750	0	06
3125	0	05
2500	0	04
1875	0	03
1250	0	02
625	0	01

This table consists of three columns, the first containing links, the second roods, or quarters of acres, the third perches; and the use of it is thus:

Suppose a field to be 7.25 chains and 25 links long, and 5.50 five chains 50 links broad, these by multiplication make 36250 398750, whereof 5 figures being cut off towards the right hand, the figure 3 signifies acres, and the rest, 3.98750, viz, 98750 denote parts; and to reduce them into roods and perches, first subtract from 98750 the greatest number of links in the table that can be subtracted from it, viz. 90000, and put down for it three roods 24 perches, which you find over against it in the annexed columns, and the remainder being 8750, look in the table, and find over against it 14 perches, which by addition makes 3 roods 38 perches; so is the whole content of the field 3 acres, 3 roods, 38 perches.

A R P

3 3 24

14

3 3 38

But note here, that if the remainder after the first subtraction cannot be found in the table, you may take the nearest to it, so the error will be but part of a perch.

As for Example.

7.75 being the half perpendicular, and 9.23 the base, give for their product 6.78405. The 6 signifies acres, and from the rest 70000 being subtracted, to which 2 roods 32 perches answer, there resteth 8405; which, because you cannot find in the table, you must take the nearest, which is 8125, to which 13 perches answer; so the whole content of that triangular close, is 6 acres, 3 roods, and 5 square perches, and a little better.

A R P

6 2 32

13

6 3 05

SUSSINGLE, or *Surfingle*, the girt which comes over the saddle, and binds it firmly to the horse.

SWAMP, a hollow, watery place, in any part of a field; a bog. See BOG.

SWANG, a fresh piece of green sward lying in a bottom among arable or barren land.

SWARD, the surface of the ground.

SWARM, a large number of bees, seeking a proper settlement. See the article BEES.

SWATH, or *Sewath*, a line of grass, &c. cut down by the mower.

SWATH-BAUK, a swarth, or line of new mown grass or corn.

SWATH-RAKE, a rake about two yards long, with iron teeth, and a bearer in the middle; to which a man fixes himself with a belt, and when he has gathered as much as his rake will hold, he raises it and begins again. This instrument is in some counties called a dow-rake, and much used in Essex for gathering barley after mowing.

To **SWEAL**, to finge, or burn off the hair, &c.

SWELLED-LEGS in a Horse, an infirmity he is sometimes subject to, by hard riding or much labour, when he is too fat, or carelessly put to grass, or set up in the stable too hot, whereby he takes cold, which causes the blood, grease, and humours, to fall down into his legs, and to make them swell.

Sometimes it comes by long standing in the stable, when the planks where his fore-feet stand, are higher than where his hinder legs are; which uneasy posture makes the blood settle in the hinder legs, whereby they are unhappily brought to swell.

There are several prescriptions for the cure of this malady.

Some use nerve oil, black oil, soap, and boar's grease melted, and anoint the place therewith; or else bathe his legs with butter and beer, or with butter and vinegar melted together.

Some bathe them in water in which sage, mallows, and rose-cakes have been boiled, putting in butter and salad oil; or boiling rosin, frankincense, and fresh grease, of each a like quantity, then strain it, and use it once a day, as there is occasion.

You may also wash the horse's legs in cold fountain water, or the horse may be left every day to stand up to the knees in running water, till the swelling is assuaged.

Others bathe the horse's legs with sheep's foot oil, train oil, or urine and salt-petre mingled together, and wetting hay ropes in the same liquor, roll them from the pastern to the knee; but care must be taken not to bind them too hard.

Others boil primroses, violet-leaves, and strawberry-leaves, of each a handful, in new milk, adding nerve-oil, petroleum, and populeon, of each an ounce, and anoint the horse with this for four or five days successively.

Others boil pitch, virgin's-wax, rosin, galbanum, myrrh, zedoary, bdellium, Arabian storax, and the juice of hyssop, and when it is cold, they add bole-ammoniac and costus finely powdered; these being well incorporated with the other ingredients, they boil them all over again, and when they use it, they spread it on a plaister and wrap it about the swelling, letting it remain there till it drops off of itself.

But when a horse's legs are much swelled, because of the scratches, boil a handful of bay-salt, a quarter of a pound of soap, with a good quantity of foot, and a good handful of milletoe chopped, in a quart or more of urine, and with this bathe his leg, very warm, twice or thrice a day, and wetting a cloth with it, wrap it close about his legs, and it will assuage the swelling.

SWELLED PIZZLE, IN HORSES, is a kind of hardness which proceeds from the parts being bruised by riding, and is cured in the following manner:

Take holly-hock, house-leek, and a little plantane, stamped together with fresh butter, and anoint his pizzle with it twice a day, and if the pizzle be sore, you must caulk him, and wash his sheath and pizzle very well with white-wine vinegar; and if there be any cankers, or holes in the yard, then you must put some burnt allum to the vinegar, and wash it very well; and he will mend without fail in three times dressing.

SWELLED VEINS; that which the French call varice, is a crooked vein, swelling with corrupt blood in the temples, biley, or the legs of an horse.

For the cure:

Open the skin of the horse, and burn it with a hot iron; then rub and chafe it well for ten days with milk and oil, and if the disease is not removed, let him bleed, and this will effect the cure:

A poultice to dissolve a swelling in Horses.

Take garden orrice-roots, and white lily-roots, of each an ounce; marshmallows, pellitory, penny-royal,

origanum, calamint, and rue, of each a handful; camomile, mellilot, and elder-flowers, of each half a handful; green aniseeds, common fennel, and cummin-seeds, of each half an ounce; boil all these together to a mass, in water and white-wine vinegar; then pound them in a stone mortar to an even smooth mass, adding to them of the meal of lupines, and of beans, of each an ounce and a half; oil of camomile an ounce and a half, oil of orrice the same quantity; mix them well in the mortar, and then heat them again, and apply this to the part affected, in greater or lesser quantity, according to the heat of the part.

This is a medicine extraordinary useful in all tumours, and is the more necessary, since tumours or swellings are so frequent in horses, by reason of hurts and bruises they are so often liable to, which if not timely taken care of, and that judiciously, do degenerate into incurable fistulas, and cancerous ulcers; for it is allowed by all surgeons, that the safest way to cure all swellings (to which they give the name of tumours) except such as are malignant, is by dissolving them, if possible, which is the most successful, and which ought to be used as soon, and as much as possible; but if that cannot be done, then you ought to endeavour to ripen them as soon as possibly can be.

Another for mollifying, softening, ripening, and bringing to suppuration, a swelling.

Take the roots of marshmallows, and those of white lilies, of each a quarter of a pound; the leaves of groundsel, common mallows, brank-ursin, and violet-plants, of each a handful; the flour of linseed and fenugreek-seeds, oil of lilies, and goose fat, of each three ounces; wash the roots and slice them, then boil them in water, and after some time put in the leaves, and boil all till the whole mass becomes perfectly tender and soft: then strain out the decoction, and pound the substance that remains in a stone mortar, with a wooden pestle, till it comes to be a pulp; then put both the decoction and pulp into a skillet, mixing with them the flour or meal of fena-feed, and fenugreek seed, oil of lilies and goose fat; boil all together over a moderate fire, stirring the ingredients from time to time, till the mass is become of a sufficient consistence.

This is a very useful medicine, because dangerous consequences do frequently happen to swellings, or tumours, in horses, that will not be discussed, that is, not go away of themselves, or that such a poultice has been wanting to bring them to a speedy suppuration.

For if a swelling or tumour that cannot be discussed, should remain too long before it be brought to a suppuration or ripening, it generally putrifies and turns to a fistulous ulcer, which, very rarely, admits of a cure.

SWILL, a vessel to wash in, standing on three feet.

SWINE Early in the morning, when you untye them, give them drasse, pulse, or other garbage, with swillings in the troughs; and when they have eaten it, drive them to the field, where they may graze and root for their food. Marshy grounds are the best, where they may get the roots of sedge-reeds, rushes, knot-grass, &c. which is wholesome for swine; and at the fall of the leaf it is best to drive them to hedges, where they may get haws, hips, sloes, crabs, &c. which are very wholesome: then the poorer sort will gather their fruits, and keep them safe, to feed their swine with all the winter. In the evening drive your swine home, and fill their troughs with swillings, &c. and when they have filled their bellies, stye them. Once a fortnight give them in the swillings some raddle or red oker, which prevents the measles and other inward disorders. The cure for the measles is, to mix red oker with old urine, till it be thick: let there be about an ale quart of it: then mix it with about a gallon of warm whey, and give it the swine to drink in the morning. If the swine vomit up their meat, give them split beans to eat, which will strengthen their stomachs. If your swine are bitten by dogs, to prevent the imposthumation of the sore, you shall anoint it with vinegar, soap, and tallow, mixt together, and it will cure the part. See the article HOG.

SWINE-CRUP, a hog's-fly.

SWINE-

T E A

T E A

SWINE-HERD, a keeper of swine:

SWINHULL, a hog's-sly.

SYCAMORE, the name of a tree well known in many parts of England. It grows to a large size; the wood is soft and very white, and therefore valued by the turners; but is not esteemed very valuable for other purposes. However, as this tree will thrive better than most other sorts

near the sea, it is frequently cultivated to screen plantations of other sorts of trees from the spray of the sea.

Mr. Young, in his *Annals of Agriculture*, vol. VII. says, the sycamore is the only tree which grows erect, and resists the wind and spray of the sea.

SYTHE. See SCYTHE.

T

TABERN, a cellar.

TAGGE, a sheep of the first year.

TAIL-SOAKED, a disease incident to cows, by which the joint of the tail near the rump, will, as it were, rot away. The cure is generally performed by cutting a deep gash into the part affected, then rubbing a handful of salt into the wound, and binding it up with a rag. Others mix foot and a clove of garlick with the salt.

Wild TANSEY. See the article SILVER-WEED.

TAPPING-OAKLINGS. See OAK, TIMBER, ORCHARD &c.

TARES. See the articles VETCHES, CORN, &c.

TEAM, a number of horses or oxen drawing at once the same carriage.

To TEAM, to pour or lade out of one vessel into another.

TEAZLE, or FULLERSTHISTLE, a species of the thistle cultivated for the use of clothiers, who dress their cloth with them.

The teasle is propagated by sowing the seeds in March, upon a dry soil. About one peck of the seed will sow an acre; for the plants should have room to grow, otherwise the heads will not be so large, nor in so great quantity. When the plants are come up, you must hoe them in the same manner as is practised for turneps, cutting down all the weeds, and singling out the plants to about six or eight inches distance; and as the plants advance, and the weeds grow again, you must hoe them a second time, cutting out the plants to a wider distance; for they should be, at last, left at least a foot asunder; and you should be particularly careful to clear them from weeds, especially the first summer: for when the plants have spread so as to cover the surface of the ground, the weeds will not so readily grow between them. The second year after sowing, the plants will shoot up heads, which will be fit to cut about the beginning of August; at which time they should be cut and tied up in bunches, setting them in the sun, if the weather be fair; but if not, they must be set in rooms, to dry. The common produce is about an hundred and sixty bundles, or staves, upon an acre, and they will sell for about one shilling a slave. *Miller's Gard. Dict.*

M. de Chateauvieux extended the New Husbandry even to the culture of the teasle, or fuller's thistle, which grew to a surprising height, and produced an extraordinary number of the finest and best heads that the fullers in his country had ever seen.

"I am well informed, says an ingenious correspondent of the editors of the *Museum Rusticum*, that the principal place in the kingdom for the cultivation of the teasle, is about Wrington in Somersetshire, many of the inhabitants of that, and the neighbouring parishes, being chiefly employed therein; and from these places the cloth manufactories in the counties of Gloucester, Somerset, and Wilt, are supplied, and even a great many packs carried annually into Yorkshire.

"The land most suitable for this plant is that of a thin, sweet surface, and marley bottom, though a clay or stone-trass bottom will do, and produce large crops: rich loam, or strong clay, is very improper, as on them the plant is

apt to grow luxuriant, and thereby cause the heads to be large and coarse-hooked, and, in a moist summer, subject to mildew and rot before they blossom and are fit to cut.

"As to situation, a southern aspect, on the decline of a hill, is to be preferred, though any other will do: but upland ground is to be most esteemed, more especially in an inclosed country, that the wind may assist in carrying off the natural humidity of the plant in moist seasons; which sometimes, in low and small inclosures, is retained so long as to cause the heads to taint, and become rotten.

"Having made choice of a piece of ground; (an old lay is preferable) in February cause it to be ploughed in ridges of three bouts each, at a depth suitable for a crop of beans, taking care that the furrows be laid straight and as even as may be; the middle of the ridge highest, and a fresh furrow ploughed in the furrow between each ridge; after which let a man go along each ridge, and with a mattock, hoe, or spade, raise earth in small clods, at suitable distances from each other, to produce earth, when meliorated, to heat or cover the seed.

"Having done thus much, let it remain as it is until the time for sowing the seed, which will be about a week or ten days in April, as then the earth is generally moistened with rain.

"At this time cause a middle-sized harrow to be drawn over the land once or twice in a place, to fill the crevices between each furrow, and level the surface; after which sow the seed broad-cast, in the proportion of two bushels on an acre; then harrow it in, the same as turnep seed, and let it remain until the plants are come up, and grown into six or eight leaves each; when some person or persons should go over the field with a hoe, and cut out the plants where they are too thick, to the size of about two feet from each other every way, if the ground be in heart; if it be thin poor land, sixteen or eighteen inches distance is sufficient.

"After this they may remain until the latter end of August, when they must be gone over as before, with this difference, the person should have a spade made about four inches broad, and eighteen inches long in the bit, or pan, with a tree in it of three feet six inches long: with this tool the workman must go backward, and turn the whole surface over, about two inches deep, in long spits, turning the spade from the plant, to turn the spit so as no earth may fall into the heart of the plant: but it would be advisable, at the time of first sizing the plants, to leave more than are necessary to stock the ground, to have some to fill up the vacancies where any may happen to die, which is often the case during the succeeding winter, and more especially should it prove frosty.

"Having done thus much, in this state they are to remain during the winter; only care must be taken that no cattle get into the field, especially sheep, which will eat out the cabbage of the plant, and spoil it.

"About the latter end of the succeeding February, the plants should be digged between, as in August, being very careful that none of the earth falls into the middle of them; and in May, when the plants begin to shoot into spindle,

spindle, the ground must be dugged over again, with this difference, instead of being laid plain, it must be raised into small hillocks about each plant, to strengthen them in the ground, so that the wind may not blow them down when loaded with heads.

" This being done, they are left till the season for cutting, which will be a work of some time, as the heads become fit, which is known by their blowing: it is to be observed, that the blossom first appears near the bottom of the head, in small, pale, blue flowers: and when these appear to have blown somewhat more than half way up, such head is fit for cutting, which is generally done in this manner; a man has a knife, the blade about two inches long, with a string in the haft to put over the hand, and a pair of strong gloves to defend him against the sharp prickles on the stalks.

" Being thus equipped, he must go along each furrow, and cut with one hand, putting them into the other, till he has as many as he can easily gripe; when cutting one which is a little more ripe than the others, and the stem about eighteen inches long, he binds the handful together with it, (the others are generally cut about nine inches long); which done, the handful is tossed to some open spot, in order to be carried to the place for drying, which is done in the following manner:

" Some small poles of ash, willow, or any straight-growing wood, about the size of a hedge-stake, and ten or twelve feet long, must be procured, at the great end of which, about eighteen inches from it, a hole must be made, and a peg put through, to extend three or four inches on each side. The poles thus prepared, the handfuls of teazles must be put on them, by running the small end through the handful, until the pole be filled: in this condition they must be set on one end to dry; but it is to be observed, that they should be carefully carried into a house or shed every night, and brought out at days; and in the house set so as for the poles not to touch each other, lest they taint, which for want of a free circulation of air, they are very subject to, and more so if it be close moist weather.

" When they are dry, so as to be free from moisture, they may be carried into some upper room, and placed up close together: over a cow-house, or place where cattle are fed in winter, is to be preferred, because their breath is supposed to help to brighten them in colour: wherefore they are the better esteemed, and supposed to be more tough in hook than otherways they would.

" When they have by this means acquired from the gradual moisture of the air an additional elasticity to the hooks, and are brightened in colour, which will be completed a little after Christmas, the time that generally the heads are sorted, and made out in the following manner. The handfuls are brought from the storehouse into some large room, usually a barn-floor, where they are untied, one at a time; and generally made four sorts of. The largest heads which are sound, and are such as grow on the middle stem of each branch, are thrown for the first sort, and called kings. The next smallest which are sound, and are commonly such as grow as side heads on each branch, are thrown for a second sort, and are called middlings. Another, or third sort, are such of the largest, or those which grew on the middle stem, as are damaged by the mildew, wet, or other accident; and which would have been kings, had not such defect rendered them unworthy that appellation. These therefore are thrown to a third sort, and denominated scrubs. These last, or fourth sort, is the refuse of all, and are such as are too small, or too much damaged for any use; and are therefore thrown away.

" When a quantity is thus separated, they are made out in the following manner: the persons who do it, put of the kings ten in each handful. First, six of the larger, in the manner of a fan extended, and four lesser of the same sort, in the bosoms of the six; and then bind their stems together with a spleet of willow, or some tough wood, by wrapping it about them three or four times, and tucking the end under. When the kings are tied up in handfuls in this manner, a straight stick of about three-fourths of an inch diameter, and two feet six inches long, is split to within four inches of one end. Twenty-five of these handfuls are put on this stick, alternately head to stem; letting two of the middle stems of each handful to be in the cleft, to hold them secure; then a small wreath, made of spleet, is slipped on the upper end of the staff, which holds

it together, and keeps the whole from falling about. In like manner are the scrubs, or third sort, also made out and put in staves. But of the middlings, or second sort, double the number of heads are put in one handful, by making two fan-like rows of six each, and four in their bosoms on each side; and these are put into staves of three feet long each, split as the former, and thirty handfuls in each staff. When they are thus made out, they are fit for sale, and are to be laid by for that purpose in some convenient place, where they may not be bruised. Thirty staves of the first and third sort are accounted a pack; and forty staves of middlings make also a pack.

" An acre of land, if well grown, and what is deemed a full crop, often produces nine packs of kings, nineteen of middlings, and two of scrubs. The common price per pack of the first sort, is twenty, the second sort fourteen, and the third sort eight shillings. But in a French war, they are generally double these prices.

The expence attending a crop per acre, are,

	l.	s.	d.
1st, Rent of the ground for the crop, which is one year and a half	—	5	0
2d, Ploughing and sowing	—	0	15
3d, First dressing or delving	—	1	0
4th, Second delving	—	0	10
5th Hilling	—	0	15
6th, Cutting and carrying home	—	1	15
7th, Tythe	—	0	5
8th, Clearing off the stalks, and binding them in bundles	—	0	5
9th, Making out, at two shillings per pack, spleets, staves, and wreaths included	3	0	0

All which make the total expence, attending—
ing one more acre of teazles — £13 5 0

" This, exclusive of seed, which is not often bought, because enough may be saved in making out the crop in winter: but if the seed be bought, it is generally valued equally with wheat. Therefore, if two bushels be sown on the acre, ten shillings may be added as the medium price; which makes the whole expence of one acre thirteen pounds fifteen shillings, if it should produce thirty packs. But such produce is not always the case, for twenty is to be esteemed a middling crop.

" With respect to crops of corn, raised amongst the plants, it is practised in many places; and indeed it has been mine to plant field beans, or garden beans, at about three feet distance singly from each other, in a promiscuous manner over the teazle land: which crop of beans, by the cultivation necessary for the teazle, is greatly forwarded in growth, and often produces from four or five and six stalks from one bean, well loaded with cods. This crop is no injury to the teazle crop the first year, and frequently pays the expence of labour attending the whole.

" The crop, which generally succeeds the teazle, is wheat. The ground, by being frequently delved and kept clean, during the teazle crop, becomes very fit for this grain, and generally produces very large crops. Forty bushels per acre is not uncommon, though the land in itself is often such as is not annually worth more than ten shilling per acre. Hence, I think, it is evident, that a crop which well shades the ground, (in summer) and that has been two or three times turned and cleaned from all weeds, before such shading, greatly fertilises the land on which it grows. But I have frequently observed an error, to which the occupiers of such land are too liable after these fertilising crops. This error is the ploughing away (by over-cropping) the profits which would ensue. If after its being thus fertilised by the crops of teazles, it were to be laid down with suitable artificial grass-seed, sown amongst wheat and properly managed afterwards, it would, I am experimentally sensible, be a lasting improvement." *Museum Rusticum, vol. III. p. 237, and vol. VI. pag. 1.*

To TED, to spread abroad new-mown grass, which is the first thing done in order to its being dried, and made into hay.

TEDDER, or TETTER, a rope with which a horse is tied in the field, that he may not pasture too wide.
To TEEM, to be pregnant; to engender young.
TEETH are little bones in horses' jaws, which serve not only to facilitate the nourishment, but likewise to distinguish the age of horses.

A horse

A horse has forty teeth, including the tushes, which are distinguished as follows.

Twenty-four of them are called grinders, which are placed at the bottom of the mouth, beyond the bars, twelve on each side of the channel, viz. six above, and six on each side.

These teeth continue, and do not fail to give place to new teeth in their room, so that they are of no use in distinguishing a horse's age.

However, they are subject to wolves teeth.

With reference to the other sixteen, twelve of them are called in their infancy, milk or foal teeth, and the remaining four go by the name of tushes.

The twelve foal teeth are short, small, and white; and are seated on the fore part of the mouth; six above, and six below.

These change and cast, to give place to others; which, in process of time, become long, large, and yellowish.

These new teeth are distinguished by the different names given them, according to their putting forth, and it is the manner of their coming forth, that gives us to know the first years of a horse.

Now of these twelve, four are called nippers, four are called middling teeth, and four go by the name of corner teeth.

The four nippers are seated on the fore part of the mouth, two above, and two below.

When a horse has put forth these, we conclude that he goes from two and a half to three years.

The middling teeth are placed near the nippers, or gatherers, one above, and one below, on each side of the jaws.

They come out and appear between three and a half and four years.

The corner teeth are placed yet more forward in the mouth, one above and one below, on each side of the jaws.

These begin to shoot between the fourth and the fifth year, and are got above the gum at five years.

When surmounting the gum at that age, they become hollow, and mark commonly till seven or eight years.

By marking we mean, that in the hollow or cavity of the corner teeth, a little black speck is formed; which, from it's resemblance, we call the bud or eye of a bean.

But when the horse passes six, the cavity begins to fill, and the black mark disappears by degrees; yet this diminution of the cavity and the mark continues from six till seven and a half.

At eight years the cavity is filled up, and the black mark gone, and in regard that the tooth is then full, even as if it had been shaved, we then say that the horse has razed; which happens a little before the eighth year, and after that the horse does not mark; so that the surest knowledge of his age is then took from his tushes.

The tushes are placed beyond the corner teeth upon the bars, two on each side below, without being preceded by any foal teeth.

The two under tushes cut sometimes at three years, sometimes at three and a half, sometimes at four; but the two upper tushes appear sometimes at four, sometimes at four and a half; sometimes before, and sometimes after the corner teeth, without any certain rule; and till the age of six they are chamfered within.

About ten years of age the two under tushes appear much worn, which serves for that age.

After that they grow out in length, and become bare of flesh, because the gum shrinks and retires; and at last, about the fifteenth or sixteenth year, the horse shells.

A horse is not capable of any great fatigue till his tushes have cut the skin.

Most of the Dutch horses are very sick when their tushes come forth; mares have them but seldom, and when they have them they are but very small.

TENDRIL, the clasper of a vine, or other climbing plant.

TENEMENT, any thing, as a house, &c. held by a tenant.

TENURE, the manner in which tenants hold their lands, &c. of their lord.

THATCH, straw laid on the top of a building, rick, &c. to keep out the weather.

THEAVE, or TIER, an ewe of the first year.

THETCHES. See the article VETCHES.

THICKET, a close knot, or tuft of trees; a close wood.

THILL-HORSE, or THILLER, the last horse in a team; the horse that goes between the thills or shafts.

THISTLE, a well known prickly weed growing in corn-fields.

Wherever thistles grow naturally, it is a sure sign that the land is strong: but they are, at the same time, a great annoyance to every plant intended to be cultivated. The best way to destroy thistles is to cut them up by the roots before their seeding time, which is in the autumn; for cutting them off too young, will only make them branch the more: or, which Mr. Lisle prefers, to pluck the thistles up by hand, when the ground is reasonably moist before they are grown to the size at which they are usually cut. They may then be easily drawn up with their root by the thumb and two fingers; and the weeder may guard against their prickles by putting on a glove, or false fingers, made of hard leather. Chalking of land is a good way to destroy this very noxious plant: but thorough tillage, summer fallows, and repeated good harrowings, are the most effectual of all.

By an excellent regulation in France, a farmer may sue his neighbour who neglects to thistle his land at the proper seasons; or may employ people to do it at the other's expence. And it were to be wished, that a similar law was enacted here, to prevent this wide-spreading mischief, occasioned by the seeding of this pernicious weed; among which may be reckoned; besides its choking the young corn, that if wheat, in particular, be not well thistled; the reapers take up the grips so tenderly, lest they should prick themselves, that, by their loose handling of them, they sometimes leave upon the ground corn enough to sow the whole field.

THISTLING, the action of cutting or pulling up thistles, in order to destroy them.

THRASHING, the action of beating out the corn;

Though the flail be the best instrument yet known for threshing the corn, because it separates the grain from the straw and husks very effectually and expeditiously; yet as it always bruises a great many seeds, even so as to render them incapable of growing, it were much to be wished that some method could be found, by which this essential inconvenience might be avoided. Some engine or other, provided with a number of flails, or other pieces answering the same end, might surely be made to move by water, wind, or a horse, so as to perform the business of thrashing still cheaper and more expeditiously, and with less damage to the health of the husbandmen, which is frequently thought to be injured by the dust, &c. which arises in the common way of thrashing, as well as by the very great laboriousness of the work. This well deserves the attention and endeavours of skilful mechanics. At all events, the thrasher ought not to wear thick iron-clouted shoes whilst he is at work, especially if he is to thrash new corn, and particularly wheat; because they will be apt to bruise it. His shoes for this purpose should be soled with an old hat, or some other soft substance.

Mr. Mortimer esteems it a day's labour for a man to thresh four bushels of wheat or rye, six bushels of barley, five bushels of oats, or five bushels of beans and peas, if the corn thrash well. But Mr. Lisle says a good thrasher assured him that twelve bushels of oats or barley are reckoned a good day's threshing: that this very man had thrashed fourteen bushels of oats daily and winnowed them, for several days together; but that those oats yielded indeed extraordinary well: and five or six bushels of wheat are a very good day's thrashing; and if the corn be clung, and yields ill, sometimes three bushels are as much as can be thrashed in a day. He rates the common price of thrashing at eight-pence for a quarter of corn; and observes, which may account for the difference between the estimate and Mr. Mortimer's, that six bushels of wheat of the growth of a warm gravelly vale are as easily thrashed in a day, as four bushels of the produce of cold hilly land; because the stroke of the flail must be forced down stronger to beat out the grain of this last, than it need to be for the former: and also, that as the straw of corn of the growth of a light soil is shorter than that of a strong clayey ground, more sheaves, and consequently more ears of this first sort, may be laid together on a floor of equal extent, than can be of the last, whose longer straw requires proportionably more room.

The worse the wheat is, though it be never so dry, the rougher it will feel when handled; because thin and coarse wheat is not so plump and globular as fine wheat, but is apt to be pitted and wrinkled, which of course renders it less slippery. It will handle cooler out of a stack two years old, than it will out of the one that is only a year old; for in that time the mists and rimes, especially in a hilly country, will be driven into the stack.

Mr. Lisle, who makes this remark, adds from his own experience, that wheat thrashed in damp weather generally yields but little flour, with a great deal of bran, when it is ground; and that if it be put into sacks, it will grow musty in less than three weeks, let the weather be ever so dry afterwards: but if it be thrashed when the air is perfectly clear and dry, it will keep well in sacks, for a long time; especially if these are laid upon trellises high enough to secure them from the dampness of the ground or floor.

For the keeping of meal, in general, there is no better way than first to bolt it, and clear it from the bran, which is very apt to corrode and putrify it, and make it musty; then to tread it down as hard as possible, and head it up closely, in clean, dry, tight, and well bound casks, which must be laid in a cool dry place.

The beards of barley come off best, in thrashing, when the swarths of this corn have taken the dew before their being housed. It will keep well in the mow, unthrashed, for one year; and for making it into malt, which must be done before the heat of the summer comes on, it should not be kept above a year and a half, or at most two years: otherwise it will be filled with weevils; unless it has been previously cured in a stove or kiln.

Oats being defended with a double husk, are the grain least subject to harbour vermin. The best way to keep them after they are thrashed, is to dry them well on a kiln, and then to barrel them up in clean close casks; but they should not be thrashed earlier than Christmas, because they are not fit for keeping before that time.

Beans and peas always thrash best after they have sweated in the mow, which they are very apt to do, because, as the whole crop of either of them never ripens all together, the green parts heat, and communicate their ferment to the whole heap. The danger to be guarded against here is, that the ripe so heated do not give fire to the green, by which both might be either rotted or consumed; to which the bigness of their leaves, and hardness of their stalks, which continue moist and sappy a long time, will also contribute very much. For this reason farmers generally choose to stack them without doors, rather than to house them; that they may be the more thoroughly dried by the sun and air. But the best way of all is to kiln-dry them, or dry them well in the sun; after which they will keep many years, without turning or any other care, though they be laid ever so thick in the granary. As beans are a very large seed, and consequently full of moisture, it is found best to let those that are intended for keeping sweat in the mow till March, when they may be thrashed without danger: for beans never give again, after they have once been thoroughly dried.

Peas are, of all grain, the most subject to rottenness and imperfection, because they are the most apt to breed worms, weevils, and mites, by reason of the lusciousness and sweetness of their grain. The better they are dried either in the kiln or sun, the former of which will generally be found most effectual in this country, the longer they will keep sound, and the fitter they will be for the food of cattle, by helping to make them thirsty; it being a just observation, that if cattle drink well, they will feed well. What is intended for the food of men should not be dried too much; because that would make the peas require double the time in boiling: nor need they be thrashed for this use, but as they are wanted; or else they may be put into close casks, and headed up. In granaries, they keep best in thick heaps, or in bins: spreading of them thin upon the floor being apt to dry them too soon, and to take from them much of their sweetness and goodness.

Vetches wanted for sowing immediately after they are cut, may be thrashed very well on a hurdle, with a cloth; though they may then be too soft, notwithstanding their being ripe, to be thrashed on a floor, where the flail and the thrasher's feet would bruise and break them.

When a careful husbandman opens and spreads his sheaves, he will pick out of them at least all the largest and most apparent weeds, before he begins to thrash. As he proceeds

in his work, he will from time to time remove all the long straw from the corn beaten out of it, which last always lies underneath, with a prong or fork, and then the pieces of straw, broken ears, &c. with a wooden rake. He will then shovel the remaining grain up on one side of the floor, and repeat this till he has thrashed out enough to make what is commonly called a clearing.

The heap is then passed through a wide sieve, which retains only the bits of straw, and such fragments or ends of the ears as have escaped the flail. These frequently contain very good corn; though the farmer seldom grudges giving them to his poultry, or binding them up with straw intended for fodder. A few of them inclosed in a small truss bound at both ends, the better to keep them in, will entice horses to eat heartily of this straw, which affords them good nourishment: and M. Duhamel judges that they would also be excellent and profitable winter-food for sheep, when there is a scarcity of grass.

A great deal of labour may be saved in the using of this sieve by fastening a loop to its rim, and resting it thereby on a hook suspended by a rope. This will sustain half the weight of the corn, and the winnower may easily give it the necessary circular motion. But yet a more convenient method, is to place a square sieve, of wire is best, with thin boards for its sides, upon two polished rods of iron, to throw the corn up into it with a shovel, and to push it backward and forward upon these rods, on which it moves easily, and will sift a great deal of corn in a short time.

For separating the chaff, which is the next business, the casting shovel is much more expeditious than either the wicker fan, or the common winnow with sails. When this shovel is used, the wind must blow through the barn, either in at one door and out at the other, or in at a window, and out at the opposite door. The winnower then, placing himself under the wind, and close to the heap of corn that is to be cleansed, takes it up, one shovelful after another, and, with a circular motion, throws it scattered in the air, against the wind, towards the opposite side of the barn. The best grains, which are the heaviest, go farthest; the lesser fall short of them; and the very small, shrivelled, and much damaged, with the seeds of cockle, darnel and several other weeds, fall still nearer to the man who throws them; while the lighter seeds of other weeds, with the bits of straw, chaff, dust, &c. are blown from all the rest, by the wind. From time to time, the winnower quits his shovel, and sweeps away the second sized corn, which would be too much intermixed with the smallest, if the heap was left alone, and suffered to accumulate till the end of the winnowing; and when the whole is done, he shovels up the finest grain. The least of all, which borders on the chaff, &c. is also then collected, and the three sorts, after being sifted or screened, to cleanse them from any remaining dust, are laid up separately; the first for sale, the next for domestic uses, and the third, if the farmer can afford it, chiefly for the food of poultry. The short straws and chaff are sifted in a pretty fine sieve, to clear them likewise of dust, and are frequently given to oxen and cows.

Mr. Lisle observes that the seeds cannot be separated from any grain by the common fan, but that it may be done with the screen; of which he therefore advises the constant use for all sorts of corn designed for sowing.

Though wind is in all cases, the chief agent in the cleansing of seeds, which being intrinsically heavier than their coats or husks, are by the same force applied to both, carried to different distances, in proportion to their weight, and thereby consequently separated; yet the natural action of this assistant is liable to many inconveniences: it blows not constantly: but frequently disappoints the winnower in his time of greatest need: when it does blow, it is not always in the best direction to answer the situation of his barn; and without doors it is intirely useless to his purpose, if it be not attended with fair weather. Besides, when its force can be applied in the best way, it is even then not equal; but generally acts by sudden blasts, which, as is well known, disorders the whole work, and occasions a considerable waste of seed.

The Dutch avoid these inconveniences by using a machine (Plate XXVI. fig. 1.) which creates an artificial wind, uniform and steady in its action, and always ready at command.

The fan, (fig. 2.) which is the acting part of this engine, produces a wind proportioned to the velocity with which

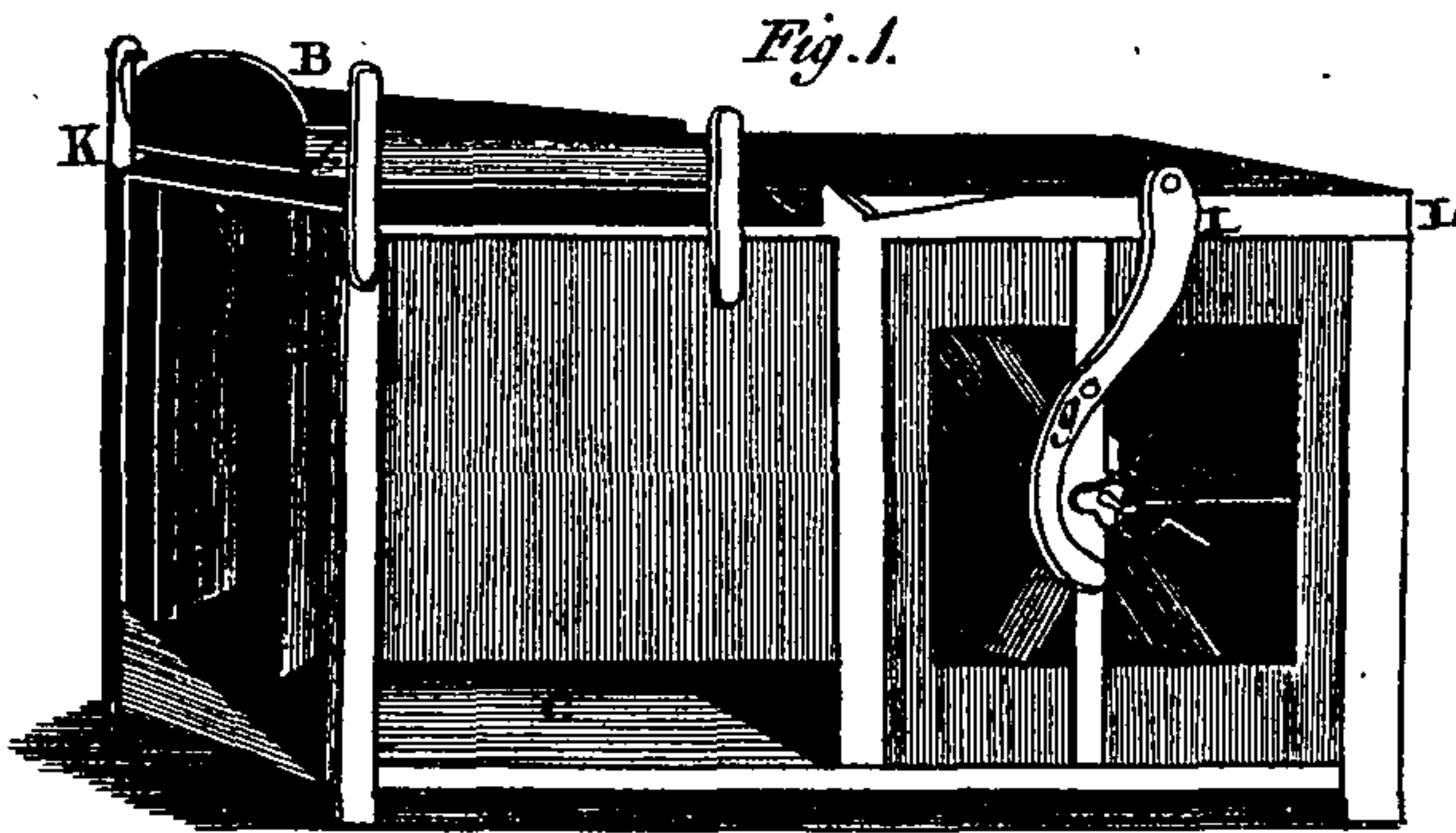


Fig. 1.

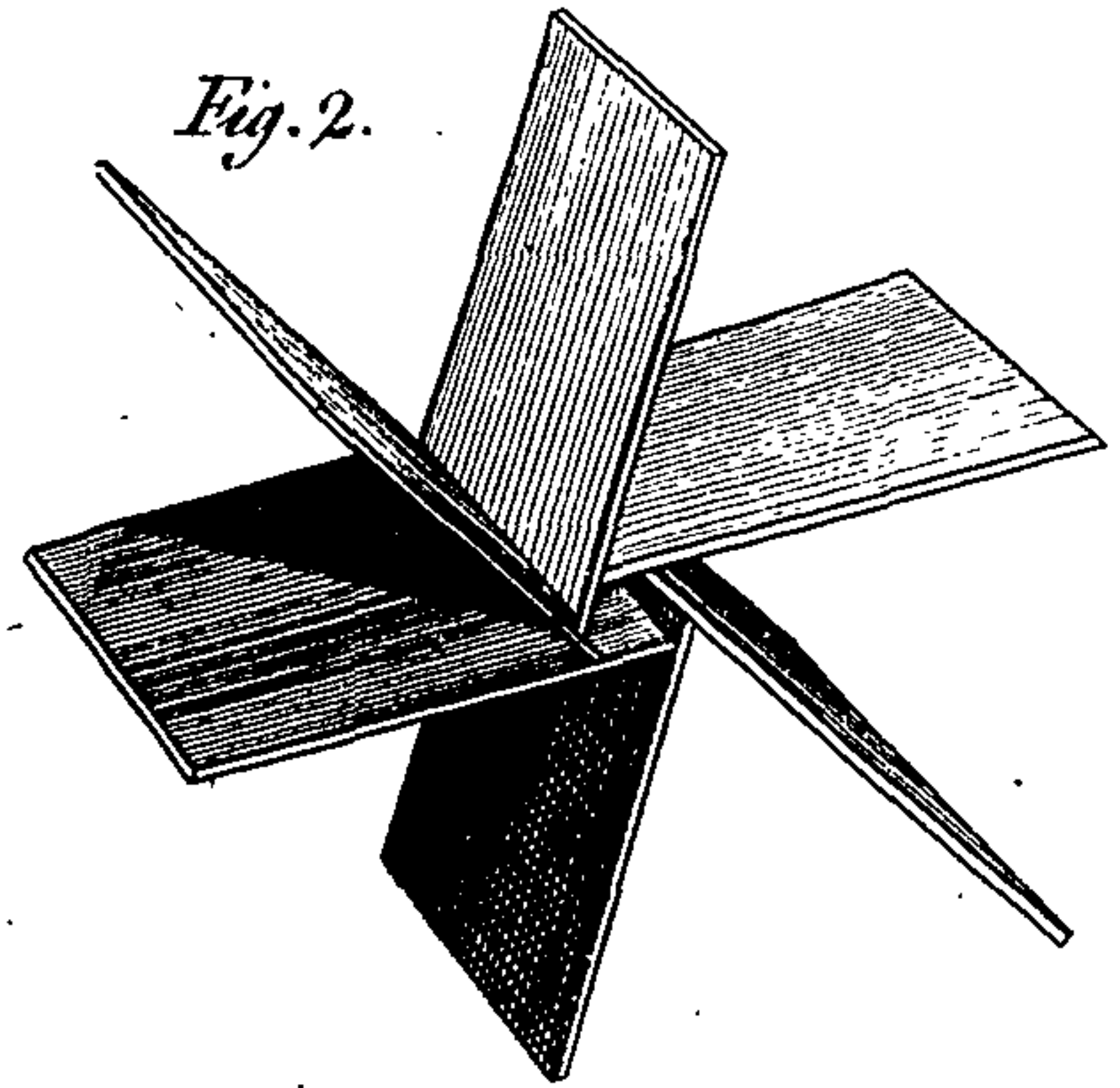


Fig. 2.

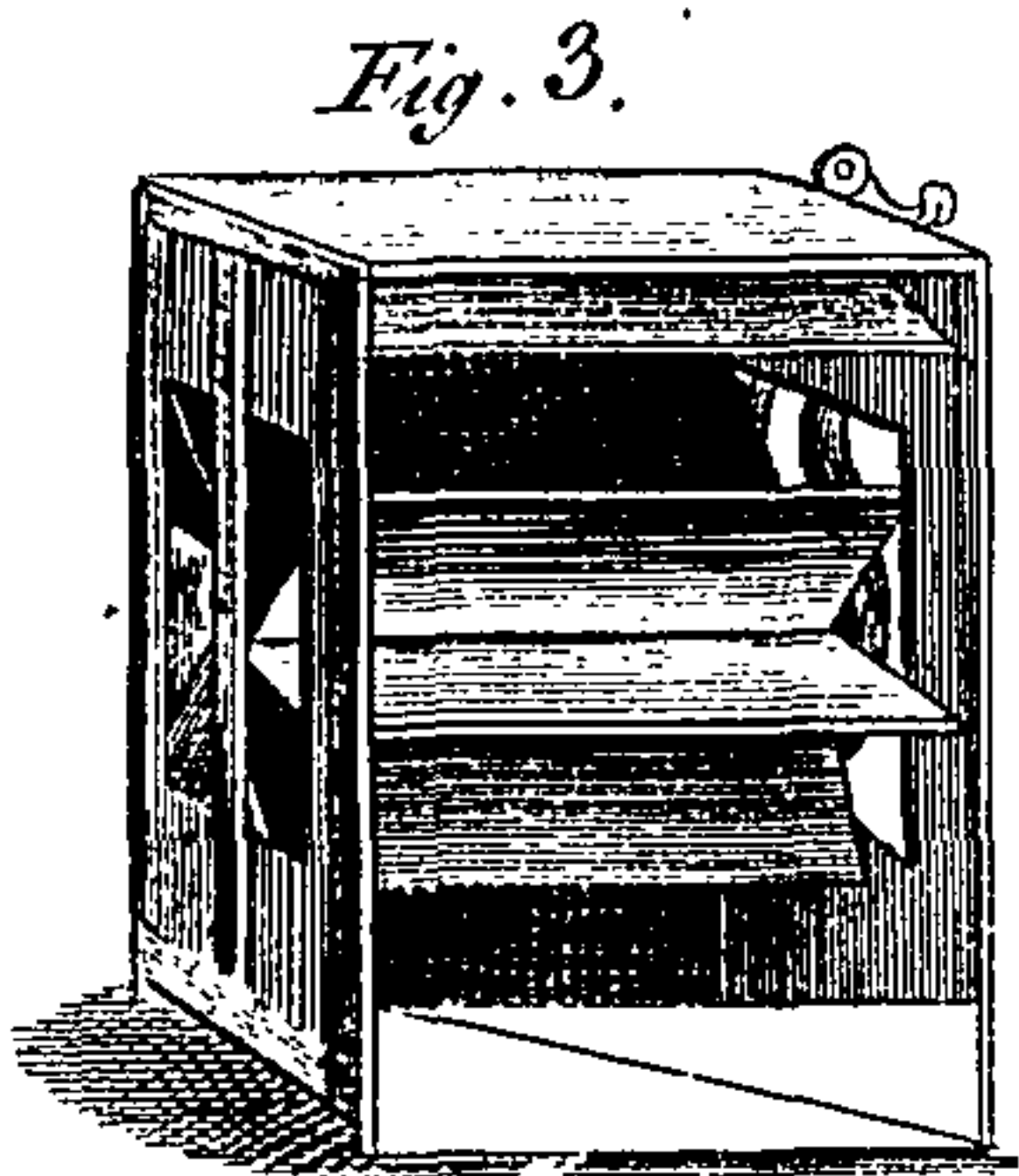
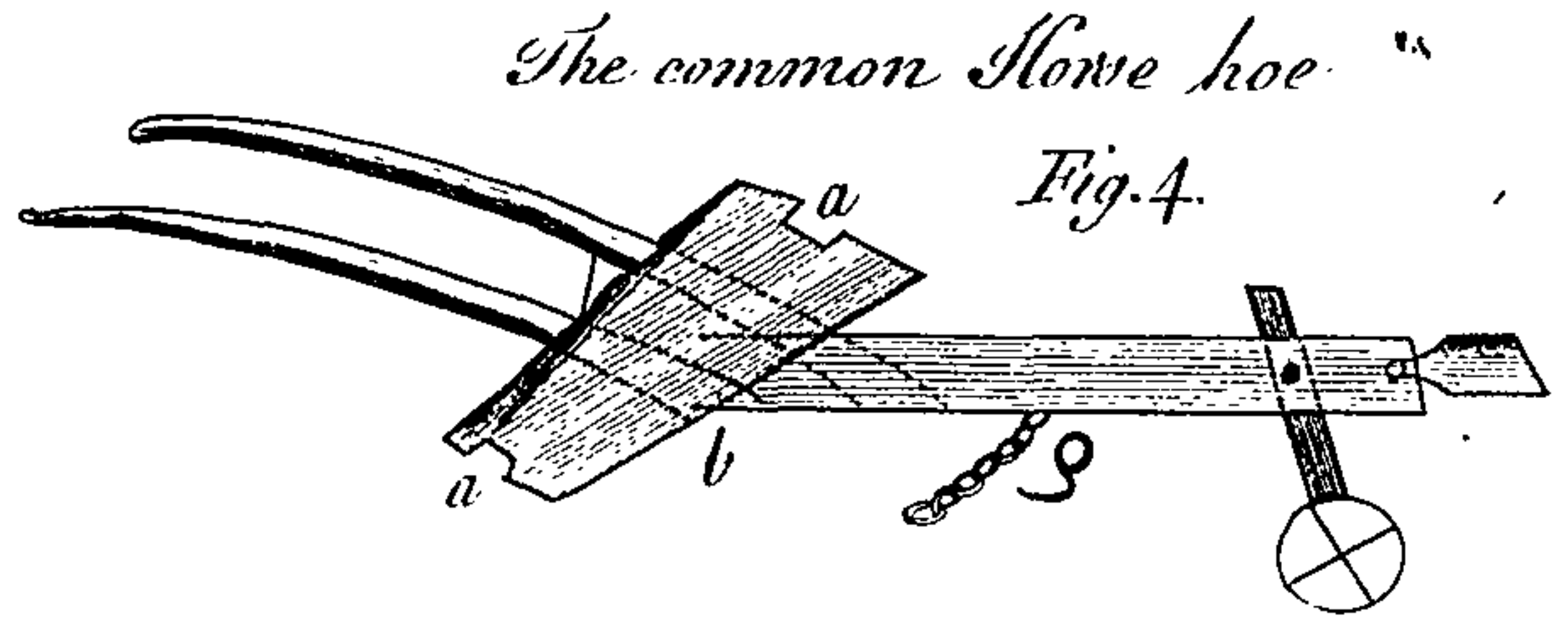


Fig. 3.



The common Howe hoe.

Fig. 4.

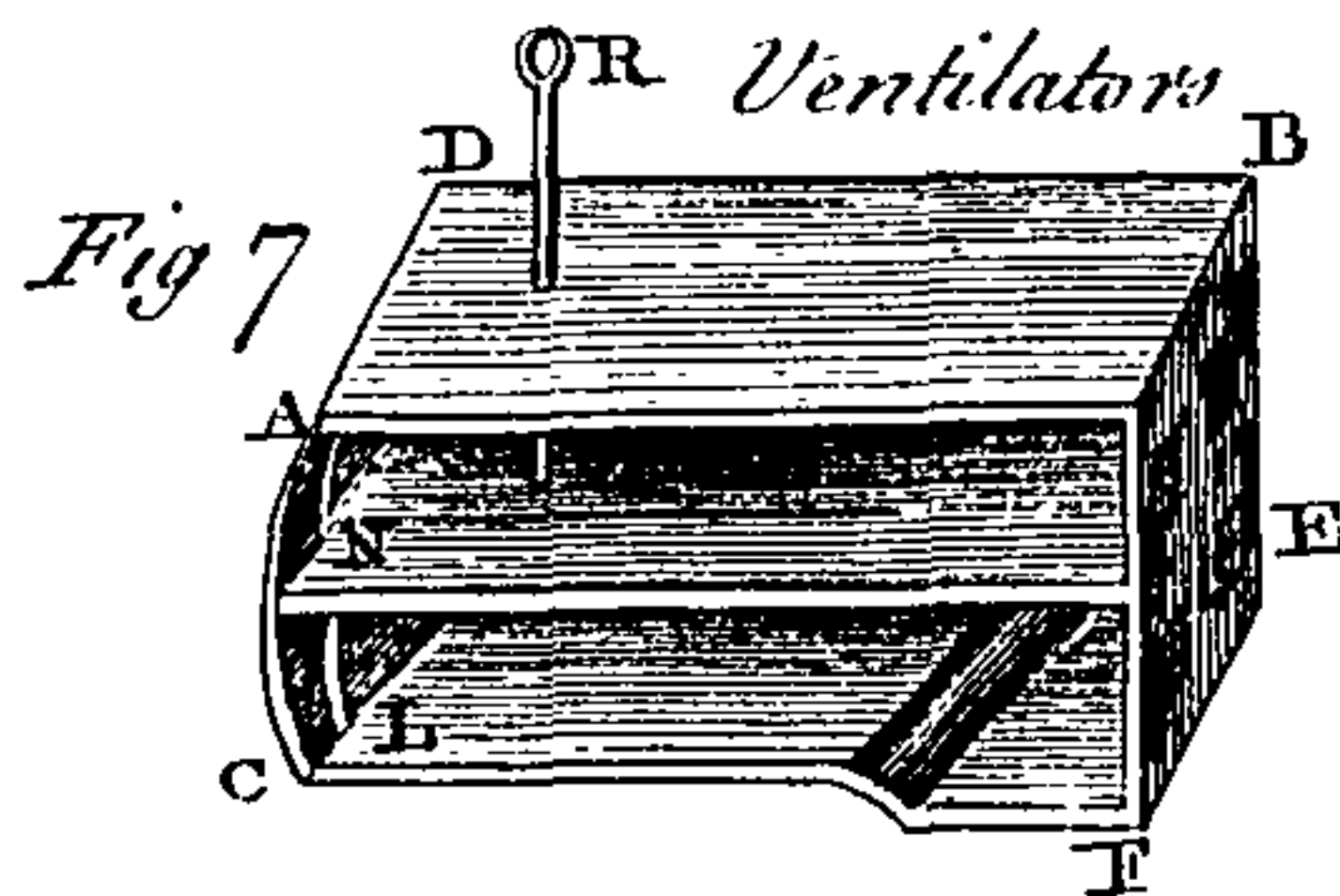


Fig 7

Fig. 9.

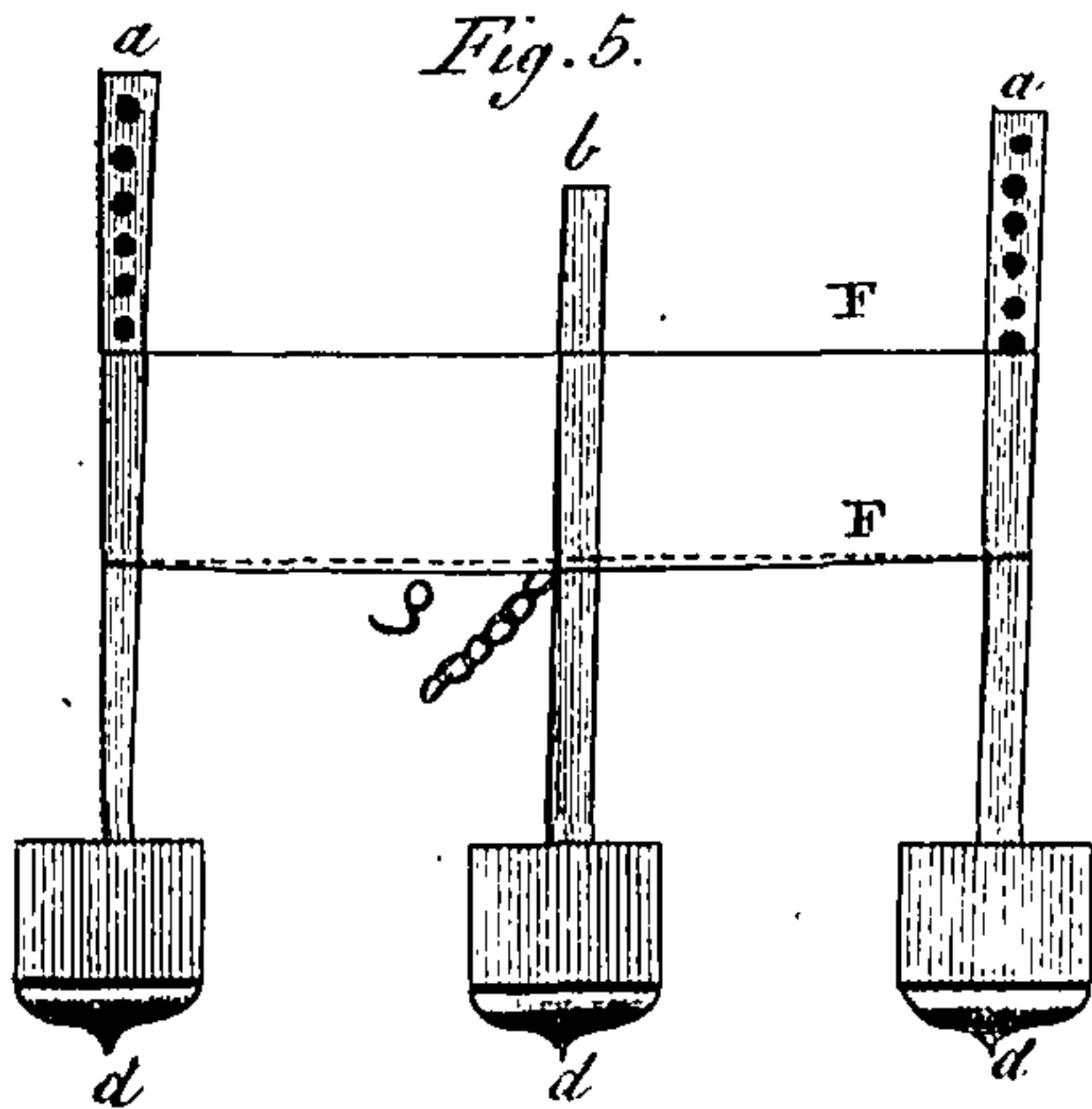
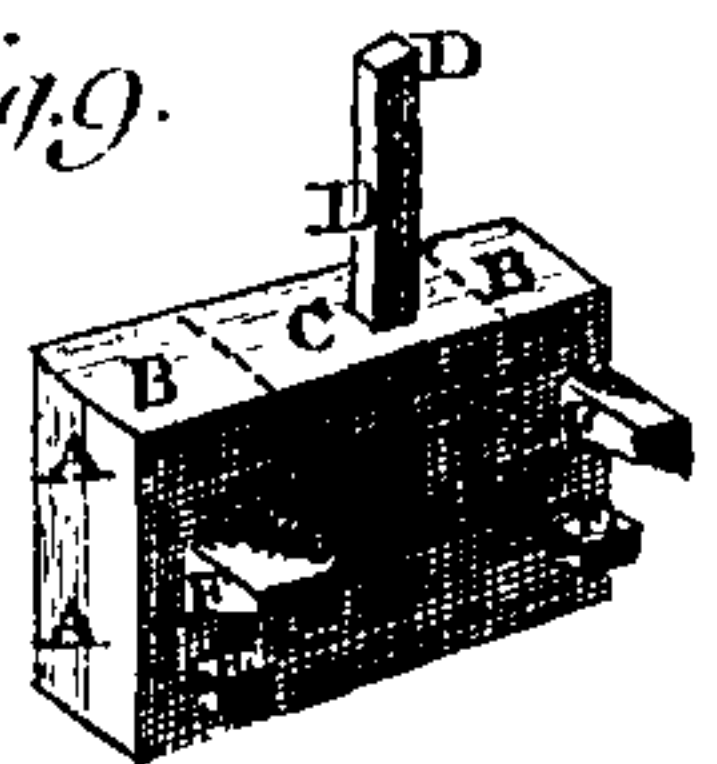


Fig. 5.

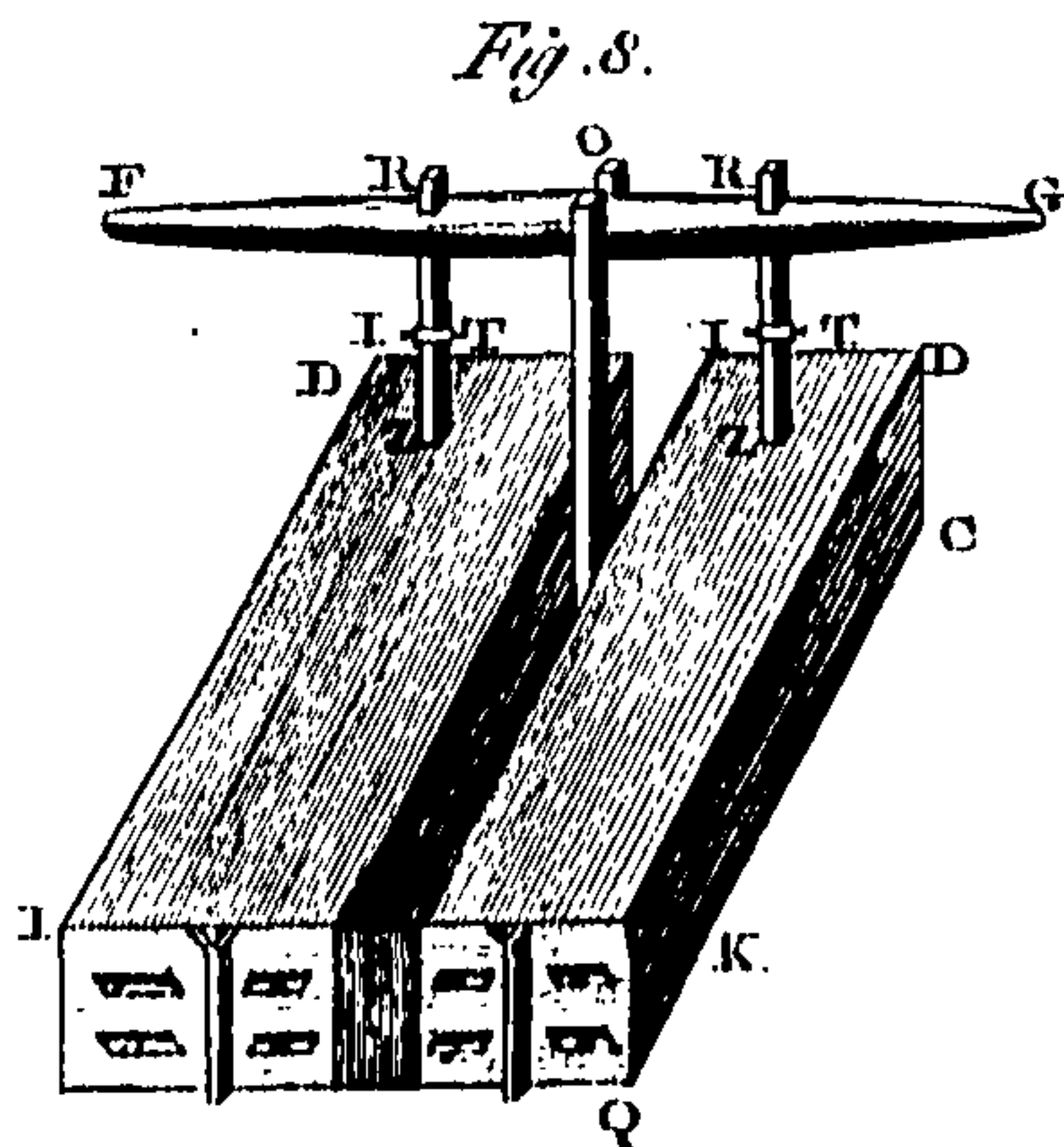
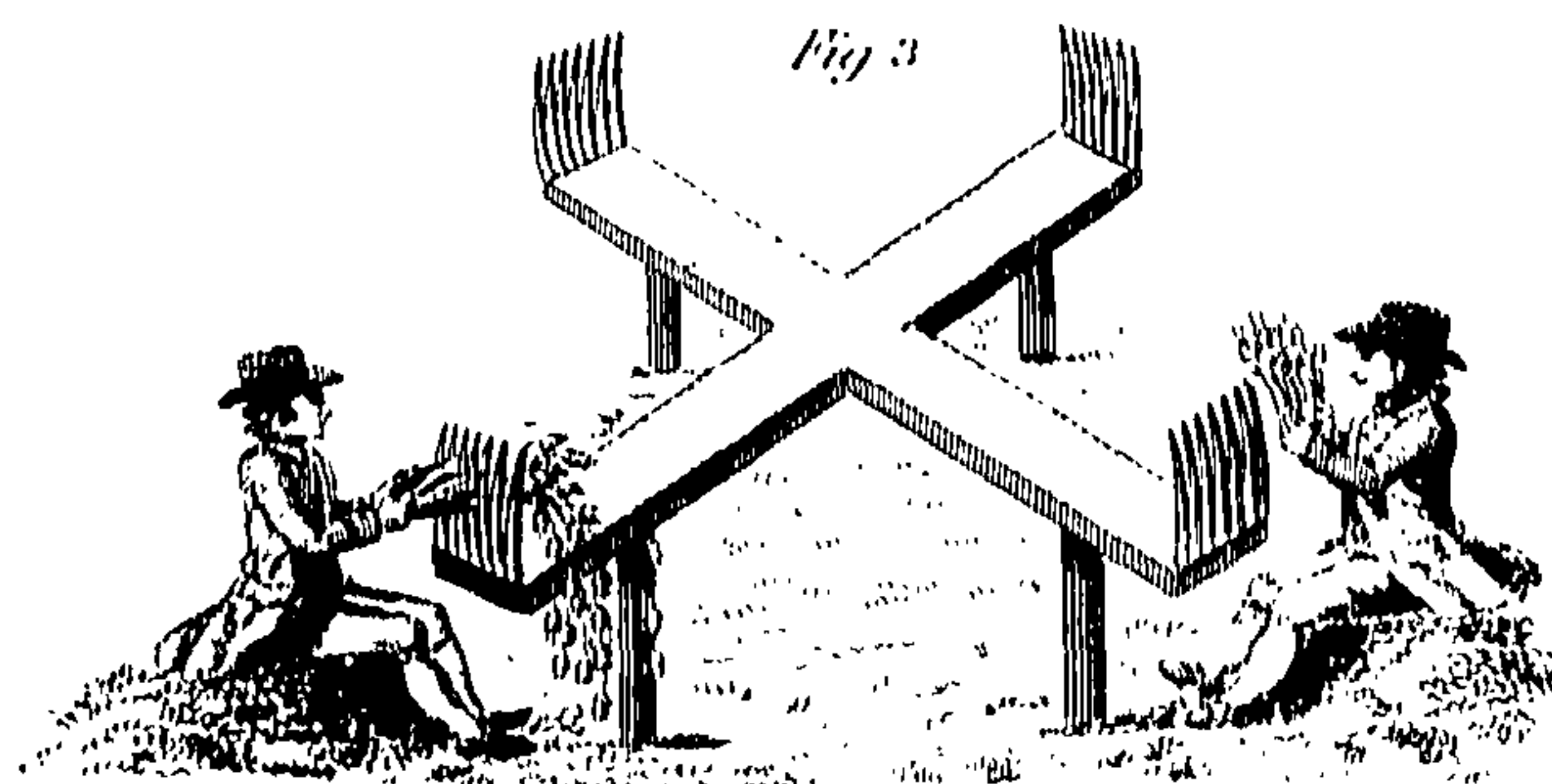
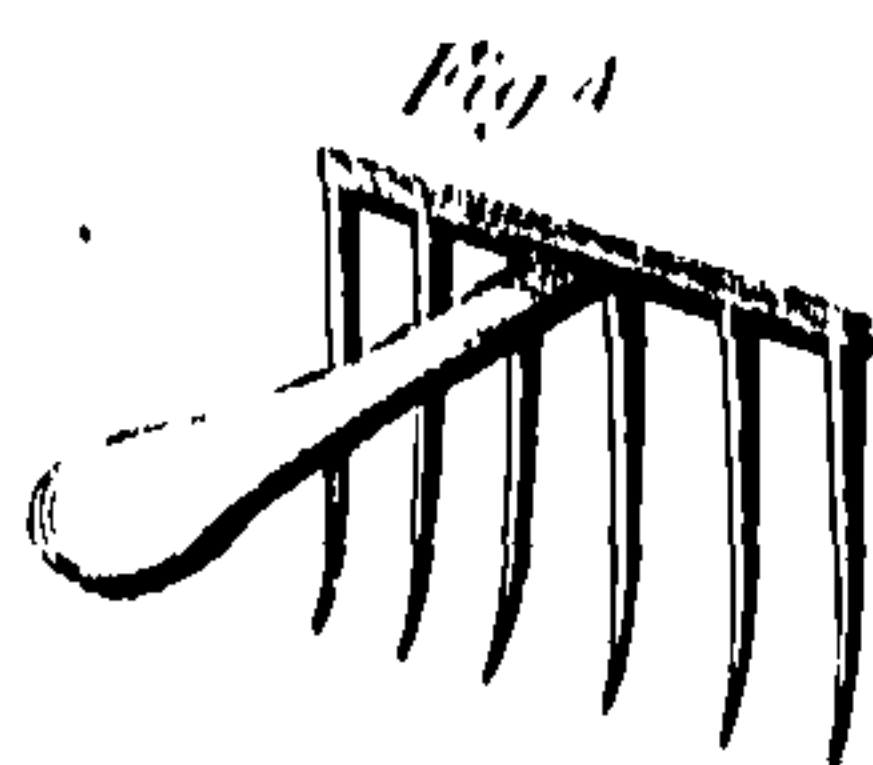
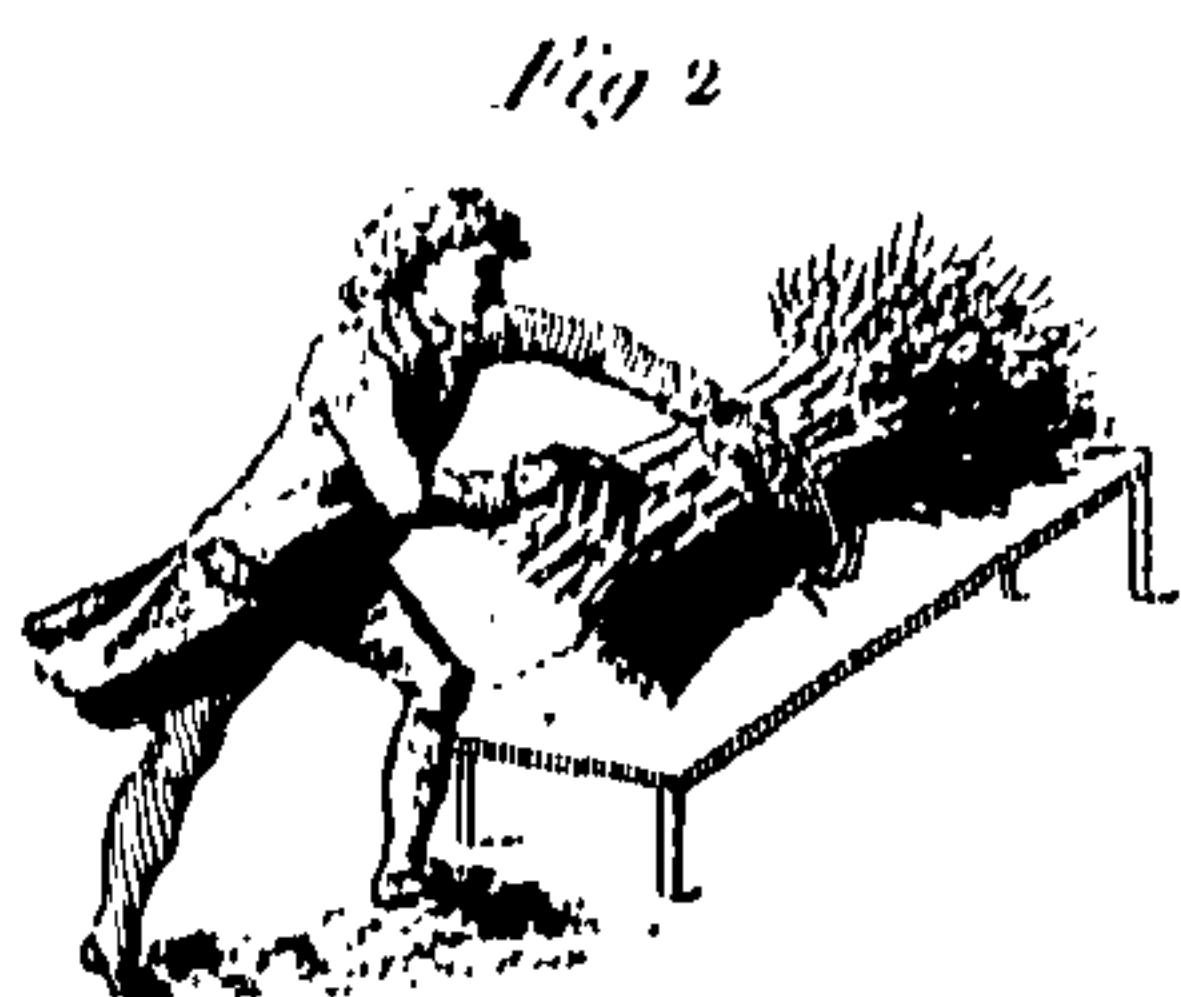
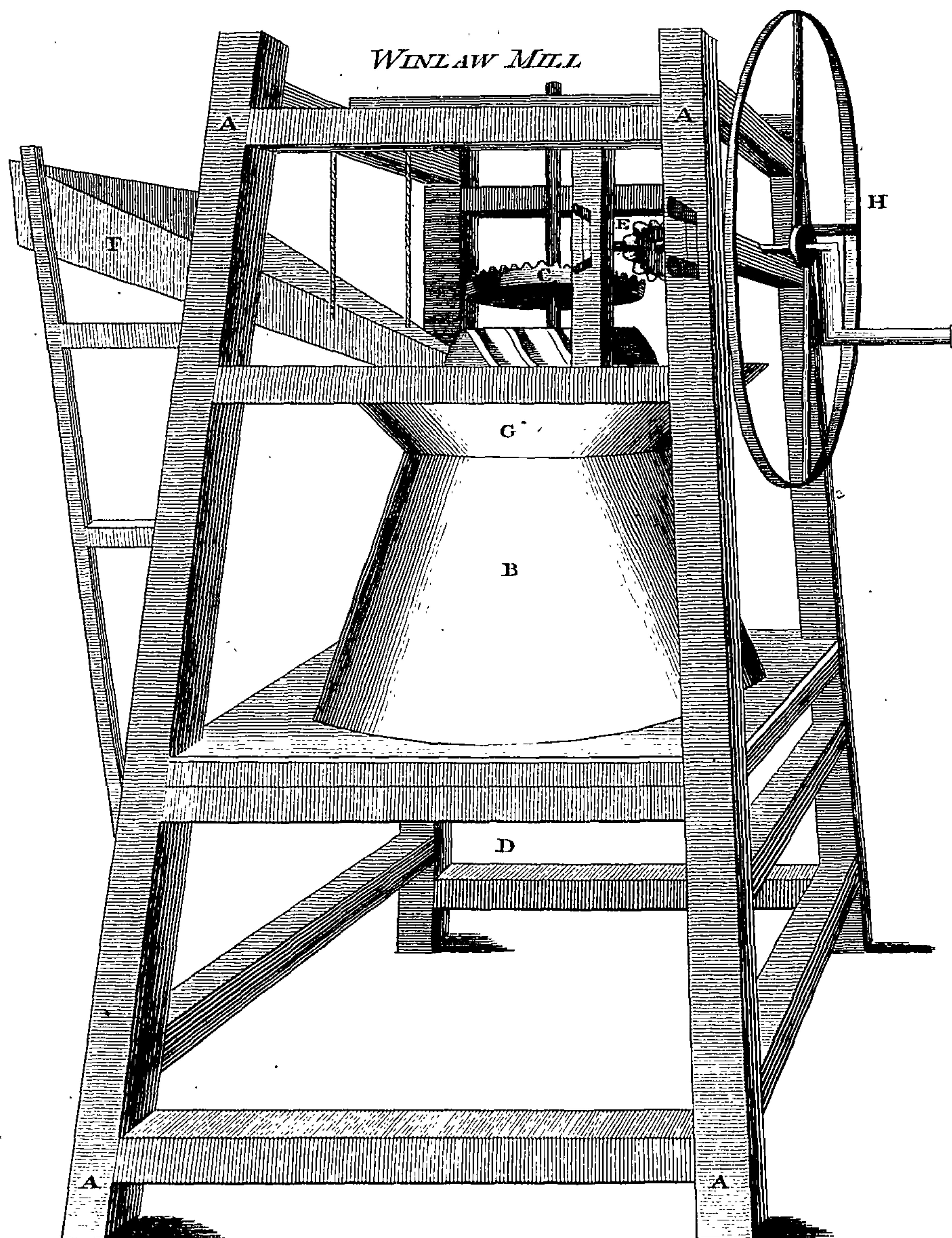


Fig. 8.



Turnep cabbage. Fig. 6.



which it is turned on its axis, and therefore capable of several degrees of strength, as best suits the purpose of the winnower.

The fan is inclosed in a large case or box, K L, and occupies one half of it; which is represented separately, and in a different view, in fig. 3. It is suspended freely on its axis, and turned by the handle A. The other half of the box is empty, and receives the seed as it falls down from the hopper B, to the sloping floor visible at C, along which it slides out at D, while the force of the wind which is confined within this winnow, and always acts in the same direction, viz. lengthways of the machine from A to E, carries the chaff, light and rotten grains, dirt, &c. out at E. In this passage, the wind meets the seed constantly falling from the hopper, and impels it more or less towards the end E, according to its weight. Good seed never goes quite so far, but comes down within the box.

The hopper here is ingeniously contrived to save labour. It hangs by strings upon four pegs, and moves with such ease, that the necessary motion may be communicated to it by the same hand that moves the fan, without any hindrance to the workman. To this purpose, a triangular board f, is fixed upon the handle of the fan, and turns with it. The angles of this board, in their rotation, press against the lower end of a little lath, incurvated as in the figure, which moves freely upon a peg at g. This end accordingly recedes from the pressure towards H, and consequently the upper end moves the contrary way, towards I, and by a string fastened from it to the hopper, draws this last after it, out of its natural situation. When this pressure ends, and the sides of the little triangle are next the lath, the hopper hangs freely, returns to its former place, and takes the lath along with it, till the next angle of the little triangle begins to act; and so alternately as long as the fan moves. As the hopper is thus in continual motion, the seed sheds down, and is winnowed as it falls.

The next care is to cleanse the corn from all foreign bodies, which could not be carried off by the wind, such as stones, bits of earth, &c. These are separated by running the grain through a sieve wide enough to let it pass with ease, while bodies of a larger bulk are retained: and it is likewise often necessary afterwards to use a fine sieve, which lets through only the dust, seeds of weeds, and other bodies smaller than the corn.

Mr. Marshall, in his *Rural Economy of Yorkshire*, vol. I. p. 281. speaks of a winnowing machine to the following effect:

"This excellent machine is well known as a curiosity in most parts of the kingdom. But the county of York being the only one in which its use has been established in common practice, it merits in this place particular notice.

"We are probably indebted to the Chinese, or other Eastern nation, for the invention of this machine. I have seen it upon an India paper drawn with sufficient accuracy, to shew that the draughtsman was intimately acquainted with the uses of it. The Dutch, to whom the invention has been ascribed, imported it, in all probability, from the East Indies. Be this as it may, it indisputably came from Holland into this country.

"Its first introduction into the Vale was by a gentleman of this neighbourhood, about five-and-thirty years ago. But the introducer committing this complex machine to the care of servants, without paying attention to it himself, it was, as might be expected, soon thrown aside as useless.

"Some time afterwards, however, it fell into the hands of a sensible substantial yeoman; who, with the assistance of a friend, discovered its usefulness, and reduced it to practice.

"My father, who had made himself master of the excellencies and defects of this pattern, made one from it, with some improvements. This was the first which was made in the district, and perhaps the first which was made in England.

"The utility of it being seen by some discerning individuals, several others were constructed under my father's direction. But, notwithstanding many of them were kept in common use, and visited as subjects of admiration, it was some fifteen or twenty years before they grew into popular estimation.

"Within the last ten or fifteen years, the making of them has been a principal employment of wrights and carpenters. At present there is scarcely any man, whose farming is considerable, without a machine fan."

"The construction of this machine has undergone several alterations, and some few improvements may have been

made in it; none of them, however, of moment, except that of changing the materials of the sails, from boards to sheet-iron. Its complexness is the only bar to its popularity.

Mr. Young, in his *Annals of Agriculture*, vol. VI. gives a description of a mill, for separating the grain from the ear in place of thrashing, by Mr. William Winlaw, to the following effect. See Plate XXVI*.

"This mill was tried in June, 1785, in the presence of many gentlemen, and gave the greatest satisfaction.

"Upon trial there was passed through the mill one bushel of the heads of wheat in one minute, with very moderate labour to the man that turned it; and, by experiment, it is found that four bushels of the ears will yield one bushel of clean grain; allowing that a man will thrash six bushels in a day, of eight hours work: the mill will clear that quantity in twenty-four minutes, and to a greater degree of perfection than can possibly be done by the flail, for it separates every grain from the ears.

"The saving of corn, by using the mill in preference to common thrashing, being proved, the straw also is in a preferable state after it is cleared of the ears; it need not be handled a second time to prepare it for the market, as it is all combed clean and fitting for use, without any further time being bestowed in preparing it. The expence of repairing or relaying the barn-floors should also be a consideration of the farmers, which the use of the mill entirely removes, besides thrashing instruments, &c.

"It requires very little practice to enable any person to manage the mill. The dart painted on the fly directs which way to turn the handle, it being pointed as it should be turned. The hopper, which serves to feed the mill, is regulated by the two round pins, to which the cords are fixed. The screw at the bottom of the frame is to adjust the distance of the inner nut from the outward cone; for if it is screwed upwards too much it will bruise the grain; if lowered down too far it will admit the ears to pass without effect. The cross bars, which support the axis on which the fly and pinion are fixed, are moveable upwards and downwards, as occasion requires. When the screw at bottom is turned to the right it moves the nut upwards, and give less space. The wedges must be slackened above to admit the axle to rise upwards or downwards, as may be found necessary. These wedges may be slackened or tightened with great ease, and without any danger of injuring the mill.

References to the Plate.

- A, A, A, A, the frame of the mill.
- B, the outward cone.
- C, the large iron wheel.
- D, the regulating screw.
- E, the pinion.
- G, the top curb surrounding the nut;
- H, the fly.

- Fig. 1. the mill.
- 2. the combing the sheaf.
- 3. the comb for stripping the ears.
- 4. the hand comb.

Directions for combing the bottom of the sheaves, and stripping the ears from the straw. (See Plate XXVI.)

The frame of the comb is made in form of a cross, with a comb fixed to every limb, that four persons may work at once, if requisite, according to the figure in the annexed plate. The teeth or prongs are made of steel, and of an angular form, set at such convenient distances as to strip the ears clean; if set too wide apart they will pass through without effect, and if too near together will not admit the straw to go between.

The objection made by some gentlemen, against the mill coming into general use, is, their fear of not finding employment for their threshers.

Answer. If gentlemen and farmers pay proper attention to improving their waste lands, and other necessary improvements requisite in husbandry, they will be at no loss to find employment for their threshers.

The improvements made of late years in our cotton manufactories, by the help of useful improved engines, is sufficient to confute the notion which many people have, that those improvements are hurtful to the labouring interest of the kingdom, when it is plainly proved that the contrary

trary is the fact, many thousands of poor people being employed by their means, who would not have had it in their power to get employment otherwise; consequently they would have been chargeable to their respective parishes, who now are useful members of society."

As the farmers in many place feed their cattle, and particularly their sheep, in the winter, with half-threshed straw; and as new straw is good food for horses, which are induced to eat it very readily when it still contains some grain; there is, in this respect, an advantage in thrashing the corn only by degrees; besides, that the grain itself is allowed to improve in its quality when preserved in the ear, so as attain the most perfect maturity, to sweat out its moisture, and to acquire a degree of hardness which fits it for long keeping. About three months after it has been cut, is generally reckoned the best time for threshing wheat that is intended for keeping; and accordingly our prudent husbandmen make this the business of winter, when their presence is least wanted in the field. But, on the other hand, feed wheat cannot well be too soon cleared from the chaff, as M. de Chateauvieux's experiments have proved; and the best way of doing this, is by striking the ears against a beam. By this method the husbandman will obtain a fine, long, unbruised straw, fit for binding up his next year's sheaves, for thatching, and for various other useful purposes. Of this he should always save, and stack, as much as he can spare, when it proves long and good, for wheat straw will keep perfectly well a year or two; and if there be no occasion for it in that time, it will make litter and dung at last. Barley straw is likewise very serviceable for thatching or to throw over stacks of barley, or peas, till they can be thatched: but oat straw is of no great use, unless it be to cover an oat-rick, peas for fattening hogs, or corn for fowls. In general, an empty space should be left in the barn, if it can be done conveniently in harvest time, to receive the litter, and foddering straw that is threshed out before cattle come to fodder; or it should be laid under some cover, for otherwise it will rot.

THRASHING-FLOOR, the floor on which the corn is thrashed. See the article **BARN**.

THRAVE, a shock of corn consisting of twenty-four sheaves.

THREAF, a handful, a bundle, a pottle.

TROATING, the action of mowing beans against their bending, which is never done but in a thin crop.

THROATWORT, the name of a perennial weed common in pasture grounds. The stalk is cornered and undivided. The flowers grow in bunches at the top of the stalk. They are erect, of a beautiful purple colour, and divided in the middle into five acute segments.

TICHING, setting up turfs in such a manner as they may be dried by the sun, and fit for being burnt for their ashes upon the land.

TIKE, an insect found in dogs, sheep, cows, &c.

TILLABLE, arable, fit for the plough.

TILLAGE, the act or practice of tilling, or cultivating land. See the article **PLOUGHING**.

"I was much pleased, says a correspondent of the editors of the *Museum Rusticum*, with an account which I received about six weeks ago, of a peculiar management of tillage at Market-Weighton, in the East-riding of Yorkshire, given to me by a sensible man of veracity, who was born and bred a farmer in that neighbourhood.

"The inhabitants of Market-Weighton have, it seems, five fields, two of a sandy soil, and three of a strong clayey soil; the former, as will easily be conjectured, destined to rye, and the others to wheat. Their sandy lands are disposed to four swathes breadth; and finding by experience that considerable parts of each land, towards each furrow, are starved by the coldness of water dripping from the higher parts of the lands, they have for many years altered their former method; and only ploughed the half of each land, viz. the two middle swathes: so that they have now excellent rye growing on the higher and dryer half of every land, and excellent meadow growing on the lower and wetter half, which being just two swathes, is moved with great ease and exactness.

"It will, perhaps, be thought by some, that by making narrower lands, they might have more dry land, and consequently more corn. But I apprehend, these industrious husbandmen find by experience, that when they make their lands narrower, and consequently with less descent, the water stagnates in the higher parts, and consequently spoils their whole crop. Nor could they, I suppose, sow more

corn on their lands; in their present disposition, with convenience, as their present method allows them just one swathe on each side.

"They have rye and meadow in one of their two sandy fields every other year; and a fallow the next year. The having half of the field in grass; affords good grass for their sheep, &c. in that year; and allows them to keep a good stock thereon; and this stock, in return, manures the ground considerably, both the fallow and the sward. One of their wheat-fields affords them plenty of worse or spring corn; and thus they are supplied with wheat, rye, spring corn, meadow, and summer grass, from their five fields, which in any other management they could scarcely be.

"It is observable also, that by this management they only plough as much as four fields, and consequently can afford one fifth more ploughing to every piece of ground in tillage, than they otherwise could, on supposition that their fields are all of the same extent.

"These provident people, gentlemen, have another piece of management well worthy the attention of others. They have two great fairs for sheep; one in spring, and the other in autumn. They hold the former of these fairs in one of their fallow fields, which is to be ploughed up in spring. The concourse of sheep, horses, &c. manures this field surprisingly, and then they turn in the dung before it be evaporated or baked. Their later fair is held on the other fallow field, which is soon to be sown with hard corn. And here they receive equal benefit.

"Whether they have their spring fair on the rye or wheat field, I know not; but I apprehend them to have it on the former, as rye is sown sooner than wheat; and the time of sowing might be too late for their autumnal fair.

"Whoever has seen the useless nastiness which is made by sheep at fairs, in the streets of great towns, will think this management of the Market Weightoners highly deserving of imitation: especially in the latter end of the year, when the rains bring in much soil with the sheep.

"I would, however, venture to recommend one improvement to these sensible people, viz. after a certain number of years to plough up one of their sandy fields entirely, and to cross-plough it, and endeavour to mix the soil of the ridges and furrows thoroughly together, and then to make the furrows where the ridges were, &c. and to sow down the outward swathes of each land with seeds proper to the soil. The advantages hence resulting, are so obvious, that it would be an affront to their understandings to insist upon them." *Museum Rusticum*, vol. VI. p. 83.

TILLER, a branch or stem of corn.

To **TILLER**, to spread or shoot out.

TILLS, tares, or vetches.

TILTH, or **TILT**, the condition of the earth after ploughing, &c.

TIMBER. Mr. Marshall, in his *Rural Economy of Midland Counties*, gives the following treatise on timber.

Mr. Laking, of Hall End, whose landlord (living at a distance) has judiciously entrusted him with the care of his woodlands, obligingly shewed me a young oak wood, of about seven acres, which he recollects to have seen planted with acorns.

"He was, at the time of planting, a child. He is now near seventy. He thinks it is about sixty-three or four years ago.

"The inclosure was in grass. A hole was opened by a kind of scoop or gouge, run obliquely into the surface, so as to raise up a tongue of turf; under which the acorn was placed. The sward was not broken, neither by the spade, the plough nor the hoe, nor does he believe that any kind of nursing, except keeping up the fences, was used.

"In about thirty years, it was coppiced, that is, partially cut down as underwood; leaving timber stands.

"It has since been coppiced twice: the last time about twelve years ago; when the timbers were thinned, in a manner that does Mr. Laking great credit.

"The weedlings were sold for rails, chiefly, at a good price.

"Mr. Hill, in whose farm this wood stands, does not recollect the exact produce of these seven acres: but another piece of somewhat more than four acres, planted about the same time, has, he says, already paid its owner upwards of 400l. as nearly as may be 100l. an acre; and the timbers,

timbers, still too thick, are some of them worth 20s. to 25s. a tree: from forty to fifty feet high, and from six to ten inches timber girth.

"There is a strikingly exact proportion between the size of the tops and the thickness of the stems: How injudicious to suffer trees to crowd each other! Mr. L. seems fully convinced of this; and is meditating another thinning. His ideas are very just in this respect. He is equally aware of the mischiefs ensuing from the lashing of tops, and of the utility arising from young plants standing sufficiently close to draw each other up straight; as well as to rot off the lateral shoots of the stems.

"The soil is a hungry clay, worth about 7s. or 8s. an acre; the clay continuing a considerable depth. How judicious to plant such land with oaks. The trees are clean and full of growth.

"Mr. Laking also showed me a small plantation of his own; about twelve or fourteen years old. The ground was sown with wheat, harrowed, and the acorns dibbled in by women, soon after the wheat was sown. The plants have never been touched. They are, however, getting very unsizeable; beginning to be drawn up too slender; and, no doubt, want weeding. They were never hoed, except partially, and Mr. L. seems to think cleaning the land is not of great use. The subsoil is a bed of fine clay: the plants are clean and thriving.

"Lady Robert Bertie has a piece of oaks getting up, by the side of Shortwood. Mr. Hill says, he sowed the acorns, about sixteen or seventeen years ago: he also sowed some ash keys, at the same time; but few of the ashes have got up, and the oaks are too thin. The acorns and keys were sown broad-cast, and harrowed in with wheat.

"Mr. L. says this piece was sown with tree seeds about fourteen years prior to the last sowing; but a rabbit-warren then lying contiguous, the plants were all cut off.

"It is in vain to attempt to propagate wood, in the neighbourhood of warrens; whether of rabbits or hares."

Mr. Marshall, observes, "1784, July 25. This summer, the oak puts on an unusual appearance. The spring shoot having been taken off entirely from most individuals (see his 29th minute) by the chafer, the Midsummer shoot (or more accurately speaking, a fresh shoot) has supplied its place; the trees now appearing in the colour and softness of May.

"The leaves, however, as yet, are small, thin, and faint; unable, probably, to draw up any considerable supply of sap: and even supposing them to acquire, before autumn, their natural size and texture, the loss of time, and the extraordinary check the sap may have received during the disfoliated state of the trees, will probably prevent them, this year, from forming their ordinary increase of wood: a circumstance which may, hereafter, be easily proved, by examination."

In Minute 140 of the same vol Mr. Marshall says, "1785, April 21. The purchasers of the Merevale timber began to fell, yesterday: although the Grosbery has barely foliated, and the hawthorn but just beginning to open. And it is the opinion of experienced timbermen, that some of the trees in Statfold wood (about fifty years younger) would likewise run.

"Query, is this early rise of sap owing to the specific nature of the trees of this district; or to the nature of the soil or climature? or are woodmen in other districts ignorant as to the circumstance of the bark of old trees running so much earlier than that of younger wood?

"It is observable, that young trees, and even the young wood of old trees, retain the leaves longer than the older branches of aged trees: the sap having, perhaps, a less free circulation, neither rises nor falls so rapidly, as it does in old wood; in which the ducts are become large, and in which the flesh of the bark may have lost, in great part, its elasticity."

In Minute 141, he says "The lag is a common blemish of timber trees in this country: a defect which I do not remember to have met with in any other; unless it be included, elsewhere, in that of shakey. It is a cleft, or rift, reaching sometimes from the top to the bottom of the stem, and, perhaps, to near its center.

"This defect is believed to be caused by frost. No other ground, however, is produced for this opinion, than the evidence of an old man, who lives (or lived) in the neighbourhood of Sutton park (in which the lag is very prevalent) and who says that, in the hard frost, he has, in the

night, heard the trees burst, with reports as loud as those of a gun; and that, on examination, he has found cracks in them large enough to thrust in his hand.

"If this be a fact, it is an interesting one. It is, at least, probable; and is, indeed, the only rational account that, perhaps, can be given of this too well ascertained effect."

In Minute 142, he says, "April 28. Two of the purchasers of the Statfold oaks began felling to-day.

"The tops run perfectly well; but the lower parts of the stems move with difficulty. This may seem a paradox. Yet the fact is so notorious that an old bar-kpeeler will have it, the sap enters as the top.

"The buds are just beginning to swell: the small twigs are full of sap: and no wonder they are so; for the buds not being yet opened, the sap has yet no vent, and there is, of course, a surcharge. This surcharge necessarily takes place at the extremities of the boughs; which might be termed the bottom of the containing vessel; while the roots and the stem might be said to act the part of a tunnel, down which the sap, collected by the fibrils, is poured."

In Minute 143, he says "May 1. This morning, spent two or three hours in Statfold wood.

"In one set of workmen, there are nine fellers to seven peelers, and, in another, three fellers to four or five peelers. But stocking (see vol. I. p. 102.) requires a greater proportion of fellers than axe-felling, in the more usual way.

"The minutiae of stocking are these: the horizontal roots having been bared with a mattock, are cut through with falling axes (see as above); and one end of a rope having been previously, or while the surface roots were cutting, fixed judiciously to a bough in the head of the tree, and the other end of the bottom of the neighbouring tree, in a proper direction, the tap and other downward roots, if not very large, are broken off, by means of this purchase; tearing out the crown of the root entire.

"Much judgment and circumspection are requisite in letting down large spreading trees. Two of those already fallen are much injured by rents below the crowns, and a third is cleft halfway down the stem, by injudicious management.

"The mischief is sometimes done by a spreading bough catching a standing tree; but more frequently, by a heavy arm falling uppermost, and dashing to one side when the tree takes the ground. The worst rent (of a valuable tree) was caused by two boughs, standing forkwise; one of them dashing to one side, the other to the opposite side of the stem, while a third took the ground.

"The preventive is, to cut off or cripple the dangerous boughs, while the trees are standing: an expedient which has a doubly good effect; as is not only guards against the splitting, but inclines the tree to fall, with greater certainty, toward the desired point.

"A log of wood, judiciously placed at the foot of the falling tree, assists in giving it a proper bias. And wedges, driven in behind, have a similar effect.

"It is very observable, that the largest trees, of this wood, have the smallest tap roots: their horizontal roots being numerous, and lying quite up to the surface; while those of the stunted inferior trees are all tap or downward roots; lying deep in the ground; having few horizontal ones.

"In this instance, the topsoil is good, with a hungry, gravelly, yellow loam, for the subsoil.

"These stunted trees are an evidence that, in situations where the subsoil is of an inferior quality, oaks, though raised from the acorn in the place where they are intended to grow up, should be tapped.

"One of the largest trees, in this wood, is much depreciated by having its stately stem fouled and rendered coarse, by rotten and small boughs sticking out of it, from top to bottom. Its purchaser allows it would have been worth more by two guineas, had the stem been clean. One hour's work, or half that labour, bestowed upon it a hundred and twenty years ago, would have given this desirable quality.

"What a mistaken idea that timber trees should not be touched with a pruning instrument! It is injurious, no doubt, to take off principal boughs, after the tree is full grown, or even in the latter stages of its growth; but to suffer the stem, while young, to remain foul with dead stumps, and small branches, is unpardonable."

He says, in Minute 144. "May 14. The felling of the Merevale timber was finished yesterday. Scarcely one tree in ten with a perfectly sound bottom. Many of them

hollow at the heart, a considerable way up, and the entire stems of course tainted. What a dear bargain ! How injudicious to suffer timber to stand thus to waste.

"The length of this timber is extraordinary. A large-girting tree measures sixty feet to the first bough : with a continuation of upright stem, near ten feet more !

"Though these trees seemed to stand well aboveground, they have, or have had, very strong downward roots ; though the substratum be rock. But the fissures of this were probably their great encouragement.

"Counted the rings of one of these trees, about three feet diameter at the butt, and two at the girting place ; and ran over those of another tree. As nearly as could be distinguished, two hundred rings.

"It is observable that, in several of these trees, a core of about ten years growth has shrunk and separated from the more outward rings.

"In Min. 145, he states that on May 22. "One set of wood-fellers, now in Statfold wood, rope very few trees, throwing them down with wedges alone : which, if the heart-spurn be sand (or rather brittle) will, they say, break it sooner, than almost any number of men pulling at it with a rope.

"Their method is to cut one of the main high growing horizontal roots, or side spurns, just through ; sticking in the wedges between the butt and the end of the root.

"This is less trouble, and consequently gains a quicker dispatch, than roping ; but it is less certain as to the point of falling. Nevertheless, if the toes be left, some of a judicious length to prevent the tree from heeling improperly when it first begins to fall, and others left uncut to pull it to the given point in falling, much may be done by wedges.

"But if the tap root be pliable, yielding to the wedges without cracking, this method of throwing down timber trees becomes in a degree impracticable." See TREE,

OAK, ORCHARD.

TIMOTHY-GRASS, the name of a grass now cultivated in England, of which it is a native, though the seeds of it were carried from Virginia, by one Mr. Timothy Hanson, to North Carolina, where it is now cultivated by the inhabitants ; and from this circumstance it received the name it now bears.

It thrives most in low, damp, marshy grounds : for in such soil and situation it will produce a fine turf in three weeks from the time of sowing the seed. It is very luxuriant, grows to a considerable height, and has in some sort the appearance of wheat or rye, having a broad blade or leaf.

All sorts of cattle are very fond of this herb whilst in a green growing state ; and it will not be improper to add, that they are nearly, if not quite, as fond of it, when dried and made into hay : but when it is intended for this use, it should always be mown when it is in full sap, just before it flowers, for if it is left longer before it is cut, being so luxuriant and quick a grower, it becomes harsh and is much dryer and more chirkly food, than when it is cut in its prime.

"Timothy-grass, says an experienced farmer, in a letter to Dr. Templeman, is in appearance a coarse grass, very little promising to be a pasture agreeable to cattle. Indeed its appearance so strongly prejudiced many against it, that it would have been at once condemned to neglect, had it not been rescued by the enterprising disposition of Mr. Roque, which had sown a considerable spot of ground with the seed first sent from America ; yet the fact is, that, whilst in the sap, it is more agreeable to horses and cattle than any other grass has been observed to be. Mr. Roque's horse soon gave him a convincing proof of this ; for having got loose, he left very fine lucern, and the moment he reached the Timothy-grass, instead of ranging about, as usual with horses, he eat clean before him.

"Deer, which are very nice in their food, are so fond of it, that, as I am very well assured by gentlemen from North America, they sow Timothy-grass there on the skirts of their corn land near the woods ; in order to keep the deer from eating their corn ; the Timothy-grass being much more agreeable to them than even corn.

"The dry hay of their Timothy-grass is exceedingly agreeable to cattle, as appears from a remarkable instance mentioned in a conversation in the Society for the Encouragement of Arts, &c. A worthy husbandman, who had himself often experienced how fond his cows and horses were of it, carried a friend into the field, that he might have ocular demonstration of it. The husbandman

took a tuft of dry Timothy-hay in his hand, and as soon as one of the cows saw it, she came instantly to feed on it though there was plenty of good grass under foot. Another cow soon followed the first, and both eat greedily of it : but each of them refused to eat the hay of common grass, which happened to be mixed with it. So fond were the horses and cows of this hay, that they would follow a person having some of it in his hand, as readily as they would one who carried corn for them.

"A very great advantage attending the Timothy-grass is, that it thrives well in such wet marshy land as will scarcely yield any other good grass ; and here, its numerous and matted roots make so strong a sward, that land which was before a loose mire, shall become so firm as to bear cattle and even carriages, without their sinking into it.

"It is almost needless to add, that in order to sow Timothy-grass seed in such marshy land, it must be drained, and then all the inequalities common in such land, as well as the strong matted roots of coarse grass, should be taken up and burnt. The land being then ploughed and laid smooth, the ashes should be spread upon it, and the seed may be sown early in the autumn ; or rather, the plants should be raised in a nursery, and set in it at six or eight inches distance, every way, from each other. This grass will also thrive well on a clay bottom, where water is apt to stagnate in rainy seasons.

"The Timothy-grass will grow to the height of three or four feet. I have been assured by a gentleman that he has seen it between five and six feet high in Virginia. If it is cut down before the seed ripens, it will soon shoot anew, and yield a good second crop. The foul meadows grass grows to the height of about three feet, and will ripen its seed twice in a season : we may therefore infer, that it may be cut for hay thrice in a season. It is not an early grass ; but as soon as it begins to shoot, it makes up for that loss by its speedy growth. During the drought of a summer, the second crop made a surprisingly quick progress. Its not being an early grass is perhaps no loss ; for as it delights in rather moist meadows, the ground might be poached, were cattle tempted to go early to feed on it.

"If from some imperfection in the soil, the plants of either of these grasses do not fill the ground sufficiently, they may be let to run to seed, which falling in the vacant spaces, soon supply the want. So far as we have yet observed in this country, these self-sown plants do not arrive at the size of the parent plants, which were set at due distances : and this affords good reason to think, that if the seed was sown in broad-cast, and the plants came up thick, they would in the same manner be stunted in their growth.

"The success of the Timothy-grass, when sown alone, demonstrates the utility of sowing the seeds of each grass separately, in order to form a just estimate of their comparative values : for though this grass is a native of England, being a species of the fox-tail, it has been hitherto rather neglected than cultivated, even though nature has pointed it out as an useful plant in wet meadows, by its early verdure and growth. I make no doubt but that the practice of raising grasses separately, will bring other no less valuable grasses to light."

"The attention of the public, says Mr. Baker (in his Report for the year 1775) particularly in England, has been very much engaged for some time past with this grass, which is introduced under a new name, perhaps with a view the more conveniently to answer the purpose of the venders of the seed ; for which I have given 14 shillings a gallon ; and I am informed that in London, it has been sold for five shillings a pint, which is 40 shillings a gallon.

"It is named Timothy-grass, instead of its being called by its proper name, for a strange reason, I think : namely, that one Mr. Timothy Hanson carried the seed of it from Virginia to North Carolina, (a great passage truly) where it is now cultivated by the inhabitants : others insist that it was brought by Mr. Timothy to Carolina from New York. We are told, that from this circumstance it received the name of Timothy : and in order to possess it of this name, and to make us believe it is not to be had in these kingdoms, we are told it is a native of America ; a fact of which I have no doubt ; but it is also a native of these kingdoms, and will be found to abound, more or less, in almost every meadow, particularly in moist grounds. I have found it rise spontaneously in many parts of my land, even in the uplands, after I had manured and improved them ; and the true name of

of this grass is, the meadow-fox-tail, so called, I presume, because the head or ear of it resembles a fox's tail in shape.

"Mr. Stillingfleet's observations upon this grass are clear, although short, and therefore I shall beg leave to transcribe what he says.

"This grass is found in great plenty, in our best meadows about London, and I believe, makes very good hay. Linnæus says, that it is a proper grass to sow on grounds that have been drained.

"I am informed, that the best hay that comes to London, is from the meadows where this grass abounds. I saw this spring a meadow, not far from Hampstead, which consists of this grass chiefly. This grass is scarce in many parts of England, particularly in Herefordshire, Berkshire, and Norfolk. [I am not surprised, says Mr. Baker, at its being scarce in Berkshire and Norfolk; because the first is a gravel, and the latter a sand. But wonder it abounds not in Herefordshire, which is a deep wet country.]

"It might be gathered at almost any time of the year, from hay ricks, as it does not shed its seeds without rubbing, which is the case of but few grasses.

Mr. Miller just mentions this grass; and likewise another which he calls the smaller fox-tail, which I have also found upon my land very frequently; it resembles the first named in every respect, except that it is much smaller.

"Mr. Stillingfleet mentions a third grass of this kind, which he calls the water fox-tail. He says, "this is also found in meadows about town, that are found, but lie under water in winter; and perhaps might be proper to sow on such grounds."

"This last I have not met with; and really had many other writers of the present time, mentioned this third sort, I should have concluded it to be the same as that first named; but I have so great a deference to, and reliance upon this writer's judgment, that I have no doubt of there being a third grass of the kind, which I shall use my endeavours to find. Mr. Stillingfleet has furnished us with an engraving of the first, but not of the water fox-tail.

"Several correspondents of the *Museum Rusticum*, have wrote upon the meadow fox-tail grass, under the name of Timothy, some few of them very rationally; but upon the whole, their letters are not so instructive as might be expected, and tend principally to dispute about trifles, and to furnish panegyrics upon individuals; and as few of the letters seem to have arisen from experience, I shall omit the taking further notice of them.

"I have, during the two last summers, collected by hand, of the native seed. I have bought of that which was sold in Dublin, and said to come from America. A noble lord, who is a member of the Society, received a present of this seed from America. He did me the honour to give me some of it. With this, and that which I bought, I have compared that which I collected, and I find them all to be exactly the same.

"Where the grass rises in ground which is in good condition, and in tillage, I observe, that very early in the spring it affords a very luxuriant and fine pasture, of which all sorts of cattle are very fond: but when the grass rises so high, as that the seed is approaching to maturity, it is exceeding coarse, and I think must make very bad hay. But if it be sown on rich ground, and shall not be suffered to stand longer than just for the heads or ears to unheath from the leaves or blades, which they do in the same manner as wheat, I have no doubt but it will make good hay, and that will afford an heavy crop.

"It is urged, as a recommendation of this grass, that it will, some say in three weeks, form a sod, equal to meadow of many years standing; and that it will, on the deepest swamp or bog, in a short time make a sod, which will bear horses or waggons. I have had no experience of this, and do confess, I should not care to venture my cattle and carriages upon such a surface, unless I had before drained the swamp or bog; with that precaution I have no doubt, but the meadow fox-tail grass will make found meadow, as many other grasses will do, under proper care: yet, I must not omit to observe, that this grass appears to be better suited to the improvement of moist low grounds, than the generality of grasses, and would certainly be very useful upon drained and improved bogs."

TINE, a tooth or spike. And hence the common phrase, of giving two or three tinnings, signifies to draw the harrows twice or thrice over the same spot of ground.

TIT, a small horse.

TOR, rowen or winter-grass.

TOVET, or Tofet, half a bushel.

TRAMEL, an instrument or device, made sometimes of leather, but more usually of ropes, fitted to a horse's legs to regulate his motion, and teach him to amble.

Tramel also signifies an iron instrument hanging in the chimneys, whereon to hang pots or kettles over the fire.

TRANSPLANTING, the act of removing trees or plants from the places where they are sowed or raised, and planting them in others. See the article LUCERNE, PLANTING, &c.

TREE, the first and largest of the vegetable kind, consisting of a single trunk, out of which spring forth branches and leaves.

Plantations of useful trees might be made to very great advantage in many places in every country, and the country greatly enriched by it, while the public would be also benefited by it, since it would raise a continual supply of timber used in ship-building, and on other public as well as private occasions.

We have, in many places, heaths and other barren and uncultivated lands, of very great extent; and how great an advantage would it be to the public, to bring these to be truly valuable? Many, if not all of these heaths, would be found on trial capable of producing trees; and some of them are truly the remains of destroyed forests; and, though the profits to be reaped from the planting these would come late, yet the expence of doing it would be very trifling, in comparison of that profit, and the means easy.

The authors who have given rules for planting, having employed themselves only about small spots of ground, the established orchards, or parks, are by no means to be supposed proper guides in attempts of this kind; and Monsieur de Buffon, who had a great opinion of the knowledge of our Evelyn and Miller, who seem to speak of every thing from their own experience, found, when he set about large plantations, that their opinions and rules were erroneous; and was obliged to have recourse to experiments only, which he varied a thousand ways: and, though many of them proved unsuccessful, yet they all gave hints towards others, by which the attempt might afterwards be brought to succeed.

This sagacious enquirer into the operations of nature in the growth of vegetables, having set apart a considerable quantity of land for the trial, and procured a number of young trees, first divided the whole quantity into a number of small squares, and having made a plan of it, examined the nature, depth, and other circumstances of the soil in each, and minuted the whole down on a proper part of the plan; that himself, or whoever succeeded him, might judge from the different growths of a number of trees planted in the same state in the different soils, the different advantages and disadvantages of every circumstance in the depth and nature of the ground, in regard to the growth of useful trees. Different numbers of labourers were employed about different spots of this ground, and the acorns for the young growth planted at different seasons; but the result in general was, that what should seem the best methods succeeding the worst; and those pieces where many labourers were employed, and the acorns planted before winter, were much thinner of young oaks, than those where the least labour had been bestowed upon the ground, and where the acorns had been planted in the spring; but those places which succeeded best from the sowing, were those which had the acorns planted in holes made by a pickaxe, without any preceding culture of the ground. And those where the acorns had only been laid upon the earth, under the grass, afforded a great number of vigorous young trees, though the greater part had been carried away by birds, and other devouring animals. Those spots of ground where the acorns were set six inches deep, were much worse furnished with young shoots, than those where they had been buried but at an inch deep, and in some places where they were buried at a foot deep, not one shoot appeared, though in others where they had been buried at nine inches there were many.

Those acorns which had been steeped for eight or nine days in wine lees, and in the water of the common sewers, appeared out of the ground much earlier than those which were put in without this previous management.

But the most successful of all the trials was that of planting in the spring such acorns as had been sown together in another

another place, and had time to shoot there; of these scarce any failed, and the plantation was perfectly flourishing, though the growth of these young shoots was not so quick and vigorous as those of the acorns which had remained, where first sown; which was probably owing to the injury the tender radicles received in transplanting.

Thus succeeded the experiments by sowing, while, of those made by planting young trees, such as had been brought out of woods, and places under covert, succeeded much worse than those which had grown in more exposed places.

The young trees of the several parts of the plantation kept on their growth in the manner they had begun to shoot, those of the more laboured parts continuing more weak, and lower than those of the less laboured.

Thus were a number of necessary experiments carefully tried; and the result of the whole was, that to make a plantation of oaks, on a soil of the common clayey or loamy kind, the most successful method is this: the acorns must be preserved during the winter in the earth in this manner: let there be made a bed of earth six inches deep, on this place a layer of acorns two inches deep, over these lay a bed of another half foot of earth, over that another layer of acorns, and so on successively, till as many are employed as there will be occasion for; the whole is then to be covered with a foot depth of earth, to preserve all from the frost. In the beginning of March, these beds are to be opened, and the acorns which will by that time have shot out, and are then in reality so many young oaks, are to be planted out at a foot distance each, and the success of a plantation of this kind need not be feared. This is a manner of planting that is done at a small expence, and even that might be in a great measure spared, were it not for the birds and other devouring animals; since, could the acorns be defended from these, they might be only laid on the surface of the ground under the grass in autumn, and they would infallibly shew themselves in so many young oaks the succeeding spring.

It is easy to continue the carrying the acorns, when taken out of their winter's bed, to the place where they are to be planted, without doing them much injury; and the small stop the transplanting puts to their growth, is in reality rather an advantage than an injury; since it only retards the young shoots for about three weeks, or less than that: and by that means secures them from the few cold mornings that may be expected about the time of their natural appearance.

As it appears from these experiments, that the acorns succeeded best where the least labour and preparation of the land was bestowed upon them; and that transplanting the young oaks, or even removing the acorns, from whence they were laid to sprout, retard the growth of the plants: also that the plants rose in the spring, and prospered, that were only laid on the ground, under the grass in autumn, and is the natural way by which oaks are propagated; this appears therefore to be the best method of propagating these trees; to which the only objection is, that the acorns sown in this manner are liable to be devoured by birds, and other animals, because exposed to their view. This may in great measure be prevented by paring the surface of the ground with a breast plough, laying the acorns upon the pared ground, and covering them with the turf that was pared off; or still more expeditiously, and at a less expence, by paring the surface with a paring plough, such as is sometimes used to pare land for burn-beating; a man immediately following the plough, to sow the acorns pretty thick, and another to throw back the turf upon the seed, will cover it very securely from those devourers, which usually destroy the acorns when exposed to their view. Where neither the breast nor paring plough can be used, the paring axe may be used.

TREFOIL, a genus of plants, the flower of which has a tubulous permanent empalement of one leaf: it is of the butterfly kind, drying in the empalement. The standard is reflexed, the wings are shorter than the standard, and the keel is shorter than the wings: it has ten stamina, nine are joined, and one is separate, terminated by single summits, and an almost oval germen supporting an awl-shaped style, crowned by a single stigma. The germen afterwards becomes a short pod with one valve, containing a few roundish seeds.

Mr. Miller enumerates twelve different species of trefoil, the first of which is well known in England by the name of red clover; and the manner of culti-

vating this plant as been already described under the article **CLOVER**.

The second sort, namely, the white Dutch clover, grows naturally in most of the pastures in England, and is generally known among the country people by the name of white honey suckle.

This is an abiding plant, whose branches trail upon the ground, and send out roots from every joint, so that it thickens and makes the closest sward of any of the sown grasses; and it is the sweetest feed for all sorts of cattle yet known: therefore when land is designed to be laid down for pasture, with intent to continue so, it should be sown with the seeds of this plant. The usual allowance of this seed is eight pounds to one acre of land; but this should never be sown with corn, for if there is a crop of corn, the grass will be so weak under it, as to be scarce worth standing; but such is the covetousness of most farmers, that they will not be prevailed on to alter their old custom of laying down their grounds with a crop of corn, though they lose twice the value of their corn by the poorness of the grass, which will never come to a good sward, and one whole season is also lost; for if this seed is sown in the spring without corn, there will be a crop of hay to mow by the middle, or latter end of July, and a much better after-feed for cattle the following autumn and winter, than the grass which is sown with corn will produce the second year. The seed of this sort may be also sown in autumn, and this autumnal sowing, if the seeds grow kindly, will afford a good early crop of hay the following spring; and if after the hay is taken off the land, the ground be well rolled, it will cause the clover to mat close upon the ground, and become a thick sward.

The seed of this white Dutch clover is annually imported from Flanders, by way of Holland, whence it received the name of Dutch clover; not that it is more a native of that country than of this, for it is very common in moist pastures in every county in England: but the seeds were never collected for sowing in this country till of late years; nor are there many persons here, even now, who save this seed, though it may be done if the same method as is practised for the red clover, be taken with this sort; it should therefore be recommended to every farmer, who his desirous of improving his land, to sow carefully an acre or two of this white clover for seed, which will save him the expence of buying for some years, when the price is great; and there will be a sure market for any quantity he may have to spare.

The third sort, namely hop-clover, called by some yellow meadow trefoil, grows naturally among the grass in the upland pastures of this country; but the seeds are frequently sold in the shops, and are by many mixed with the other sorts of clover and grass-seeds, for laying down ground to pasture. This plant grows with upright branching stalks about a foot high, garnished with trifoliate leaves, whose lobes are oblong and heart-shaped, but reversed, the narrow point joining the foot-stalks. The flowers, which are yellow, grow from the wings of the stalk, upon long foot-stalks, collected into oval imbricated heads, having naked empalements lying over each other like scales, somewhat like the flowers of hops, from whence the plant had the name of hop-clover. But there are two sorts of this clover, which grow naturally in England. The other is a much smaller plant than this, and generally known by the name of none-such, or yellow hop-trefoil.

The hop-clover is strongly recommended by the following circumstances. 1. It not only grows, but flourishes on the most barren sands, and therefore must be a very proper grass to cultivate on such unfertile soils, where any other grass that is worth notice will not grow at all. 2. It is no apt to swell cattle, as the red clover does. 3. In good ground it will continue long, and be a very good seed or crop, as Mr. Tull, though prejudiced against clovers, confesses; and, by its flourishing both on sands and clay, which have not been ploughed for many years, it seems likewise to continue long in any soil.

The fifth sort grows naturally on chalky lands in many parts of England; and in some countries the seed is sown after the same manner of the common red clover, especially on chalky ground, where it will thrive, and produce a better crop than clover. The stalks of this are hairy, and grow erect to the height of two feet or more, garnished with trifoliate leaves, standing upon long foot-stalks, whose lobes are longer than those of the red-clover, and have no marks of white; they are of a yellowish green colour,

colour, and are covered with soft hairs. The flowers grow in oval spikes at the end of the branches; they are of a pale copper colour; their petals are long and tubulous, but the brim is divided into two lips, as the other sorts.

This is known by the title of trefoil, in the places where it is cultivated; but the seedsmen sell the hop clover by that name, so they make no distinction between this, the hop-clover, and none-such; therefore, by which of these three titles the seeds are bought, they prove the same.

This sort of trefoil is much cultivated in that part of Essex which borders upon Cambridgeshire.

The sixth sort grows naturally in Spain and Italy; this has upright stalks near two feet high, which are hairy, garnished with trifoliate leaves, having roundish lobes, which are sawed at their points. The flowers are produced at the top of the stalk in long, obtuse, hairy spikes of a bright red colour, so make a pretty appearance during their continuance. It is an annual plant, so is not proper for sowing as fodder.

The seventh sort is an annual plant, which grows naturally in the South of France and Italy; it rises with a strong smooth stalk near three feet high, garnished with trifoliate leaves, whose lobes are two inches and a half long, and near a quarter broad, standing upon long footstalks, which are embraced by stipulæ or sheaths their whole length. Their flowers are produced at the top of the stalks in very long spikes; they are of a beautiful red colour, so make a fine appearance. It flowers in July, and the seeds ripen in autumn.

The eighth sort grows naturally in Spain and Italy; this rises with a slender stiff stalk near two feet high, garnished with trifoliate leaves, whose lobes are very narrow and hairy. The flowers are produced at the top of the stalks in oblong conical spikes; the indentures of their empalements end in long bristly hairs, which are almost equal in length; the spikes are hairy, and the flowers of a pale red colour.

The ninth sort is the common hare's foot trefoil, which grows naturally upon dry gravelly land in most parts of England, and is a sure indication of the sterility of the soil, for it is rarely seen upon good ground. This plant is seldom eat by cattle, so is unfit for pasture, and is only mentioned here because it is sometimes used in medicine; it is an annual plant, whose root decays soon after it has perfected its seeds.

The tenth sort grows naturally on arable land in many parts of England; this has trailing stalks, which put out roots at their joints. The leaves stand upon large slender foot-stalks; the lobes are roundish, and sawed on their edges; the flowers are collected in roundish heads, standing upon slender foot-stalks, which rise from the wings of the stalks; these have bladdery empalements, which terminate in two teeth. When these lie on the ground, their globular heads, having a little blush of red on their upper side towards the sun, and the other part being white, have a great resemblance of strawberries, and from thence it was called strawberry trefoil.

These sorts are preserved in botanic gardens for variety; they are easily propagated by seeds, which may be sown in an open bed of ground, either in autumn or spring.

The plants, which come up in autumn, will grow much larger, and flower earlier in the summer than those which are sown in the spring, so from those good seeds may be always obtained, whereas the others sometimes miscarry. When the plants come up, they require no other care than to keep them clean from weeds, and thin them where they are too close.

The eleventh sort is the common melilot, which is used in medicine, and has been already described under the article *MELILOT*; which see.

The twelfth sort grows naturally in Bohemia and Austria, but has been long cultivated in England as a medicinal plant, though at present it is rarely used; it is annual. The stalks are large, hollow, and channelled; they rise about a foot high, garnished with trifoliate leaves, whose lobes are oval, and slightly sawed on their edges, standing upon pretty long foot-stalks. The flowers are collected in oblong spikes, which stand upon very long foot-stalks, springing from the wings of the stalk at every joint; they are of a pale blue colour, shaped like those of the common melilot; these appear in June and July, and are succeeded by small yellow seeds of a kidney shape, two or three being included

in each short pod. The whole plant has a very strong scent like that of fenugreek, and perishes soon after the seeds are ripe. *Miller's Gard. Dict.*

TRENCH, a furrow cut in the earth for draining land. See the article *BOG*, and *DRAINING*.

TRENDLE, any thing that turns round.

To TREFALLOW, to plough land the third time before sowing.

TROUGH, a long vessel for holding water, &c.

TRUG, or **TRUGG**, a hod for mortar.

TRUNDLE, a sort of carriage with low wheels, for carrying heavy and cumbersome loads.

TRUNK, the stem or body of a tree; or the part between the ground and the place where it divides into branches.

TRUSS, a bundle of hay, straw, &c.

A truss of hay must contain fifty-six pounds, or half a hundred weight: thirty-six trusses make a load. In June, July, and August, a truss of new hay must weigh sixty pounds.

TUMBREL, a dung-cart.

TUMOUR, a preternatural swelling or eminence rising in any part of a horse, and arises either from external injuries, or internal causes.

Swellings caused by external accidents, as blows and bruises, should at first be treated with restraining; thus, let the part be bathed frequently with hot vinegar or verjuice, and, where it will admit of bandage, let a flannel wetted with the same be rolled on: if by this method the swelling does not subside, apply, especially on the legs, a poultice of red wine lees, strong beer grounds, and oatmeal, or with vinegar, oil, and oatmeal; either of these may be continued twice a day, after bathing, till the swelling abates; when, in order to disperse it entirely, the vinegar should be changed for camphorated spirit of wine, to four ounces of which may be added one spirit of sal ammoniac; or it may be bathed with a mixture of two ounces of crude sal ammoniac boiled in a quart of chamber-lye, twice a day, and rags dipped in the same may be rolled on.

Fomentations made by boiling wormwood, bay-leaves, and rosemary, and adding a proper quantity of spirits, are often of great service to thin the juices, and fit them for transpiration; especially if the injury has affected the joints.

But in bruises, where the extravasated blood will not by these means be dispersed, the shortest way is to open the skin, and let out the grumes.

Critical tumours, or swellings which terminate fevers, should by no means be dispersed; except when they fall on the pasteron or coffin joint, so as to endanger them: in this case the discutient fomentation should be applied three or four times a day, and a cloth or flannel frequently wrung out of the same should be bound on, in order to keep the joint continually breathing.

But if the swelling fixes under the jaws, behind the ears, on the poll, withers, or in the groins and sheath, &c. it should be encouraged and forwarded by ripening poultices, wherever they can be applied; oatmeal boiled soft in milk, to which a proper quantity of oil and lard is added, may answer this purpose; or the poultice recommended in treating of the strangles: these must be applied twice a day, till the matter is perceived to fluctuate under the fingers, when it ought to be let out; for which purpose, let the tumour be opened with a knife or strong lancet, the whole length of the swelling, if it can be done safely, for nothing contributes so much to a kind healing, as the matter's having a free discharge, and the opening being big enough to dress to the bottom.

Pledgets of tow spread with black or yellow basilicon (or the wound ointment) and dipped in the same, melted down with a fifth part of oil of turpentine, should be applied to the bottom of the sore, and filled up lightly with the same, without cramming; it may be thus dressed once or twice a day, if the discharge is great, till a proper digestion is procured, when it should be changed for pledgets spread with the red precipitate ointment, applied in the same manner.

Should the sore not digest kindly, but run a thin water and look pale, foment as often as you dress, with the above fomentation; and apply over your dressing the strong beer poultice, and continue this method till the matter grows thick, and the sore florid.

The following ointments will generally answer your expectations, in all common cases, and may be prepared without, as well as with, the verdigris.

Take Venice turpentine and bees wax, of each a pound; oil of olives one pound and a half; yellow rosin twelve ounces: when melted together, two or three ounces of verdigris finely powdered may be stirred in, and kept so till cold, to prevent its subsiding.

Take of yellow basilicon, or the above ointment without verdigris, four ounces; and red precipitate finely powdered half an ounce: mix them together cold, with a knife or spatula.

This last applied early, will prevent a fungus, or proud flesh, from shooting out; for if you dress too long with the above digestive, the fungus will rise fast, and give some trouble to suppress it; when it will be necessary to wash the sore as often as you dress, with a solution of blue vitriol in water, or to sprinkle it with burnt allum and precipitate. If these should not be powerful enough, touch with a caustic, or wash with the sublimate water, made by dissolving half an ounce of corrosive sublimate in a pint of lime-water.

But this trouble may in a great measure be prevented, if the sore is on a part where bandage can be applied with compresses of linen cloth: for even when these excrescences regerminate, as it were, under the knife, and spring up in spite of the caustics above-mentioned, they are to be subdued by moderate compression made on the sprouting fibres, by these means.

Authors on farriery have in general given very proper receipts to answer every intention of this kind by medicines: but as they have not, I think, laid down sufficient rules for their application in those cases where they are most wanted, I hope the following general directions will not be unacceptable; as the difficulty in healing some kinds of sores arises frequently from the unskilful manner of dressing them.

It may be necessary then to observe here, once for all, that the cures of most sores are effected by the simplest methods, and that it is often of much more consequence to know how to dress a sore, than what to dress it with; and in this consists indeed the chief art of this branch of surgery; for the most eminent in that profession have long since discovered, that variety of ointments and salves are unnecessary in the cure of most wounds and sores, and they have accordingly discarded the greatest part, formerly in repute for that purpose; repeated observations having taught them, that after the digestion, nature is generally disposed to heal up the wound fast enough herself, and that the surgeon's chief care is to prevent a luxuriance, commonly called proud flesh; which all ointments wherein lard or oil enters, are but too prone to encourage, as they keep the fibres too lax and supple; and which dry lint alone, early applied, as easily prevents, by its absorbing quality, and light compression on the sprouting fibres.

Thus if a hollow wound or sore is crammed with tents, or the dressings are applied too hard, the tender shoots of flesh from the bottom are prevented pushing up; and the sides of the sore in time from this distention may grow horny, and turn fistulous; nor has the matter by this method a free discharge.

On the other hand, if sores of any depth are dressed superficially, the external parts being more disposed to heal and come together than the internal, they will fall into contact, or heal too soon; and the sore not filling up properly from the bottom, will break out afresh.

Hence we may justly conceive how little stress is to be laid on famous ointments, or family salves, unskilfully applied; for unless this due medium is observed, or obtained in the dressing, no hollow sore can heal up properly.

I thought it necessary to be a little explicit on this head, as gentlemen so frequently complain of being disappointed in their cures, notwithstanding the excellency of their ointment or balsam; and to convince them that less confidence should be put in these favourite medicines than is generally imagined; for where the habit is sound, and the blood and juices in good condition, there are few simple dressings that will not succeed; and when otherwise, the

most pompous will not avail, till these habits are rectified by proper internal medicines.

As soon then as a good digestion is procured (which is known by the thickness and whiteness of the matter discharged, and the florid red colour at the bottom of the sore) let the dressings be changed for the precipitate medicine; or the sore may be filled up with dry lint alone, or dipped in lime water with a little honey and tincture of myrrh, or brandy; about a fifth part of the latter to one of the former; a pledget of lint dipped in this mixture should also be applied to the bottom of the sore, which should be filled up with others to the surface or edges, but not crammed in too hard, as before observed, nor yet applied too loosely.

By this method, the sore would incarnate, or heal up properly, and soft spongy flesh would be prevented, or suppressed in time; whereas when ointments or salves are too long continued, a fungus or proud flesh is thereby so encouraged in its growth, that it requires some time to destroy and eat it down again: a proper compress of cloth and a linen roller is absolutely necessary both for this purpose, and to secure on the dressings, wherever they can conveniently be applied. *Bartlett's Farriery*, p. 236.

TUPP, a ram.

TUPPING-TIME, ramming time.

TURF, a blackish, sulphureous earth, used in several parts of England, Holland, and Flanders, as fuel.

In Flanders, their turf is dry or pared from off the surface of the earth, and cut in form of bricks. The sedge, or species of grass growing very thick on the turf earth, contributes greatly, when dry, to the maintenance of the fire.

The Dutch take their turf from the bottom of the dykes or canals which run across most of their lands; by which means they not only supply the defect of wood, which is very great in most of the United Provinces, but also keep their dykes clear and navigable: this turf earth is very black. As they take it up from the bottom of the dykes, they spread it about the edges of such a thickness, as that it may be reduced to three inches when moderately dried. In this condition they cut it into pieces of turfs seven or eight inches long, and three broad, and, to complete the drying, lay them up in heaps, and at last in stacks.

In the north of England, Scotland, &c. turf is dug out of soft, moist, rotten earth, called peat-moss. They dig horizontally from the surface, to the depth of about four feet with a spade, which at once fashions and takes them out in parallelipeds nine or ten inches long, and three square; which are spread on the ground to drain as fast as dug; and then set up an end three or four against each other, for the wind to blow through them; and at last they are stacked or housed. The pits or dykes in a few years fill up again, and afford a fresh crop.

The turf or peat, that is cut horizontally, is usually dug out in holes or pits, and cannot conveniently be dug so deep, nor in such a regular manner as when dug perpendicularly, the banks in this last method of cutting being in straight lines; as in some parts of England more southward, particular in Wiltshire, and near Newbery in Berkshire, where great quantities of peat have been dug in that manner.

The surface of these peat grounds is commonly a black, moory and crumbling earth, of about a foot deep, more or less, with sometimes a stratum of whitish earth lying under it mixed with many small shells of the periwinkle kind; having the properties of other shell marle, but in a lower degree than the shell marle found near the sea. The peat below is of different depths, from two or three to five or six feet, sometimes deeper; and below the peat is sand or clay. The peat so is wet, and towards the top it is moist.

When the peat is to be cut, the ground is marked on the surface, in a straight line of a length at pleasure, and between three or four feet broad, which is called the pit: the surface is then dug level with a common spade, and the moory earth carried away, and laid in a heap, in some convenient place to be burnt to ashes. If the water does not rise up to the top of the pit, it is penned up almost to the top, by a dam made up below: for the peat is cut in the water with a narrow spade, shod at the lower end: the spade is about four feet long, besides the handle, and four inches broad, and has an ear, or a sharp iron on one side of it, bent to a right angle, which serves to cut and separate one side of the peat from the pit, as the back of

of the spade does the other. In this manner every peat is formed into an oblong, four inches square, and about four feet deep, if the peat earth runs so deep. The cutter easily breaks the peat at bottom, by leaning the spade forward, which rises in the water upon the spade, and is then laid flat, upon a flat broad bottomed wheel-barrow. The peats being laid close side by side, in three or four layers high, are wheeled away, slipped off the barrow upon the ground, as close as they can lie, where they remain till dry on one side; and then turned to dry on the other. Sometimes in wet summers, they are set up on end, in small heaps, to dry. In very fine weather they will be dry in about a fortnight or three weeks, by turning them on the ground by hand.

The peat, when first cut, is about four inches square, and shrinks in drying to about three inches square, and also something in the length; so upon the whole, they are reduced in drying to about half their first dimensions, but not equally; the hardest black peat, which are the best, shrink less than those that are spongy. The proper time to cut the peat is from March, when the frosts are gone off, to September, or between five and six months.

A quantity of ground is necessary to dry the peat upon, in proportion to their length. The peat of an acre, that run to about a yard deep, will require nine acres to turn and dry the peat upon, if so much was to be dried at once: for the peat being four inches square at the end, the side of the peat upon the ground has nine times that surface: and in that proportion for a larger or smaller quantity of land to be cut out: and some room must be left for paths, at proper distances.

The peat land here is sold at a high price, from sixty or seventy to one hundred and twenty pounds per acre; and when the buyer has cut out the peat, the land reverts to the original proprietor; which, if it lies so low, that it cannot be drained, is of little value; but if the water can be carried off, and it lies near a river or stream of water, the land is levelled, and laid in a proper manner to be floated; and in that case the improvement is very great. For it frequently happens that the surface of the peat land lies so high and dry, before the peat is cut out, that the herbage is of small value, yielding only small crops of coarse grass; but when the surface, by cutting the peat out, is sunk low enough to be watered, and that water can be carried off, such land is then worth above double, or even treble its former value, without any expence to the owner: for the land is laid level by the buyer of the peat,

I saw a tract of land there about one hundred acres, belonging to one farm, which had been examined by boring with an auger; the peat was very deep, and being near a market, was valued at one hundred pounds an acre. And as it lay convenient to water, which could be carried off the land, after the peat was cut out, would be improved, and produce much greater crops of grass than before the peat was cut out of it.

The peat buyer has very little trouble in cutting and selling it; for he employs a cutter, who cuts, dries and delivers the peat, for which he is paid by the load, of forty-two bushels of dry peat per cart load: he cuts and removes the surface that lies above the peat earth, and levels the ground after the peat is all cut out. He is reckoned to earn from two shillings and sixpence to three shillings a day.

An acre of peat ground, of one spade, or four feet deep, produces from one thousand to one thousand four hundred cart loads of dry peat, which was sold formerly at three shillings per cart load on the spot; but it considerably advanced, since the peat land in that country became scarce. One man can cut about six loads of dry peat in a day.

If the weather is so favourable, as that six dryings can be carried off the ground in a season, about two acres and a half of land will be room sufficient to spread and dry the peat upon, produced in one season from an acre of peat of four feet deep.

The peat runs sometimes but two or three feet deep, and is then cut at once; but when it runs deeper than three feet and a half or four feet, it is cut at twice; and the water at each cutting must be kept up near the surface of the ground that is cutting: for then the peat is the easier cut, and easier broke off at bottom, and brought up upon the spade to the surface of the water.

When it is not intended to water the land after the peat is cut out, and therefore of no use to level it, all

the surface is carried away, and reduced to ashes: but if the bottom is to be levelled for watering, the surface of the land, as being the most fertile part of it, is thrown down upon the bottom to level it for watering; and sometimes all the earth above the peat, is thrown down upon the bottom, when necessary to raise it, the turf, and also the moory earth; when this is done, the moory earth should be thrown down first, and the turf for staple laid uppermost.

In wet summers the peat cannot be all dried sufficiently for sale: when that happens, the damaged and broken peat is burnt upon the spot, or carried to the heap of turf and moory earth, where those, together with the white marly earth, are burnt to ashes, with a slow smothering fire, and thrown up in heaps of a round form; or long, like the ridges of a house; where, in a short time, by the changes of weather, a crust is formed upon the surface of the heap, which throws off the rain, and preserves the ashes pretty dry; but as the salts of the ashes are liable to be washed out by much wet, and the value of them are thereby considerably lessened, some are at the expence of erecting sheds, to keep their ashes dry, till they can dispose of them.

The expence of collecting the materials for these ashes, and burning them, is about a penny or three half-pence per bushel; and they are sold to the farmers at about two-pence half-penny or three-pence per bushel upon the spot; but the price was advancing, on account of the demand for them and most of the peat land being cut out. They use baskets for measuring the ashes, of sixteen inches diameter at top, and twenty inches deep, measured diagonally, and heaped measure. The same baskets serve for measuring the dry peat. Forty-two of these bushels of ashes is called a cart load.

The quantity of ashes produced from a cart load of peat, burnt in the chimney, of the best peat, is about five bushels; but in digging peat, the cutter is apt to thrust the spade deeper than the peat, so that the lower ends of the peat, having in them a mixture of clay or sand, produce more ashes than the net peat soil; but the ashes in that case are of an inferior quality: for the genuine peat soil contains much sulphur and produces the strongest ashes, whereof six or eight, to ten or twelve bushels, are commonly sufficient to dress an acre of corn or clover: for the last of these crops, and for grasses in general, whether the natural or cultivated grasses, peat ashes are a great improvement.

The ashes from peat burnt in chimneys, being of the best sort, and kept dry, are the most valuable, and sell at about double the price of the ashes burnt in the field. Formerly these ashes were sold at a shilling per bushel down to ten-pence; this was at first, and before peat was burnt in great quantities within doors. They afterwards sunk in price to about six-pence the bushel; and since that advanced again.

Some have thought that the peat soil has a kind of vegetative quality, and will grow up again in a course of years after it has been cut out; but this is a mistake. In boggy soils or fens, the spongy peat that has been dug out of them, will indeed grow up again; because the peat of such soils is a composition of the roots of aquatic plants, which grow and produce new roots, till the pits are again filled with them, as at first, and then may be cut again, and will produce peat or turf as at first.

But the peat soil we have been treating of, is very different from that of the turf bogs. The peat soil is a composition of rotten wood, most of it entirely rotten, and some but partly so: trees of various kinds and sizes are found in the peat soil, some of oak, of thirty, forty feet, or more in length, the heart hard and sound, and only the sap rotten; abundance of nut-shells also, and other indications, shew that these peat lands were formerly woods. When the soil made up of these is cut out for peat, it is evident that it cannot grow up again into a peat soil: and there have been some instances in that country of peat being cut in pits horizontally, before they came to be expert in the present method of cutting it perpendicularly; and as these pits were cut irregularly, in some parts deep, and others shallow, and much of the ground missed, and not cut at all, the land was all cut over again, in a regular manner, in order to get all the peat out of it. The manner of the first cutting was then observed; and the marks of the spade at the first cutting was in several places plainly visible; which shews that peat soil does not vegetate, and that peat once cut out, will not grow again, and fill up the old pits with the same kind of soil. This is taken

taken notice of here, that the owners of such land may not be misled with the erroneous opinion of a new growth of peat soil, after it has been once cut out.

TURF-ASHES. See the article *ASHES*.

TURF-BOGS. See *Bog, Moor, and Moss*.

TURFING-SPADE, an instrument used to under-cut the turf, after it is marked out with the plough.

TURKEY, the name of a well known fowl, reared in many parts of England.

"Most of our housewives, says a Swedish author on husbandry, have long despaired of success in rearing turkeys, and complained that the profit rarely indemnifies them for their trouble and loss of time: whereas, continues he, little more is to be done than to plunge the chick into a vessel of cold water, the very hour, or if that cannot be, the day it is hatched, forcing it to swallow one whole pepper-corn, and then restoring it to its mother. From that time it will become hardy, and fear the cold no more than a hen's chick. After which it must be remembered that these useful creatures are subject to one particular malady whilst they are young, which carries them off in a few days. When they begin to droop, examine carefully the feathers on their rump, and you will find two or three, whose quill part is filled with blood. Upon drawing these the chick recovers, and after that requires no other care than what is commonly bestowed on poultry that range the court yard.

"These articles are too true to be denied; and in proof of the success, three parishes in Sweden have, for many years, gained several hundred pounds by rearing and selling turkeys." *Rural Oeconomy*, p. 739. See *POULTRY*.

TURNIP, or **TURNIP**, an esculent plant, of which there are three species enumerated by Miller. The first is the turnip which is commonly cultivated in the fields, of which there are the following varieties, viz. the round, red or purple topped turnip, the green topped turnip, the yellow turnip, the black rooted turnip, and the early Dutch turnip. The last sort is commonly sown early in the spring, to supply the markets in May and June, but is never cultivated for a general crop. The red rooted turnip was formerly more cultivated in England than at present; for since the large green topped turnip has been introduced, all the skilful farmers prefer it to the other sorts; the roots of the green will grow to a large size, and continue good much longer than the other sorts. The next to this is the red or purple topped turnip, which will also grow large, and is extremely good for some time; but the roots of this will become stringy much sooner than those of the green topped. The long rooted turnip, the yellow turnip, and the blackish rooted turnip, are now rarely cultivated in England, neither of them being so good for the table or for feed, as the red and green topped turnip, though there are some few persons who sow them for the sake of variety.

The French turnip is not much cultivated in England, but in France and Holland they are in great esteem, especially for soups; their roots being small, are boiled whole in the soup, and so served up to the table; these must be used while they are young, otherwise they will become rank and stringy.

These are supposed to be only varieties, which have accidentally been obtained from seeds, therefore I have not enumerated them as distinct species; but yet I am certain they are constant, where care is taken in the saving of their seeds not to suffer any mixture to stand for seeds: I have sown of three or four sorts several years, and have always found them retain their differences; however, it is not easy to determine if some of these were not by culture first obtained from seeds of the common white turnip. The yellow turnip seems most unlikely to have been an accidental variety, for I have never known this alter, and the roots are yellow within, whereas all the others have white flesh, notwithstanding their outsides are of very different colours.

The long rooted turnip is, I think, a distinct species, the form of the root, and its manner of growth being totally different from the other sorts. I have seen these roots as long as those of the parsnip, and nearly of the same shape; these run deep into the ground, so are unfit for feeding of cattle; and unless they are very young, become strong, so not proper for the table, which has occasioned their being rejected of late years.

The green topped turnip grows above ground more

than any of the other, which renders it preferable for feeding of cattle; and being the softest and sweetest root when grown large of any of the kinds, is most esteemed for the table; but in very severe winters they are in greater danger of suffering by frost, than those whose roots lie more in the ground, especially if they are not covered by snow; for when they are frequently hard frozen and thawed, it causes them to rot sooner than those whose flesh is less tender and sweet. I have seen the roots of this sort, which were more than a foot diameter, boiled and were as sweet and tender as any of the smallest roots.

Turnips delight in a light sandy, loamy soil, which must not be rich; for in a rich soil they grow rank and are sticky, but if it be moist they will thrive the better in summer, especially in fresh land, where they are always sweeter than upon an old worn-out or a rich soil.

The common season for sowing of turnips, is any time from the beginning of June to the middle of August, or a little later; though it is not advisable to sow them much after, because, if the autumn should not prove very mild, they will not have time to apple before winter, nor will the roots of those which are sown after the middle of July, grow very large, unless the frost keeps off long in autumn. But, notwithstanding this is the general season in which the greatest part of turnips are sown in the country, yet, about London, they are sown successively from March to August, by those who propagate them to supply the markets with their roots; but there is a great hazard of losing those which are sown early in the year, if the season should prove dry, by the fly, which will devour whole fields of this plant while young; so that where a small quantity for the supply of a family is wanted, it will be absolutely necessary to water them in dry weather; and where a person sows those seeds in April and May, it should always be upon a moist soil, otherwise they seldom come to good, the heat of the weather at that season being too great for them upon a dry soil; but those which are sown towards the middle or latter end of June, commonly receive some refreshing showers to bring them forward; without which, it is very common to have them all destroyed.

These seeds should always be sown upon an open spot of ground; for if they are near hedges, walls, buildings, or trees, they will draw up, and be very long topped, but their roots will not grow to any size.

They are sown in great plenty in the fields near London, not only for the use of the kitchen, but for food for cattle in winter, when there is a scarcity of other food; and this way is become a great improvement to barren sandy lands, particularly in Norfolk, where, by the culture of turnips, many persons have doubled the yearly value of their ground.

The land upon which this seed is sown, should be ploughed in April, and twy-fallowed in May, that is, once more ploughed and twice well harrowed, and made very fine; then the seed should be sown pretty thin; for it being small, a little will sow a large piece of ground; one pound is the common allowance for an acre of land. The seed must be harrowed in as soon as it is sown, with a short-tined harrow, and the ground rolled with a wooden roll, to break the clods and make the surface even. In ten days or a fortnight after sowing, the plants will come up; at which time, if the season should prove dry, they will be in great danger of being destroyed by the fly; but if it so happen, the ground must be sowed again, for the seed being cheap, the chief expence is the labour; but the ground should be first harrowed to loosen it, especially if it is stiff land.

When the plants have got four or five leaves, they should be hoed to destroy the weeds, and to cut up the plants where they are too thick, leaving the remaining ones about six or eight inches asunder each way, which will be room enough for the plants to stand for the first hoeing; the sooner this is performed, when the plants have four leaves, the better they will thrive; but in the second hoeing, which must be performed about a month after the first, they should be cut up, so as that the remaining plants may stand fourteen or sixteen inches distance, or more, especially if they are designed for feeding of cattle; for where the plants are allowed a good distance, the roots will be over-gained by their bulk, which is what I have often observed. But in such places where they are sown for the use of the kitchen, they need not be left at a greater distance

distance than ten inches or a foot, because large roots are not so generally esteemed for the table.

It is not many years since the practice of sowing turneps for feeding of cattle, has been of general use; how it happened that this improvement should have been so long neglected in every part of Europe, is not easily to determine, since it is very plain, that this piece of husbandry was known to the ancients. For Columella, in treating of the several kinds of vegetables which are proper for the fields, recommends the cultivating rape in plenty; because, says he, those roots which are not wanted for the table, will be eaten by the cattle: yet this plant was not much cultivated in the fields till within the last sixty or seventy years; nor is the true method of cultivating turneps yet known, or at least not practised, in some of the distant counties of England, at this time. For in many places the seed is sown with barley in the spring, and those plants which come up, and live till the barley is cut, produce a little green for the sheep to pick up, but never have any roots. In other places, where the turnep-seed is sown by itself, the method of hoeing them is not understood; so that weeds and turneps are permitted to grow together; and where the turneps come up thick in patches, they are never thinned, so that they draw up to have long leaves, but never can have good roots, which is the principal part of the plant, therefore should be chiefly attended to.

The general method now practised in England, for cultivating this plant in the fields, is the same as is practised by the farming gardeners, who supply the London markets with these roots, and is the same as before directed. But it is only within the compass of a few years, that the country people have been acquainted with the method of hoeing them; so that the farmers formerly employed gardeners who had been bred up in the kitchen gardens, to perform this work; but it is now performed by many country labourers, by which means that practice is lost to the kitchen gardeners; the labourers doing it much cheaper.

There has also been another method practised very lately, by some very curious farmers, in cultivating of turneps, which is by sowing the seed in rows, with the drill-plough. In some places the rows are sown three feet asunder, in others four, in some five, and some six. The latter has been recommended by some, as the most proper distance; and although the intervals are so large, yet the crop produced on an acre has been much greater than upon the same quantity of land, where the rows have been but half this distance; and upon the fields which have been tilled, the crops have greatly exceeded those which have been hand-hoed. The late lord viscount Townshend was at the expence of making the trial of these two different methods of husbandry, with the greatest care, by equally dividing the same fields into different lands, which were alternately sown in drills, and the intermediate lands in broad-cast. The latter were hoed by hand, in the common method, and the other cultivated by the hoeing plough; and when the roots were fully grown, his lordship had an equal quantity of land, which had been sowed in different methods, measured, and the roots drawn up and weighed; those roots which had been cultivated by the plough, where so much larger than the other, that the crop of one acre weighed a ton and a half more than that of an acre in the other husbandry.

But when the turneps are sown in drills, they will require to be hoed by hand, to separate and cut out the plants, where they are too near together in the rows; as also to cut up the weeds between the plants, where the plough cannot reach them. If this is carefully performed, the ploughing of the intervals will encourage the growth of the roots, by thus stirring of the ground, and make it much better prepared for the crop of barley, or whatever else is sown, the following spring. This method of culture may be supposed to be more expensive than that commonly practised, by those unacquainted with it; but those who have made trial of both, find the horse-hoeing to be much the cheapest, and by far the best. For the country people, who are employed in hand-hoeing of turneps, are very apt to hurry over their work, so that half the weeds are left growing, and the plants are seldom singled out so well as they should be; nor are they curious enough to distinguish the charlock, which is one of the most common weeds in arable land, from the turneps;

so that about the middle of September, it is very common to see the fields of turneps full of the yellow flowers of the charlock. Now, in the horse-hoeing, all the weeds in the intervals will be entirely destroyed: so that if a few plants in the rows of turneps should be over-looked, they may be easily drawn when they appear visible, and by this method the land will be sooner and better cleaned from weeds.

The greatest evil which attends a crop of turneps, is that of their being destroyed by the fly, which usually happens soon after the plants come above-ground, or while they are in the seed-leaf; for, after they have put out their rough leaves pretty strong, they will be past this danger. This always happens in dry weather; so that, if there should be rain when the turneps come up, they will grow so fast, as to be in a few days out of danger from the fly; and it hath been found, that those, which have been sown in drills, have escaped the fly much better than those sown in broad-cast; but, if foot is sown along the surface of each drill, it will be of great service to keep off the fly, and a small quantity of it will be sufficient for a large field, where the drills only are to be covered.

Another danger of the crops being destroyed is from the caterpillars, which very often attack them, when they are grown so large as to have six or eight leaves on a plant. The surest method of destroying these insects, is to turn a large parcel of poultry into the field, which should be kept hungry, and turned early in the morning into the field; these fowls will soon devour the insects, and clear the turneps. To this evil the turneps, which are sown in drills, are not so much exposed; for as the ground between the rows will be kept stirred, the plants will be kept growing, so will not be in danger of suffering from these insects, for the parent insects never deposit their eggs upon any plants which are in health; but as soon as they are stunted, they are immediately covered with the eggs of these insects; and this holds in general with vegetables as with animals; who are seldom attacked by vermin when they are in perfect health; whereas, when they become unhealthy, they are soon overspread with them; so that it is the disease which occasions the vermin, and not the vermin the disease, as is commonly imagined.

When the turneps are sown in drills, it will be the best way to plough between every other row at first, and some time after to plough the alternate intervals, by which method the plants will receive more benefit from the often stirring the ground than they would do, if all the intervals were hoed at one time; and the plants will be in less danger of suffering from the earth being thrown up too high on some rows, while others may be left too bare of earth; but, when the earth has been thrown up on one side of the drill, it may be turned down again soon after the next interval is ploughed. This alternate moving of the earth will prepare the ground very well for the succeeding crop, and greatly improve the turneps; but, as the plough cannot well be drawn nearer to the drills than two or three inches, the remaining ground should be forked to loosen the parts, and make way for the fibres of the roots to strike out into the intervals; otherwise, if the land is strong, it will become so hard in those places which are not stirred, as to stint the growth of the turneps. This may be done at a small expence; a good hand will perform a great deal of this work in a day, and, whoever will make the trial, will find their account in practising it, especially on all strong land, where the turneps are much more liable to suffer from the binding of the ground, than they will be on a loose soil; but yet, in all sorts of ground, it will be of great service to practise this.

When the ground is thus stirred in every part, one ploughing will be sufficient, after the turneps are eaten, for the sowing of barley, or any other crop; so that there will be an advantage in this, when the turneps are kept late on the ground, as will often be the case, especially when they are cultivated for feeding of ewes, because it is often the middle of April before the ground will be cleared; for the late seed in the spring, before the natural grass comes up, is the most wanted, where numbers of sheep or ewes are maintained, and one acre of turneps will afford more feed than fifty acres of the best pasture at that season.

In Norfolk and some other counties they cultivate great quantities of turneps for feeding of black cattle, which turn to great advantage to their farms, for hereby they

procure a good dressing for their land; so that they have extraordinary good crops of barley upon those lands which would not have been worth the ploughing, if it had not been thus husbanded.

When the turneps are fed off the ground, the cattle should not be suffered to run over too much of the ground; for if they are not confined by hurdles to as much as is sufficient for them one day, the cattle will spoil three times the quantity of turneps as they can eat, so that it is very bad husbandry to give them too much room: therefore the hurdles should be every day removed forward, and if the turneps are drawn out of the ground before the cattle or sheep are turned into the new inclosure, there will be less waste made, for they will then eat up the whole roots; whereas, if they are turned upon the turneps growing, they will scoop the roots, and leave the rinds, which being hollow, the urine of the sheep will lodge in them; so that, when they are forked out of the ground, the sheep will not eat any of those roots which are thus tainted.

I cannot omit taking notice of a common mistake, which has generally prevailed with persons who have not been well informed to the contrary, which is in relation to the mutton which is fatted with turneps, most people believing it to be rank and ill tasted; whereas it is a known fact, that the best mutton this country affords is all fatted on turneps, and that rank mutton, whose fat is yellow, is what the low marshy lands of Lincolnshire, and other rank pastures produce.

In order to save good turnep-seeds, you should transplant some of the fairest roots in February, placing them at least two feet asunder each way, observing to keep the ground clear from weeds, until the turneps have spread so as to cover the ground, when they will prevent the weeds from growing. When the pods are formed, you should carefully guard them against the birds; otherwise they will devour it, especially when it is near ripe; at which time you should either shoot the birds as they alight upon the seed, or lay some bird-limed twigs upon it, whereby some of them will be caught; and, if they are permitted to remain some time, and afterwards turned loose, they will prevent the birds from coming thither again for some time, as I have experienced. When the seed is ripe it should be cut up, and spread to dry in the sun; after which it may be threshed out, and preserved for use.

There have been many receipts for preventing the fly taking turneps, but few of them deserve notice; therefore I shall only mention two or three which I have seen tried with success. The first was steeping the seeds in water with flour of brimstone mixed, so as to make it strong of the brimstone: another was steeping it in water with a quantity of the juice of horse aloes mixed, both which have been found of use. The sowing of foot or tobacco-dust over the young plants, as soon as they appear above ground, has also been found very serviceable: in short, whatever will add vigour to the young plants, will prevent their being destroyed by the fly, for they never attack them, till they are stunted in the growth.

Miller's Gard. Dict.

Mr. Lisle is inclined to think, that the best way to manage turneps, the seed of which, says he, is impatient of growth, and apt to burst in too much wet, as also to corrupt, if the ground be so dry as only to give it a damp, but not wet enough to set it on growing, is, first to harrow the ground fine, after it has been brought to a perfect tilth by ploughing, then to roll it with a roller big enough to break the little clods, if any such remain, and so let it lie till the next rain; then, the ground being mellow to sow the seed, and harrow it in with short-tined harrows, which may not open the ground too deep, nor bury the seed; then roll it again with a one-horse roller, in order to keep the moisture in the ground as deep as the seed may be: for the surface of the earth must not be dried before the seed can strike root, which may be in twice twenty-four hours; and yet that surface must be so fine, and so lightly compressed, that the seed may spear through it. He takes the mystery, as he calls it, of the success or miscarriage of a crop of turneps to consist in these four things, viz. first, in the seeds not lying too deep; secondly, in its not lying too wet, which it cannot easily do if harrowed in shallow, for the surface of the earth is soon dry; thirdly, in its not lying too dry; and fourthly, in its lying in a fine bed. In another place, he tells us,

that his gardener affirmed to him, that he had found turnep-seeds, which had been dropped by accident and covered over with earth in digging, fresh and good a year after, when the earth was turned back again, and that it has then grown and produced good turneps. The reason is, that every seed which is buried so deep as not to be affected by the changes in the air, may remain in a sound state, and in a fit condition to vegetate, for many years, as hath been evinced by numbers of instances.

Mr. Duhamel advises after the two first hoeings, a slight ploughing all over the field, with a plough that has no fins to the share, as a speedier and cheaper way to thin the plants; the turneps will not require any farther care. They will have attained their full size in October, before the frosts come, and should then be taken up, stripped of their leaves, which may be given to cattle, and laid upon hurdles in a dry place, with a layer of dry sand between each layer of turneps, which may be thus piled up, and which will keep very well in this condition, for the food of cattle during the winter. In Norfolk, they stow them in their barns, when intended for fattening of bullocks.

A dry season is the best for hoeing turneps, because neither the weeds nor the turneps hoed up then will be so apt to grow again: and Mr. Lisle supposes that care should be taken to hoe up those that are deepest rooted in the earth, and to leave those that grow upon, and almost out of it, without much regarding their size; because those which lie on the ground, and have room to grow, will soon become the largest.

Some sow turneps on their flax and hemp grounds, at the same time as they pluck up those plants, and the seed is pretty well buried by the stirring thereby given to the earth. Others give their corn stubble only a slight ploughing after harvest, then sow the turneps very thin, and harrow in the seed. These methods do very well when the ground is in good tilth. Others again, sow late turneps, merely for the sake of their leaves, which they use as green feed, when they are about a foot high; and in this case they sow the seed very thick.

An easy way to have two growths of turneps in the same field, is to sow seed of the last gathering, and seed that is two years old; for this last is longer before it rises, than the new: and an advantage attending this method, is, that the turneps, by rising at different times, will have the better chance to escape the fly, or grub, which sometimes destroy them entirely: for it has been observed, that these flies often come suddenly in great swarms, and eat up the turneps as fast as they rise; and that they sometimes disappear as suddenly; so that the turneps which rise a few days after, in a neighbouring field, are not at all injured by them: consequently, when the turneps of the same field rise at different times, one or other may escape the ravage of these insects; for they destroy them only while in their seed leaf.

The worm to which turneps are very liable may be guarded against, or at least in a great measure, as Mr Lisle informs us, by liming the ground. This will also render them much sweeter than they would otherwise be; and we are of opinion that fresh slaked lime strewed over the ground when the turnep-seed is sown, will contribute greatly to preserve the young plants from the fly. It is to the worm lodged in the root of the turnep, perhaps engendered from the egg of the fly, that Mr. Lisle imputes the distemper or disease in turneps, which the Norfolk farmers call the hanbery; so named from a like distemper in a horse's heel. It is a watery excrescence, formed probably by this insect, in the same manner as galls are formed upon the leaves of the oak. In some years it takes off whole crops, and the turneps never thrive after it has begun to grow in them.

A gentleman, remarkable among many other good qualities, for several excellent improvements which he has made in agriculture, tried with success the following experiment, to preserve turneps from the fly, and the better to secure their growth. He sowed the seed in a nursery, where there was least danger of slugs or the fly, and where they might easily be watered in case of great drought, to make them grow the quicker. They remained in this nursery, till they were large enough to be transplanted. By this means he gained some weeks longer, to perfect his fallow, or give a thorough ploughing to ground which had borne a crop that season. He transplanted his turneps into the field, and by planting them regularly at due distances, greatly

greatly lessened the expence of hoeing; their regularity making it very easy to destroy the weeds from time to time, as they appeared.

In the second part of the Memoirs of the Society of Berne for the year 1762, the reverend Mr. Bertrand, not satisfied with even a scrupulous discharge of the duties of his clerical function, has instructed his parishioners, his country, and mankind, in the important subject of agriculture. The improving of light soils by the culture of turneps, is one of his objects: upon which he very judiciously observes, that though it be right to plough stiff lands before the winter, in order to their being mellowed by the frost; yet, as the finest and best parts of the soil will be in danger of being washed off, or carried down into the loose earth underneath, when this is done in a light ground, or in mould which has a sandy or gravelly bottom; it will be most adviseable here, to turn the stubble down immediately after the corn has been taken off, and then to sow turneps; because their spreading leaves will shelter and secure the fine mould upon the surface, and keep the land in good heart, whilst the earth will be loosened and divided by their roots, so that it will be rather fitter for a spring crop, than if it had lain uncultivated.

The chief use of turneps is, to feed cattle in the winter and spring, when there is a want of grass for their pasture. Cows, oxen, and hogs, are very fond of this food, which fattens them, and increases the milk of the former. Sheep too eat it readily, and thrive upon it, when they have been used to it early, but they do not relish it when it has not been offered them till they are grown old: however, if they are kept fasting two or three days, most of them take to it, and when they have once tasted it, they become very fond of, and feed kindly upon it. In some places, they feed their lambs with turneps till the middle of April, though they then begin to run up to feed. Farmers choose rather to do this, than to let them hurt their clover, saint-foin, lucern, &c. Some parboil them a little, at first, till their cattle, and particularly their sheep, are accustomed to them: but a lamb only three weeks old, will, after it has once eaten of this food, scoop out a raw turnep with great glee.

Turneps, if not clean eaten, and well cleared off the ground, may take root again, run to seed, and do great damage to the ensuing crop. Mr. Lisle instances it in a gentleman of Berkshire, who ploughed up a turnep field in the spring, and sowed it with peas: but the little dwarf turneps that were left behind, uneaten, notwithstanding his ploughing them up, took root again, run to seed in great quantities, and did much damage to his crop of peas.

The practice of turning a flock of sheep, at random, into a large field of turneps, is very bad: for they will then spoil more in a fortnight, than would keep them a whole winter. The best way, therefore, of feeding them with these roots, is, as Mr. Tull advises, and after him M. Duhamel, one or other of the three following methods, which are equally applicable to the drill, and to the common husbandry.

The first is, to portion out the turnep ground, by inclosing with hurdles so much only as the sheep can clear in one day; and so to advance the folds farther into the field every morning, until all be spent. But it is to be observed, that the sheep never eat them clean this way, but take only the leaves and the heart of the turnep: so that great part of them remains in the earth. It is true that these fragments, if left there, rot, and become a manure: but when they are wanted for the food of the flock, and are to that end pulled up with iron crooks or forks made for this purpose, the sheep do not relish, and consequently eat but little of these then dirty withered remains, tainted with their urine, dung, &c. nor can they nourish them so well as roots which are fresh and cleanly.

The second method differs from the former only in pulling up the turneps so far as they are hurdled off, before the sheep are turned in. They then eat them better, because the food is fresh and in good condition. Besides, as the whole turneps are pulled up more easily than their pieces can be, there is not such waste as in the other way. The turneps which grow next to the hurdles should be thrown towards the middle of the space hurdled off; because they will be less liable to be trampled upon and spoiled there, than nearer to the hurdle, where the sheep run about most, in search of means of escaping into the open field.

The third way is to pull up the turneps, and carry them into some other ground, and there spread them every day on a new place, where the sheep will eat them up clean. This is done when there is land not far off, which has more need of dung than that where the turneps grow. The expence of carrying the turneps is compensated by saving the price, or at least the carriage, and removing of the hurdles: only when the turneps are laid on a spot of grass, as is frequently done in wet weather, the benefit of the dung and urine of the sheep is lost.

This method is requisite when the field on which the turneps grow is wet; because, 1. The sheep would trample upon, and bury, part of the turneps, which would be lost. 2. In treading that wet earth, they would poach it, and render it unfit for corn. 3. By this means a field may be dunged, as we have just observed, which wants it more than that where the turneps grew. 4. This must necessarily be done, if wheat has been sown in the alleys between the rows of turneps, according to the principles of the new husbandry.

Turneps are always carried off the field, when they are intended to fatten the larger sorts of cattle: and they should be cut in pieces for them, lest they choke themselves with the whole ones. They are given morning and evening to stall-fed cattle, which in the intervals, eat likewise common fodder; but the turneps increase their appetite to such a degree, that a middle sized bullock, stalled for fattening, will consume near two hundred pounds weight of these roots in twenty-four hours, besides hay: whereas, if nothing but hay were given him, he would hardly eat half the quantity that he will with the turneps. A healthy bullock, in only good plight at the time of his beginning to be fed with turneps, will be very well fattened in three months.

Mr. Tull says he found by experience, that the best way of sowing turneps is in single rows, six feet asunder. He sowed them in double rows also at that distance, but they did not do well: and he likewise sowed them in single rows with intervals of only three feet. These last yielded a greater crop than a neighbouring field, which was sown and managed in the common way: but neither the single rows three feet asunder, nor the double rows with intermediate distances of six feet, yielded, says he, half so much, as the single rows six feet asunder: from whence he concludes, that it is best to leave a space of six feet between the rows; for that, if the alleys are well ploughed, these turneps will thrive wonderfully, even though no other moisture falls but the dew, which will sink into the earth to their roots.

However, notwithstanding Mr. Tull's experiment, M. Duhamel is for sowing turneps in double rows, if the intervals are of six feet; or if they are sown in single rows, he would have these rows be but four feet asunder, which is the space left between the rows of vines in Languedoc, and which is there ploughed with oxen.

Mr. Tull did for some time drill his turnep-seed upon six feet ridges, a single row upon the middle of each, and found in this way his crops were better, than on three feet ridges: but upon further experience, he found four feet ridges were more proper than six; and at the end of his table of the contents of the horse-hoeing husbandry, he writes as follows, viz.

“Those who have the engine (for drilling turnep-seed) are advised to sow turneps in single rows, on high four feet ridges; but when they are designed for seed, in six feet ridges.”

Turneps at their first coming up, are often destroyed by the fly, which eat off the young leaves, the two first or seed leaves in particular; which destroys the turneps. These flies come in such numbers, that large fields of turneps are frequently destroyed by them in a day or two; they come suddenly and go off in the same manner; for which reason Mr. Tull contrived to put a brass spout, or tube, to his turnep drill, which carries part of the seed so far behind the share, that it falls into the furrow after it is in part filled by the mould; so that the seed that drops first into the furrow lies as deep as the bottom, and what drops from the spout lies shallower. This may be improved, by making holes in the bottom of the spout, or by making the bottom of it with wire, like a screen; and then the seed will drop, and be covered, by the mould, at such different depths, that it will come up at more different times, than if the lower side of the spout is made solid, and discharges the seed

seed only at the end of it. By this means, and sowing mixed seed, half new, and half old, there will be many chances of its escaping the fly.

There is another advantage in drilling the seed in this manner, the plants may be thinned by hand, the person employed to thin them, taking hold of the strongest plants, with the fore finger and thumb of his left hand, may draw up the others with the other hand, without displacing, or much disturbing, the strong plants that are to remain; which is a safer way of thinning those plants than with a hand hoe, as Mr. Baker has experienced in thinning his turneps. In this way some more seed may be drilled upon an acre, than the common allowance of four ounces; for the more gradually the plants come up, they will rise the more distinctly, and at the greater distances in the row; and may be the more easily set out at the distances they are to remain for a crop.

If the land is in good heart, a proper soil for turneps, and drilled early, a foot asunder in the rows, is a proper distance for large turneps; but in different circumstances, ten inches distance is sufficient, and four feet intervals between the rows.

Some farmers draw up their turneps late in autumn, and lay them up in store against winter. In this way, the turneps are always ready; while those that remain in the field, are sometimes so much frozen, or covered with snow, that it is difficult to get them out of the ground when they are wanted.

There is a certain period in the growth of turneps, as in other plants, when they are in the greatest perfection, and most nourishing to cattle. Some who have occasion to buy turneps know this, and reckon that an acre of turneps before Christmas, will fatten as many sheep, as an acre and a half, of the same turneps, after Christmas. The principal reason why the farmers do not use them till winter and spring, has been the scarcity of food for their cattle at that time; but now they are not so much at a loss in that respect as formerly; as several plants lately introduced, do fully supply cattle in the room of turneps, as carrots, parsneps, cabbages of various kinds, and rape or cole seed.

An ounce of seed will sow as much land when drilled, as a pound will in the common way: and if care be taken to distribute only the necessary quantity, a great deal of trouble will be saved in the hoeing of the plants, afterwards, to thin them. But it is essential to observe, and we must again repeat it, that all roots, whether turneps, carrots, parsneps, parslly, or any other, always thrive best where there is a great depth of fine, light, well loosened mould. M. Duhamel trenched the whole of his kitchen-garden three feet deep: all his pot-herbs grew very fine, and his roots in particular were of a surprising size.

Mr. Tull, by drilling his turnep seeds alternately at different depths in the earth, was sure to succeed in one part or other, whether the season was wet or dry. If wet, the seed slightly covered sprouted first; and in dry seasons, that which lay deepest was the first that rose. By this means, and by mixing the seed, half new and half old, for the new always comes up soonest, he had four comings up, which, as he observes, gives the plants so many chances to escape the fly.

If one was sure of having rain immediately after the turneps are sown it would undoubtedly be right to sow them very shallow; but if no rain happens, they are best deeper in the earth, because they there meet with moisture sufficient to make them grow.

When the season has been so kindly that all the seeds have grown, and the plants have not suffered by the fly or other insects, they must be thinned early, that the ground may not be exhausted by such as are not intended to remain; for those that are left should be about a foot asunder.

When the turneps sown in drills thrive well, only each alternate alley need be hoed at one time, and the others a few days after; it being better to feed the plants gradually, by dividing the hoeings in this manner, than to give them a great deal of food at once, by hoeing all the alleys together, and afterwards leave them double the time without any culture at all. Another advantage attending this method is, that the plants will be the less liable to be killed by hot dry weather, and the less apt to be damaged by heavy rains. But it will not, indeed, so effectually destroy weeds, which ought always to be a principal object of the husbandman's care, and which ever is one of the chief in-

tentions of the New Husbandry. However, as all weeds are very apparent in the alleys, it is easy to extirpate them there; and as to those which may chance to be in the rows, the persons who thin the turneps may cut them up at the same time. He will there most easily distinguish the charlock from the turneps, especially when the leaves of these last are come to be about the breadth of a half crown.

All plants sown in single rows are greatly benefited by the alternate hoeing of the alleys between them: for, as M. Duhamel observes, 1. Four of these hoeings, which cost no more than two entire ones, are almost as beneficial to the plants as four complete hoeings. 2. A plant which finds a great deal of nourishment on one side, is the better able to thrive without receiving so much on the other. 3. If, in hoeing very near the plant, some of its roots are broken; those on the other side, not hoed, supply the wants of the plant, till the broken ones have made fresh shoots. 4. The horse-hoe may therefore be brought very near to the turneps, without fear of hurting them; provided it do not force them out of the earth. 5. When a farmer has a great quantity of turneps to hoe, they are sooner supplied by this culture, than they possibly could be if all the alleys were to be hoed.

A furrow should not be left open near the turneps, while they are young; because the earth about them would in that case become too dry: but there is no danger of this in the autumn, when they are grown strong, and the earth is moist. Neither is it advisable to leave a furrow open near them during the winter; because they would be in danger of being hurt by the frost.

When these plants are grown large, and their roots are consequently pretty well extended, the hoe-plough need not come quite so near them as at first: nor is it necessary to hoe them at all, till they are about the bigness of one's finger's end.

One alternate hoeing, or which is the same thing, two half hoeings, will be sufficient when the turneps are sown late. But when they are sown early, and many weeds grow, one hoeing will not be enough.

By following this culture, M. Duhamel has seen turneps which weighed from sixteen to nineteen pounds; and we may depend on their weighing one with another twelve pounds a-piece in a good soil, which is a vast produce from an acre of land. Mr. Miller says, that one acre of turneps, thus properly cultivated, will afford more feed for sheep or ewes in the winter, than fifty acres of the best pasture at that season.

Another vast advantage which attends the sowing of turneps in rows, is, that instead of occupying the whole ground when it should be sown with wheat, and sometimes even when it should be sown with spring-corn, as is frequently the case in the old way; they are no hindrance to either in the New Husbandry: for as alleys are in good tilth, three rows of corn may be sown, seven inches asunder, between the rows of turneps; and when these roots are pulled up, the ground where they grew is hoed, and becomes the alleys between the beds of corn.

The best turnep-seeds are obtained from the largest roots, which may be either transplanted for that purpose, or marked out in the field where they were sown. Those which are commonly sold in the shops, seldom produce the finest plants.

Experiments on Turneps cultivated according to the New Husbandry.

In 1754, M. de Chateaufieux sowed turneps on beds, in two rows. They suffered greatly for want of rain, and none of them grew to the size they would have done in a more favourable season. Some of them weighed eight pounds; but their general weight was from three to four.

In 1755, M. de Chateaufieux sowed some beds with one row, some with two, and others with three rows. They were afterwards thinned, so that the plants stood a foot asunder in the rows. Those sown in one row were the largest, and, in general, the most equal. Some of them weighed fourteen pounds, and the most of them from seven to eight. In the other rows, they did not weigh so much; but they were more numerous.

In consequence of these experiments, M. Duhamel, to whom they were communicated, makes the following striking calculation relative to the quantity of food which turneps will afford for cattle.

"Let a square whose side is 216 feet be formed into beds four feet wide, which is sufficient for one row of turneps. These will be 216 feet long, and consequently will contain that number of turneps, planted a foot asunder. These 216 multiplied by 54, the number of beds, will give 11664 turneps for the product of the square; and these multiplied by six, the supposed weight, of each turnep, will give 69,984 pounds for the weight of all the turneps, on this spot."

This may be looked upon as a very considerable crop; for it will be sufficient to stall-feed four bullocks during the three winter months, at the daily allowance of 200 pounds each: and yet there is reason to believe that the quantity will be doubled in a good year, as will be pretty evident to those who consider at how low a rate the medium weight of the turneps is here estimated.

In 1755, M. Duhamel sowed turneps in a field, on beds cultivated with the horse-hoe. They grew extremely fine; many of them being twenty-nine inches in circumference.

The following account of the advantages of the Drill Husbandry in the culture of Turneps, was sent by Mr. Willy, of South-Petherton, to the Society for the Encouragement of Arts, &c.

The generous method you have taken to promote useful knowledge must give every lover of his country the greatest pleasure, and incline him to do all in his power to increase it; it is with this view, and by the persuasion of many friends, I presume to lay before you the following lines, hoping they may give you some satisfaction in respect to the difference betwixt the Old and New Husbandry.

I began husbandry in the year 1742, had always an inclination to drilling, and was at much trouble and expence in getting one instrument after another made for the purpose; but was often disappointed, and for some years was forced to lay by the thoughts of it. About eight years since a gentleman lent me Mr. Tull's treatise; I then got some new instruments made, which sowed very regularly, and since that time have sowed all my corn in rows. Several closes I ploughed in six furrow ridges, and sowed with three rows of wheat, ploughing the intervals with a small-fall, drawn by one horse, and made it fit for wheat the next year; it generally took one third of the common quantity of seed, and in two years it yielded more than half as much again as the best crops in the common way did in one year; which, considering the small expence of seed and labour, was some advantage, though not very great; but then it left the ground in very good order for the next crop of spring corn. I kept one close, about two acres, four years to wheat in the same method: but the two last years did not answer to the two first, which makes me think Mr. Tull wrong, when he says, that plants of a different nature are nourished by the same sort of food. I could give an account of the exact quantity produced in each year, but it would be tedious: upon the whole, I believe this method of sowing wheat will be of no advantage except in poor strong clays, where I apprehend it must exceed all others. But there are a few inconveniences attending it; frequent ploughing the intervals is apt to make the wheat shoot fresh ears, which do not ripen with the others; and if any of the full ears when near ripe do but touch the fresh ploughed earth, ever so little wet will make them sprout, and these will injure the whole crop; and I find it impossible to keep all up, as the rows are at so great a distance. But my method of drilling in the open fields, and which I intend to follow, is to put five rows about eight inches apart, on a ridge about five feet in breadth. This takes but two-thirds of the seed sowed in the common way, and has always produced a better crop than the lands on each side of mine; this my neighbours are now convinced of, and several of them have drilled their wheat this season: our soil, for the most part, is a deep heavy sand.

I apprehend the principal advantage in drilling wheat is placing it at a proper depth, which I think is within two inches or thereabouts. I have observed, that the first motion of the wheat is by some roots, which in a little time run very deep; then it shoots up its blade; next it begins to form a head, about an inch under ground, from which come (very soon in a mild season) the second and third blades; and after that it begins to shoot fresh roots and branches from this same head, till in time it grows very large, especially in a fruitful soil and a good season; and it keeps on shooting fresh roots all the growing season: now if the corn is too deep, and a severe frost happens while

this head is forming, the plant is quite destroyed: but if it lies shallow, it shoots a new blade from the corn, and goes on in its operations as before; this was the case in 1763; a severe frost happened in the night of the thirteenth of February, which destroyed a good deal of wheat; so that some which lay deepest was ploughed up, and sown with other seed in the spring. Last year multitudes of the plants were killed in the same manner, and brought the crop very thin. In short, I am very certain, that whoever will make their observations will find that what I have said is the truth, That the shallowest corn will flourish sooner and better, and from thence will be led to see the advantage of drilling wheat.

But although I intend leaving off Mr. Tull's method of sowing wheat, yet I hope always to follow it in beans and turneps.

My beans I have sown these four years in double rows, about ten inches apart, and about two feet intervals. These I plough from and to the beans, when about six inches high; this is done with a little fall drawn by one horse, and will plough three acres in a day. This method hath succeeded so well, that many are come into it; although the farmers have always an aversion to new methods of managing; we sow but one-third of the seed, and have a much better crop, as is allowed by all.

As for turneps, all my neighbours will allow the drill to beat every thing. I sow a double row about eight inches wide, on a ridge about five feet, and though I did not sow this year till August, I have turneps two feet round, after wheat. I have given them but one ploughing as yet, besides hoeing them out at proper distances. I believe all will acknowledge I have double the crop in weight with any sown in the old way. I left four intervals unploughed in one close, to see the difference, and it is very surprising. One of my neighbours was prevailed on to sow a few rows in a piece he was sowing, and let my man plough them. The difference is so great that he is become an advocate for the drill husbandry; indeed I do believe that it will soon make its way through all the prejudices of the old farmers to the contrary; especially as we have a drill invented by an ingenious carpenter, with which several farmers have sown beans, pease, turneps, and wheat, and it answers exceedingly.

For these seventeen or eighteen years past, I have been striving to improve a crop of turneps. Before this, nothing was known or aimed at hereabouts, but sowing in the common way, one pound of seed in an acre; and then come thick, come thin, weeds and all grew together, till the sheep were turned into eat the crop as it was, and generally it was very poor.

The first improvement I made was by Ellis's direction, to drag them well with heavy harrows till they were got pretty thin, by which method I soon got better crops than any about me. But then I sowed double the quantity of seed, that I might have sufficient stock of plants for my after husbandry. My neighbours were soon convinced of the advantage of this, and followed my example, which is now the common practice. After this, finding the thinnest was best, I got some hoed; this I found still better, but very expensive, our people being not used to it. I tried Mr. Ellis's receipt to prevent the fly from destroying the young plants, but my ploughmen refused to sow the seed when mixed with sulphur. I then invented a long box, made full of holes, for the seed to fall through, and fastened it to two wheels so as to keep it above ground; this went so light that a boy could draw it, and sowed the seed very regularly. I shewed this to a friend of mine, (Mr. Joseph Pittfield, of Sidland in Dorset) who had one made immediately, and soon made an improvement on it, by having the holes made in rows about a foot asunder. Finding that the plants could be thinned and cleared at a much less expence, I followed this method of sowing for myself, as did some of my neighbours, for some years, and with a deal of satisfaction. A few years since, I was willing to try what stirring the ground deeper would do; and being resolved to try the drill husbandry in corn likewise, I had a small fall made, with which one horse will plough more than two acres in a day, first turning four or five inches deep from the plants, and then back to them again: we generally sow turneps after wheat, peas, and flax, and my method is to plough the ground into six furrow ridges, which with the open furrow makes about five feet in breadth. On such a ridge I sow (out of a short box) two rows of seed, though sometimes but one, and harrow it

in with a very light harrow. When they have four or five leaves I get them thinned, and give them a ploughing; and some time after, when they begin to kern, I have them thinned and cleaned again: and this is all the husbandry I have hitherto bestowed, and all I think is necessary, as we do not sow till late; the cost of which is about three shillings *per acre*.

I have sown some betwixt rows of beans, and have answered very well: when the beans were pulled I had the plants thinned and cleaned, and the earth ploughed between the rows.

The first I sowed last year was a small piece about half an acre, where hemp failed; I had the ground ridged up, and sowed with two rows of seed, and managed, as I said before: indeed the ground was dunged for the hemp. This was sown the latter end of July, but did not come up till the middle of August, for the want of rain. I pulled them before Christmas, and had fifteen putt loads, which every one will acknowledge to be a good crop; I believe double a common one; and though the rows were four feet apart, the leaves touched each other. The next I sowed was after wheat, about the middle of August: when the wheat was carried off, I had the ground ploughed into ridges where the old furrows were, and sowed one row of seed on each ridge: these cost but little in thinning and cleaning, and once ploughing, and were a very good crop: the largest of them was more than two feet round, and weighed above six pounds; indeed towards the hedges they were much smaller; I had fifteen putt loads per acre, though the ground had bore three crops since it was dunged. Another piece of two acres I sowed after peas, in double rows; but not till the latter end of August: I had the ground ridged up, and when the plants were fit, I had them thinned and cleaned as usual, but left four ridges for ploughing to see the difference; and truly it was surprising: those that were ploughed were more than three times as large, though they had all the same husbandry, except ploughing. They are as good a crop as the wheat stubble, though sown later, which makes me think double rows are best: our soil is mostly heavy good sand.

We have reserved for this article the following account of several very important experiments made by Mr. John Wynn Baker, under the direction of the Dublin Society, and published at their request, on the culture of cabbages, the turnep-cabbage, borecole, and turneps, by various methods, with an accurate state of the produce; and of the absolute and comparative advantages of each in feeding sheep and horned cattle. See the articles BORECOLE-CABBAGE, POTATOES, and TURNIP-CABBAGE.

In the month of March, 1763, two acres of ground, very highly manured with dung, were planted with potatoes, in the manner usually practised in this kingdom, with spade and shovel; in the beginning of November following the potatoes were dug. The land being low, and the winter very wet, it could not be ploughed until the beginning of March, 1764; when, it should be observed, the under stratum, upon which the dung and potatoes lay, rose at the ploughing as stubborn and strong as if no part of the ground had been tilled before: which proves the potatoe tillage, in the manner in which it is usually practised, not to be so beneficial to land as is generally imagined: the fact being, that only about thirty inches in every nine feet of the ground is tilled at all.

In the night of the 10th, and on the 11th and 12th, of May following, there was very fine rain; this rain enabled me, on the 12th, to reduce this stubborn ground pretty fine by the harrow.

In the month of March, 1763, the other part of this field was broke for fallow (an improper time to break fallows; but, my entrance upon the farm in that month was the cause); in June following it was cross ploughed, which brought it into very large lumps: from the position this ploughing threw them into, they were exposed, in a greater number of points, to the influence of the weather, than the ground would have been, had the second ploughing been in the same direction as the first.

In this situation I left this fallow till the March following; when it was ploughed for the third time, with the potatoe ground, in the same direction as the first; by this third ploughing this land was brought into an exceeding fine tilth.

This benefit arose from the ground not having been harrowed at all. This is something contrary to the common mode of culture; but was adapted to the species of

ground I had to work upon, which I shall describe hereafter.

What the harrow would have done in part towards reducing it after the second ploughing, was completely effected by the influence of the summer and winter; the first destroyed all the weeds and couch-grass (with the latter of which the ground abounded); and the lumps exfoliating by the operation of the winter, by degrees fell into fine mould; whereas, had it been harrowed before the winter, the rains would have run the smaller particles together, so as to have given a great adhesion to the ground before the spring, abstracted from the like mischief, which the cattle would have done by drawing the harrow. In the beginning of June, I ploughed this part of the field a fourth time, and the potatoe ground a second; by which ploughing I laid the whole field into ridges of five feet width, except about half an acre, which I reserved for other purposes, as will appear hereafter.

In this field I had two parcels of manure ready prepared for it. One consisted of earth raised from the headland; mixed with lime, which lay about twelve months, having been in that time twice turned.

The other parcel consisted of the like earth, and lime, mixed in the same manner, after which I mixed dung with it, *stratum super stratum*, which lay about two months, when I turned it: after which it lay about two months longer: by this stirring, the ingredients, of which this parcel was composed, were perfectly incorporated with each other; and a new putrefactive fermentation was excited in it, which perfectly prepared it for the land; and all the earth was so fully impregnated with the juices of the dung, that it was very little, if any thing, inferior to the dung: whereas, when dung lies by itself, great part of the volatile saline particles are lost, as soon as the fermentation begins: some fly off in vapours, and others run off with the juices of the dung and rain which fall upon it.

When I have mixed dung and earth, in the manner already described, I always once or twice, when the season affords it, cover the compost with a large quantity of snow, or ice; which, upon dissolving in its passage through the whole, causeth the earth to be finely impregnated by the dung. Snow, by being gathered with shovels or rolled together in balls, is longer dissolving than ice, and therefore I prefer it, unless it be ice of water which happens to be the soakage of a dung-yard, such ice being always replete with food for vegetables.

The land being now, in June, in five feet ridges, in the manner already described, I began to draw out my compost, which I disposed in the following manner: I drove the cars up every alternate ridge, and upon each of them dropped the compost, till I had manured about three acres of the fallow ground; then, with shovels, I divided this manure, as equally as could be, in every furrow, which was readily done, from the convenient manner in which it was deposited.

In the same manner I put out the other parcel of manure (which, it may be remembered, I before said consisted of lime and earth) upon an acre and a half of the potatoe ground; and on a part of the fallow ground, where no compost or other manure had been put, and spread in the same manner as the former.

The whole field being thus manured, I ploughed it again, which was the fifth ploughing of the fallow, and third of the potatoe ground; by this ploughing I altered the position of every ridge, by laying the middle of each exactly over the manure; consequently the furrows were made, where the middle of the ridges was before.

The half-acre before-mentioned I manured with at least double the proportion of compost, which was allowed to the other part of the fallow; and as it was flat, it was necessary to manure every part of it, being intended for turneps, to be sown in the promiscuous way.

To this piece of ground I gave a sixth ploughing, as it could not have the benefit of the horse-hoe, when cropped; and therefore I thought it necessary to reduce it as fine as possible, in order to give the broad cast crop of turneps every advantage I could.

The field being prepared in the manner already described, I proceeded to crop the land in the following order.

July the sixth and seventh, I planted one row of cabbage plants upon the middle of every ridge, of about an acre of the fallow ground, the plants in the rows two feet from each other. In like manner I planted about half an acre with turnep-cabbage plants.

Hence

Hence it may be observed, that the plants were in rows five feet asunder, and two feet asunder in the rows.

This business ought to have been done, at least, a month sooner; but I could not get the ground ready in due time; however, the success of these crops may encourage others not to give up their expectations, although they may happen to be as late as I was, which must frequently occur in the course of business; though this is always to be avoided as much as possible.

I never begin to put my plants out till about six o'clock in an evening, unless I can be ready for planting in a rainy day, which is always to be preferred; in the other case I always keep the men at this work as long as they can see. If it can be done in, or immediately after rain, that will save the expence of watering the plants, which is an object worthy of attention in a large work of this kind; besides the circumstances of the plants succeeding much better.

On Friday the 6th of July we had fine rain, and on the seventh I finished. On the eleventh we had some light showers, and on the twelfth fine rain, which secured life to my plants; but they began to look sickly before the twelfth; three of the intervening days having been hot and dry.

On the seventh I also planted three of the five-foot ridges, the plants in the rows two feet asunder.

Be it observed, that, for the obtaining large cabbages of the spring sowing, the seed ought to be sown early in March; and, if once planted out before the final planting them, it will be an advantage to the crop; the case is the same with respect to turnep-cabbage; but it is more essentially necessary in the common way of raising cabbages; for, otherwise, they will run into long shanks, and will not cabbage well; most gardeners allow their plants too little room: this is not the case here; my cabbage and turnep-cabbage seeds were not sown till the twenty-sixth of March, and I was so much hurried, that I never had time to get them planted out before the final planting, save about three thousand plants; and yet they are all very short in their shanks. This may justly be attributed to the manner of disposing them, and the culture they receive in this husbandry.

Here I cannot omit to remark one circumstance, for the observation of gentlemen and farmers who may adopt this husbandry, viz. That I have not one cabbage this year of the sort I intended to have; what I have being chiefly sugar-loaf, the seedman having deceived me; and, if I had not happened to have about an ounce of turnep-cabbage seed by me four years old, I should not have had one plant of that kind this year; the seed, which I bought in Dublin for it, turning out a poor, small, wretched cabbage.

I shall now proceed to make my report of the farther treatment and success of these crops, before I proceed to the turneps, &c.

Upon the 17th of August, I horse-hoed my cabbage, turnep-cabbage, and borecole, for the first time, by taking off, at one furrow of the plough, only one side of each ridge, close to the plants: thus they remained till the 25th, when I ran the plough in the same furrow; by which, with the first furrow, I ploughed about twenty-one inches deep. This being finished, I immediately returned the earth back to the plants; this afforded them fresh nourishment; and in order to give their roots time to penetrate this fresh earth, which, by the horse-hoeing, was become very fine mould, I let them remain in this state till the twelfth of September; when I horse-hoed them again, by taking off the other side of every ridge; and, on the twentieth, deepened the furrow in the same manner as the former, and immediately returned the mould back to the plants; and, on the eighteenth of October, threw up a small furrow on each side of every ridge, which finished the culture of these crops, and restored the ridges to the form in which they were when the plants were put out upon them.

The plants all grew very luxuriantly; and, in the hottest weather were infinitely more brittle in their leaves, than any I could see in the gardens of my acquaintance: which is a certain indication of health in this kind of plants.

The horse-hoeing was so essentially destructive to weeds, that it cost me but four-pence to weed these crops, which occupied about an acre and three quarters of ground.

The repeated horse-hoeings cost me two shillings and

four-pence an acre, for workmen's wages, exclusive of horses, of which I used two, and sometimes three.

December the 8th, I cut one row of the cabbages; they beginning to decay, which is indicated by their bursting. The number was two hundred and fifty-eight, and they weighed sixteen hundred-weight; three quarters, and twenty-one pounds; i. e. one thousand eight hundred and ninety-seven pounds: which, at an average, is seven pounds and near six ounces for each cabbage.

The produce upon an acre, on weighing this row, which was five hundred and sixteen feet long, amounted to twenty-three tons, four hundred, two quarters and fourteen pounds; i. e. fifty-two thousand and thirty-eight pounds: which is, at least, from ten to seventeen tons less, as I compute, than the produce would have been upon an acre, had I obtained the sort I intended to have; which was the large, late, Dutch cabbage. However, such a produce as was here obtained, will be an ample reward for the labour any one may bestow in this husbandry, as will appear when I shall come presently to shew how many cattle twenty-three tons will maintain.

December the 17th, I took up one row of the turnep-cabbages, which were in number two hundred and forty-nine, they weighed eighteen hundred weight, and fifteen pounds; i. e. two thousand and thirty-one pounds, after chopping off the roots and stalks below the turnep, which ought not to be weighed, as being no part of the food for sheep or cattle: the weight of these plants, one with another, was something more than eight pounds and two ounces; some few weighed fourteen or fifteen pounds. The produce upon an acre, on weighing this row, which was four hundred and ninety-eight feet long, amounted, at the same proportion, to twenty-five tons, fifteen hundred, three quarters and seven pounds; i. e. fifty-seven thousand seven hundred and sixty-one pounds.

This crop was much greater than ever I had before; and, from some observations I have made this year, I am inclined to believe, their culture may be improved to a produce of ten tons more upon an acre: but, abstracted from that, the produce already obtained is more valuable than any crop I know of, for they are invincible by the winter, either in or out of the ground. The great distress of even the careful farmer is in the months of March and April, for his ewes and lambs, when turneps are gone, or are but very indifferent food, and all other green winter-food is exhausted.

Feeding ewes upon dry hay affords but little milk to their lambs; add to that, hay is not made without great expence and anxiety, over and above the rent of the land; for really, where the farmer is so unfortunate as to have his hay upon hand in wet weather, it is a business which will exercise his patience, no less than it will consume his money.

One superior excellence in these plants is, that sheep will prefer them to turneps: another is, that they are a firmer and more substantial food; and, to ascertain their firmness in texture, and quality in keeping after being drawn, I have kept them near twelve months exposed to the open air, to the extremes of heat and cold, and, after that, they were found, save some few.

If any person who may cultivate this plant for sheep, should keep a large flock, he may let the plants remain in the ground till he wants them; in that case he may turn the sheep into the field, where they will eat them quite down to the stems; and, as the plants stand naturally above the ground, and by my manner of cultivating them, they are still higher, by being placed on the tops of the ridges, the sheep cannot dirty them, as they do turneps when turned into the crops; add to this, that when the sheep have eaten all the leaves, and begin to eat the butts or turneps of this plant, they will not rot as turneps do, when wounded; but will certainly keep sound, even after that, for six weeks or two months: nay, yesterday, the fifteenth of February, upon dressing some of them for seed, I found some, which had been accidentally wounded by cows, upwards of three months ago, perfectly sound, notwithstanding the great quantity of rain which had fallen upon them.

When the leaves are wanted early in the winter for sheep, or black cattle, or, the land is wanting for any other crop; in either case the plants may be taken up, the leaves taken off, and the turneps thrown any where upon a piece of sound dry grass ground, where they will keep, and

and be ready for sheep in the spring : but this work is attended with some trouble and expence, the roots being very firm in the ground.

The latter end of December, and in January, the plants began to throw out fresh shoots, which are to produce the seed : and, when they began to do so, all the leaves of the preceding year fall off, being first greatly decayed ; and as the leaves, in October and November, are really very numerous, and afford a large quantity of food for cattle, is well worth the trouble to take them off before they begin to decay ; and when this is judiciously done, the trouble is very little.

The method which I would recommend is, that two men be sent into the field, each taking one row before him, and, as he pulls off the leaves, laying them upon the ridge between the turneps ; when these two ridges are finished, or as many as may be thought necessary, let one horse, or more, be brought with a pair of cleaves upon his back ; let him be placed in the furrow, between the two rows ; and as he passes along, the two men fill the cleaves, which may be most conveniently done, from such a disposition of the business, without any injury to the turneps in the rows.

Where extensive crops of these plants are raised, it will be very useful to collect all the roots, whether left in the field by sheep, or otherwise separated, and mix them with heaps of earth, where a putrefactive fermentation will shortly commence, by which the earth will be strongly impregnated with volatile and fixed salts, and will then be an excellent manure ; and, indeed, all succulent vegetables will contribute to the same end, under the like treatment.

I must beg leave in this place just to mention, for the consideration of the society, and which I earnestly recommend to be tried by mariners, another use, to which, I think, this plant may be converted, which is still of more importance than any which I have yet named.

We lose more men in the beginning of a war in the navy, as I have been informed by the navy-surgeons, by the scurvy, than by the enemy, which is attributed to their sudden change of food. From fresh provisions and vegetables on shore, the men are at once brought to salt provisions.

The turnep of this plant, I am inclined to believe, would keep three or four months on ship-board, perhaps longer ; but the navy-surgeons have told me, that if it would keep six weeks, it would save the lives of many men. Something has been said on this subject before, in a pamphlet intitled, *Hints on Husbandry*, in a letter to the Dublin society, printed by Flinn, in Castle-street.

I cannot dismiss this subject, without earnestly recommending the culture of this plant to the attention of the farmer, particularly to such as keep any stock ; and, although the plant is very little known, except in the gardens of the curious, yet, whoever will cultivate it in the way I have here set forth, will find himself amply repaid for his labour ; for how comfortable is it for a man's mind to be at ease about his stock, in the months of scarcity ? Whereas I have every year observed, that the farmer's stock, particularly ewes and lambs, are turned into his meadows to live upon the springing grafs, to the irrecoverable injury of the hay harvest ; as frequently have I seen them upon young clover, to the manifest injury of that crop.

I could enlarge greatly upon these injudicious practices ; but in brief I shall only say, that if I shall live to see the culture of this plant generally established, I shall have the comfortable reward of knowing that I have been useful to mankind ; a circumstance which will be more grateful to me, than if I had conquered a nabob, or extirpated an Indian nation.

December the eighteenth, I cut two perches in length of one of the rows of borecole, which contained twenty-one plants ; they weighed one hundred and eighteen pounds, which is very near five pounds ten ounces for each plant : but I am inclined to believe, that these plants will succeed as well, if they are planted only eighteen inches asunder in the rows. However, at the above proportion, there would be seventeen tons and fourteen hundred upon an acre. But, if the produce would be the same, were the plants only eighteen inches asunder, in that case an acre would produce, by this culture, above twenty-three tons and twelve hundred.

This plant is well worthy the farmers or graziers attention, for, as fast as it is cut, it will again, in about a

month or six weeks, afford another crop : I have been cutting these plants for my family-use ever since the middle of August last ; I believe some of them have been cut three times ; and they are excellent for the table. For feeding cattle and sheep they are highly valuable, as no frost will injure them ; and, although the first crop amounts not to as many pounds upon any given quantity of ground as the others, yet the succeeding crops will, I believe, make their produce nearly, or quite, of equal weight with any other of the cabbage kind. But I must not omit to observe, that as these plants afford only open leaves, and many of them very small, there will be a little more trouble in collecting and carrying them to the sheep and cattle, than there will be with the other kinds.

It may not be improper to observe, likewise, that upon the approach of the spring, when they begin to throw out their spring-shoots for seed, if the large leaves have not been taken off for winter use, they will decay and fall off in the same manner as the turnep-cabbage leaves have already been described to do.

I have not yet tried it, but I believe that the best way of using this plant, would be to allot one whole field to the culture of it, proportioned in size to the stock intended to consume the produce ; and in September or October, to turn the ewes into the field for a few hours, morning and evening, and then lodge them on any piece of grafs or fallow, which may want improvement, to which they will greatly contribute by emptying themselves upon it ; and thus continue turning them into the borecole field, till they have eat all the luxuriant leaves ; then let the plants rest a month, and there will be another crop. By having two small fields under this crop, a flock of store-sheep might be maintained a whole winter at a very small expence ; for whilst the produce of one field would be consuming, the other would be coming on.

This method occurred to me from an accident, which attended my borecole this year. My cows got into the field, and presently devoured some of the leaves of the plants ; these plants have engaged my attention ever since, and I have the pleasure to see them again in a very luxuriant state.

If any person should be able to put this scheme in practice before I can accomplish it, I recommend it to them, not to let the sheep pasture so long upon the crop, as to wound the stalks for want of leaves ; as too great an injury to the stalks may check the succeeding growth ; which injury, I am inclined to believe, will not happen to the plants, at least not in so great a degree, whilst they have a sufficient quantity of leaves.

It doubtless will be observed, that I confine this scheme to ewes or store-sheep : my reason for that is, that fat sheep should always have as much food before them, as they may choose to eat ; add to this, that sheep, when they are fat, are more subject to be lame, than store-sheep, to which ploughed ground will greatly contribute.

We shall now return to the state of the field, in which it was after being manured, and ploughed into small ridges of five feet breadth, with the compost under them in the fallow part, and part of the fallow with the lime and earth, and the potatoe ground aided with the lime.

Upon the fourteenth of July, I sowed with my drill plough what remained of the ridges of the fallow manured with the compost. That part of the fallow which was manured with the lime and earth, and that part of the potatoe ground which was before described to be in ridges, with turneps, and that part of the fallow before described to be flat, and manured with a double proportion of the compost, I sowed in the promiscuous way with turneps also.

The drilled turneps filled only one row along the middle of each ridge.

When the drilled turneps were about three inches high, I thinned them by hand, as being much preferable, and more expeditious than any instrument, intending to have them singled out to about one foot asunder in the rows : but, it being so new a work, the women could not be brought to do it effectually at once, they apprehending, that the whole crop would be lost, and urging, that they were sure there was already too much ground allowed to one row : under these circumstances, I could not get this work done quite to my mind this year, as I had, besides this field, two other sown in the same way, amounting in all to about twelve acres.

My turneps should have been sown at least three weeks earlier ; but the immoderate and continual rains of the preceding

preceding winter, involved me so much with my spring sowing, that I could not accomplish my turnep-sowing earlier.

The turneps, after being thinned, received the horse-hoeings much about the same time and distances as the cabbages; with this difference only, that I deepened the furrows of but a few ridges in another field by a second ploughing in the same furrow, which I did not find to benefit the turneps much: for, if the ground be well prepared before the sowing, the depth of one furrow will be enough for turneps, provided that be deep and bold.

Thinning the turneps in drills by hand cost me eight-pence an acre; weeding of them cost me four-pence; and the repeated horse-hoeings about fourteen-pence an acre for workmen's wages, exclusive of the horses, of which I generally used two, except in very hot days, and then I found three were necessary.

The broad-cast turneps were carefully thinned by hand, when they were about two inches high; which the women did with more courage than they did the drills; and sometime afterwards, I hand-hoed them once, and weeded them twice.

Thinning them by hand cost me four shillings. Hoeing them afterwards cost eight shillings, and weeding them cost me two shillings and four-pence. They were scarcely half an acre; this expence being therefore doubled, they cost me at the rate of twenty-eight shillings and eight-pence an acre, over and above the extraordinary ploughing, and double proportion of manure.

In truth, this crop greatly exceeded my expectations, being by far the best I ever had in the broad-cast way; but I attribute their success wholly to the thinning them by hand; for two, three, four, and often more, turneps will be so united and interwoven, that it would be impossible for the most dexterous hoer to separate them; whereas the fingers and thumb will preserve the master plant, whilst the others are most conveniently drawn from it by the other hand of the person employed: add to this, that there is no labour in which we are more liable to be deceived, than turnep-hoeing.

In one of my other turnep fields I manured about an acre of ground with shell-marle, which I sowed in drills with turneps in the same manner as the former, on the sixteenth of July.

In the same field, I manured about half an acre with the native earth, which had been exposed to the weather for upwards of two years, which I sowed likewise in drills with turneps on the sixteenth of July.

Both these crops were thinned by hand, and horse-hoed, in the same manner as the former.

Thus we have five experiments in the drill way upon turneps, with different manure. One with the compost already described, one with lime, one on potatoe ground, aided with lime, one with shell-marle, and one with native earth; and also one in the broad-cast way, with a double proportion of the compost, and an extraordinary ploughing.

The principal point to be determined by these experiments is, whether sowing turneps in drills, or the broad-cast way, will afford the heaviest crop: but the trials with the different manures will, I hope, be also useful.

The produce of drilled and broad-cast Turneps compared.

December the seventeenth, I measured out three square perches of the best of the broad-cast turneps, and also three square perches of the drilled; and the produce was as follows:

The three perches of the broad-cast turneps weighed sixteen hundred weight and one quarter, *i. e.* one thousand eight hundred and twenty pounds; which, at the same proportion, amounts, upon an acre to forty-three tons, five hundred weight, three quarters and six pounds; *i. e.* ninety-six thousand nine hundred and seventy pounds.

The three perches of drilled turneps weighed seventeen hundred weight, two quarters, and twenty-one pounds, *i. e.* one thousand nine hundred and eighty-one pounds; which, at the same proportion, amounts upon an acre to forty-seven tons, two hundred, three quarters, and two pounds, *i. e.* one hundred and five thousand five hundred and ninety pounds.

	T.	C.	Q.	lb.	Pounds
An acre of drilled turneps	47	2	3	2	or 105520
An acre of broad-cast ditto	43	5	3	6	or 96970
In favour of the drilled	3	16	3	14	9650

Thus, we see, that, notwithstanding the extraordinary proportion of manure, and the extraordinary ploughing, which was afforded to the broad-cast turneps, the drilled crop, with intervals of five feet, produced the greatest quantity upon an acre, by three tons, sixteen hundred, three quarters and fourteen pounds weight.

The drilled turneps in my other fields were very large, regular, and even crops, as many gentlemen saw during their growth.

Those sown on the acre manured with the shell-marle were very near as good as the rest—those sown on the potatoe ground were not near so large, but were regular—those sown in that part of the fallow-ground which was limed, were very poor crops—and those sown on the ground manured with the native earth were miserable.

The crops in my other fields were all treated in the same manner as that already described; except, that the fallows were broke in September, 1763, instead of March, 1763.

It now remains to describe the nature and quality of the land, and then to draw conclusions from the various experiments.

The land lies upon a lime-stone quarry, which is very near the surface; and is, naturally, a very strong and stubborn soil, with an infinite number of loose lime-stones in it. With dry winds, or a parching sun, the ground unites, and is as hard as bricks; moderately wet, it is reducible by instruments; but, when thorough wet, it runs together, and is like brick-clay when tempered. This, I repeat it, is the natural quality of the land, and is what the writers would call a barren, grey, stiff earth, but is not quite a clay.

I have found repeated tillage, when the land is in a proper state of moisture, will reduce it, and divest it of its natural adhesion. Tillage and manure together render it capable of producing any thing; as, I believe, such agents will do upon any land, provided it can be kept moderately dry. The fields, which I had under turneps and cabbages, have been in appearance all the summer a fine loam, and really bore the complexion of very fine land, abstracted from the rich appearance of the crops.

I recommend to the practice of all persons, who may have such land as this to work upon, never to harrow the fallows before winter, but as early as may be in the spring, and during the working the fallow in the summer, but not to leave more than one day's ploughing unharrowed, but rather harrow in the evening what has been ploughed in the morning, and then the harrow will reduce it; but if the ploughing is continued for two days, without any harrowing, the harrow will have no more effect upon the land, than it would have upon bricks, unless it be moistened with rain; in which case it will be reducible, as, it may be remembered, I described the potatoe ground to have been reduced, after rain which fell on the twelfth of May.

Conclusions to be drawn from the preceding Experiments.

These experiments prove gardens to be no more than farms in miniature, under an extravagant expence of culture; since we can with the plough raise more tons of the larger kinds of garden vegetables for twenty shillings, than by the spade for as many pounds: and, indeed, I do not see why most of the small ones may not be raised in the same way.

They also prove, that it is profitable for the farmer to raise different species of cabbage for his cattle in winter; and I have it in contemplation to try them for summer use also. However, for the winter, it is an object of great importance, not only to the well feeding of cattle, but to the saving an infinite consumption of hay, which by this husbandry may, at least, be pastured in summer.

The experiments on the turneps prove, first, that it is more profitable to raise them in drills than in broad-cast: secondly, that the culture is a great deal cheaper: thirdly, that less manure will produce a larger crop, than in broad-cast, provided it be disposed the same way as mine was; fourthly, practice shews the expence of drawing the drilled turnips for sheep or black cattle, to be at least two-thirds less, than drawing the broad-cast: fifthly, in the drill way not a turnep need be left upon the ground; whereas, in the broad-cast way, the leaving many is unavoidable, to the great annoyance of the succeeding crop, particularly if that shall be barley: and sixthly, that the land is left after drilled turneps, in a much higher state of preparation for a succeeding crop, than it can possibly be in the broad-cast way.

To these advantages another may be added, which I find very material, viz. that of slicing them for black cattle, which is highly necessary, even when they are small, nay more so, for cattle are sometimes choaked with a small turnep. A man will be near as long slicing a small turnep as a large one, and will make no dispatch; whereas, my men and boys now slice for me every evening about nine hundred weight in an hour; which is a task upon them after night-fall, except on Saturday nights; then they slice double the quantity.

As it seems to be a paradox to say a man will slice a large turnep as soon as a small one, it may be proper to explain it to the reader. The man is in danger of cutting his hand when he is slicing a small turnep; but in no such danger with a large one: and, besides that, one slice of a large one, contains more food, than two or three whole small ones.

The experiments prove, that the potatoe tillage, in the manner it is now generally practised, is not so beneficial an improvement of land, at least not of strong ground, as is generally imagined: although there is a greater consumption of dung than in any other husbandry.

The experiment with the lime upon the fallow ground, proves lime to be an insufficient manure, for the high improvement of lime-stone ground. There are so many advocates for lime as a manure that it is adventurous to say any thing against it; but, I hope, the reader will observe, that I pronounce upon it, as being insufficient, "for the high improvement of lime-stone ground." I have tried lime in another field of my farm, in which I sowed wheat, and my success was no better in that than in my turneps; and I earnestly recommend it to every improver, who may have favourable opportunities of getting lime, that he try it upon a small patch, before he launches into a large expence for it; such caution may perhaps save him money. This advice arises from practice; for I imprudently burnt a large quantity of lime at an expence of near an hundred pounds, and, I can truly say, I have not received in benefit as many shillings.

The experiment of the shell-marle, proves that to be a very high and excellent manure; for, as it will produce turneps upon poor ground, it may be safely relied upon for any other crop.

The native earth proves to be perfectly insufficient for turneps; though it certainly mends the ground a little, besides that it adds to a shallow soil.

Accidents and Distempers.

Turneps are subject to be destroyed by the fly. In an orchard I sowed two acres with turnep-seed in drills in July last. They were invaded by the fly; I had a contest with them for a fortnight, and at last conquered them, with a loss of only four or five perches of my turneps, which happened where there were most trees. Every morning before the dew was off, I had the rows dashed with lime, which was flaked every day on purpose. This lime adhered so closely to the leaves, when they were wet with the dew, that it defended the upper sides from injury: then I found the flies began on the under side of the leaves, which I had never seen them do before; however, upon this, I was obliged to have the dust thrown very low; and, whilst the plants were wet, a great deal adhered to them, even on the under sides:—thus I saved my turneps, which were as fine a crop as any I had, save the four or five perches before-mentioned.

The upper side of the turnep leaf, in its infant state, is very smooth, and on that part the flies always lodge, unless they are interrupted; in that case they will destroy the plants by wounding the under side, which is not so inviting to the insect as the upper, it being a little rough, though not enough to protect it from them.

The greatest inconvenience I found in this work was, that every little shower of rain washed off all the lime, and then the work was to begin again; sometimes I repeated it three times a day: however, it will be found to answer well, but it requires to be done with care.

I have, by the same method, saved lucern, which is also subject to be destroyed by the fly, upon its first coming up.

I discovered last season three distinct species of the turnep fly (if I may so call it); one of them is black; it seems to hop like a flea, and resembles it exactly. The second is a small degree larger, and very distinguishably has wings,

upon which are two small white specks; and the insect is of an oval form. The third is like a domestic fly, but not by a fourth part so large.

The turnep-cabbage is subject to the rust, or mildew. In my orchard I had some plants put out, at different distances for experiments; they grew very well for a time, but they were all infected with the rust, and those nearest the trees suffered most. In my field I could find but three, which were injured by this distemper. This seems to prove that they require an open exposure; and therefore they better suit the purpose for which I have recommended them.

Turneps, cabbages, turnep-cabbages, and boorcole, are food for black cattle and sheep.

A sheep, I find, will consume about twenty pounds of turneps in twenty-four hours, provided they are allowed as many as they can eat, which should always be allowed to fat sheep; but as sheep vary in size, so I presume will they consume more or less food.

An acre of turneps, of forty-seven tons to an acre, will maintain one hundred sheep fifty-two days, allowing each sheep twenty pounds a day. My sheep weigh about twenty pounds a quarter.

In the month of November last, I gave my sheep access to some pea-ricks, which I had erected on purpose for them, of which they eat with great eagerness; but I find they affect them in the same manner as they do horses, when given to them new; for the sheep, I apprehend, from violent colics, which I conceive the peas gave them, were seized with strong convulsions; and in this way I lost six of them, in a few days before I considered what could be the cause: but having examined the intestines of every one of them, and finding no symptoms of any other disease, I was led to draw the following conclusion; and what seems to confirm my opinion is, that I have not lost one since I took them from the peas. If other persons have not met with the like accident, who have fed their sheep with new peas, it should seem that turneps and peas together do not agree with sheep. However, that is a fact which I shall soon be able to determine, for I shall admit the sheep to the peas again to-morrow, which will be the twentieth of February; a season in which it is imagined we may safely give peas of the preceding year to horses, and therefore, I conceive there can be no danger in giving them to the sheep: but, if they should be affected as they were before, I think there cannot remain a doubt, that the peas and turneps disagree in their stomachs. And here I shall leave a space to add to my report afterwards.

Now, the fifteenth of March, the sheep have been ever since at the peas, and I have not lost one.

Of cabbage, and turnep-cabbage, a sheep, of about twenty pounds a quarter, will consume about fifteen pounds a day. An acre, at that rate, will maintain one hundred sheep about thirty-four days. The cabbage, and turnep-cabbage, are a firmer and more substantial food than turneps.

I have fed a cow this winter upon turneps, and I have now two bullocks which are stall-feeding upon turneps also. It is computed that they weigh between four and five hundred weight each; and I find by experiment, that each of them eat about two hundred and sixteen pounds in twenty-four hours; which is, therefore, about half their own beef-weight; from hence we may, with reason, imagine a beast will eat every day of turneps, at stall-feeding, about fifty-six pounds for every hundred weight of beef he may contain.

One of the bullocks was put up miserably poor from the plough, for an experiment, on the fourteenth of December; he took kindly to the turneps; and on the sixteenth I began to give him with his turneps, pea-flower, to the amount of eight pounds every day; and I find he is greatly improved, but he will not be beef; though I am very inclinable to think, that if he had been put up six weeks sooner, in April, he would have been good beef. This experiment I shall repeat next year. What induced me to mention it here is, that some other persons may perhaps try it next winter, and, if they should, I shall be much obliged by their report of the effect. I am led to believe, that bullocks may be profitably fed with peas, because horses and pigs thrive very fast upon them.

When the cattle are first put to turneps they dung but little, the turneps going off chiefly by urine, the quantity of which is really incredible; but, after some time, they dung more; and, from a whitish colour, the dung resumes the natural colour, and is of the common firmness. I al-

low each of the cattle seven pounds of hay every day, and I do not find that they eat fewer turneps on that account; the reason, I believe, is, that the hay makes them more eager for the turneps. They refuse water.

To each of my cows, and store cattle, I allow seventy-two pounds of turneps a day, and a little straw, thirty-six pounds being what I find a moderate sized beast will eat at a meal. To my plough bullocks I allow the same quantity of turneps, with as much straw as they can eat; but I forbid them having the turneps till they have been unyoked about an hour, and after they have eat some straw; as I conceive the turneps are too cold for them immediately after their labour.

I have lately confined a milch cow four days, and fed her with turneps, and could find no disagreeable flavour in her milk from that food, though I have often heard turneps complained of as giving a bad taste to the milk when cows are fed with them. Query, whether it might not arise from the leaves of trees falling upon the turneps? Leaves of trees always spoil the milk when cows eat them. Here follow

Calculations upon the feeding Black-Cattle with Turneps and Cabbages.

Suppose four cows or bullocks, of four hundred weight each to be stall-fed upon turneps, allowing each beast two hundred and sixteen pounds a day, an acre of forty-seven tons would maintain them one hundred and twenty-one days. Indeed a larger stock should be put up for heavier cattle, as the turneps will not keep so long.

Suppose ten dairy cows to be maintained upon turneps, allowing each cow seventy-two pounds of turneps a day; at this rate, an acre of forty-seven tons will keep them one hundred and forty-seven days. All cattle, fed in this manner, should have about seven pounds of hay a day allowed to each.

The fat cattle eat about one hundred and a half of cabbages a day; therefore an acre of twenty-three tons will, at that rate, maintain four bullocks, of four hundred weight each, seventy-six days.

When fed with cabbages, they dung more, and make less urine, than when they are fed with turneps, and will drink a little water.

Hence I am induced to believe, that cabbages are a better food for cattle than turneps. I am fully persuaded near as many tons may be raised upon an acre, with proper seed and good management; but they will cost five or six shillings an acre more.

There remains one general observation to be made, and which I imagined contributed greatly to the success of the abovementioned crops, viz. that we had for these species of crops, very seasonable and fine rains. From the sixth of July, on which day I began to put down my cabbage-plants, to the first of December, both inclusive, we had seventy days, in which there was, more or less, rain; and the latter end of August, and beginning of September, the heaviest dews that I have seen. From the sixth of July to December the first, both inclusive, were one hundred and seventy-seven days; so that we had but one hundred and seven dry days, many of which, I see by my calendar, were cloudy and inclinable to rain.

"Land, says an Essex farmer, cannot be brought into too good tilth for sowing turneps: they require a deep, loose, well-wrought mould; and to effect this, discreet ploughing and harrowing is the best way. I say discreet, because one ploughing, properly timed, is worth three that are out of time. It is a maxim in husbandry, that some land cannot be ploughed too much; but we should add, at proper seasons and intervals, or an ignorant farmer might ruin himself, and yet think, he had followed the directions that were given him.

"A light land requires less ploughing, as well as less nicety in the times of ploughing, than a stiff heavy soil: and it is also sooner brought into good tilth: two well-timed ploughings will often do it; whereas a clayey soil will require three or four, before it is brought into order.

"An early ploughing will greatly forward the getting a stiff soil into order: the month of April should be the latest, that such, when intended for turneps, should be turned up. It may then lie till the beginning of June, when it should be harrowed down with loaded harrows to break the clods, and immediately cross-ploughed: about a fortnight after this it should be ploughed for the last time, and imme-

diately cross-harrowed and sown out of hand with turnep-seed pretty thick, and scratched with a light harrow to cover the seed.

"Light lands, as I said before, may do very well with two ploughings, one in the spring, and the other just before sowing at Midsummer.

"I look upon it that turnep-seed cannot well be sown too thick, for it seldom all comes up, and of what does get above ground, much is often destroyed by the fly and slug; so that the plants sometimes, though the seed was sown thick, require but little thinning by the hoe. In fact, I think it better at first to bestow an additional quantity of seed, than to have to sow three or four times over, as I have been often obliged to do, till I practised this method of sowing thick, which generally succeeds very well with me.

"The beginning of July is the time in which I for the most part, sow my turnep-seed; in this matter the grand affair is to hit it off, so that the turneps do not grow sticky or spongy before the winter, and yet are forward enough in their growth to resist the frosts, &c. and be fit food for the cattle in the winter, or in the spring.

"To have a good and profitable crop of turneps, it is absolutely necessary they should at proper times, be hoed, not only to kill the weeds, but also to thin the plants, and set them out at a proper distance.

"The proper time for the first hoeing is when they have put forth their fourth leaf, and the second hoeing should be in about three weeks afterwards: twice is, in general, enough, unless a very following rainy season should come on, when it will be proper to take the advantage of the first sun-shine weather, to give them a third hoeing; this, indeed, is often neglected, but I always found it pay well, by the thriving condition it put my crop in.

"As to the distance at which the plants should stand one from the other, that must be regulated by the size of the turnep; but it should never be less than one foot, nor is there occasion for its being more than two; about sixteen or eighteen inches is a proper distance for the common turnep we generally sow about us.

"If the soil on which the turneps grow, is light and dry, the most profitable way is to feed your sheep on them in the spot where they grew; but if the soil is heavy and stiff, it is best to have them pulled and carried in tumbrils on to some dry pasture, or on any dry field you want to mend; for was you to feed them on the land, one half of them, at least, would be rolled in the dirt, trodded under foot and spoiled.

"Land cannot be too rich, or too well dunged, for bearing turneps; and this will bring them forward, and make them escape the fly better; for when once the leaves become rough, the fly does not chuse to touch them: it is therefore certainly best to encourage them in their growth, and bring them as soon as possible out of danger.

"When my young crop of turneps have come up, and I have been fearful of the fly, I have frequently sown over them wood ashes, and sometimes foot: these have been of great service, especially if gentle rains followed, as neither the flies nor slugs chose afterward to touch them. But I must observe, that this is no safe remedy, if the weather is dry and hot, for ashes being of a hot nature, will then be apt to burn up the crop.

"As to the slugs, the best way of destroying them in dry weather is with a light roller: this crushes and kills them, and does the crop service, especially if it is light land; for it presses the particles closer, so that the moisture in the earth is not so soon exhaled by the heat of the sun; consequently the young turneps do not so soon suffer by a continued drought.

"It is scarcely necessary to observe, that dry weather is best for hoeing turneps in, as then neither the weeds nor the turneps that are cut are apt to grow again.

"In light gravelly or sandy soils, the seeds of turneps may be deeper covered than in stiff clayey land: in the first it may be pretty well harrowed in; in the latter, it should only be slightly scratched with a very light short-tined harrow, or even only bush-harrowed; as by that means they will sooner appear above ground, be sooner out of danger and thrive better afterwards, the apple of the root growing almost entirely out of the ground, the whole nourishment being collected by the tap-root, and by the horizontal roots, which issue from it on all sides.

"The quantity of seed to be sown on an acre, should be from two to three pounds, according to its goodness; and many use equal quantities of old and new seed, think-

ing this method best; for the new seed comes up first, and if the fly takes it, the old seed in a day or two succeeds, and generally fares better.

"If a crop of turneps fails, either through any defect in the seed, or by the ravages of the fly or slug, it is usual for the farmer to sow the same land again; and this, if there is occasion, he repeats two or three times, till at last he secures himself a crop. For the reason above-mentioned it is esteemed best to sow early, as by that means there will be time, if the first crop fails, to sow another.

"Turnep-seed is very apt to take damage from wet, if it is not covered as soon as sown: without this precaution it will sprout prematurely, malt or mould: by too early a germination the seed is apt to burst.

"When pease are sown on a rich mellow earth, they are apt to grow rank: in this manner they cover the ground, keep the moisture in it, raise a kind of fermentation in the soil, and make it hollow and porous; inasmuch that when the crop has been off, turneps have been harrowed in without ploughing, and have thriven amain; but there is danger in pursuing this practice without great caution." *Museum Rusticum*, vol. I. p. 205.

"I have in my time, says a Norfolk farmer, sown a great deal of land in turneps, and have applied them with great advantage to various uses; but our chief reason for cultivating them in this county is for feeding and fattening sheep.

"It is almost needless to say, that they answer this purpose extremely well, their use is too well known to all the eastern farmers, to be in these days controverted.

"We have various methods of spending them: some fold their sheep on the land where the turneps grew; I have done this, but it is not a method I approve of: however, for the benefit of such farmers as chuse to practise it, I shall give one caution; which is, that they use wicker hurdles for folding their sheep, which will otherwise be apt to thrust their heads through the bars, and entangling themselves, are by that means often killed in the night, to the great loss of the owner.

"If, however, it should not be convenient to the farmer to get these wicker hurdles, but he should be obliged to take up with those made of rest stuff in form of a gate, let him then be careful, when he has set his hurdles, and staked and bound them right, to pull up all the turneps that grow within two or three feet of the outside of the fold, and throw them over the hurdles for the sheep to eat within-side.

"This will take away any temptation the sheep may have to put their heads through the bars, and they will by that means escape the danger of being strangled.

"Every animal is fond of liberty; and though the sheep will bear confinement, perhaps, better than any other creature, yet whoever has seen them when first driven into the fold, must have observed that they naturally go round the hurdles to try to find an opening to get out at; by this means the turneps which grow near the hurdles are trampled on, dirtied, and spoiled. For this there is a very easy remedy; let the shepherd only pull up all the turneps that grow near the inside of the hurdles, and all will be well.

"I observed before, that I am not fond of giving my sheep turneps as they grow: I think it much the better way to have them pulled; by this means they have an opportunity of eating the whole root, and my stock of winter fodder goes much further; whereas, when they feed on the turneps as they grow, they generally scoop them out, and leave a hollow shell in the ground, which, though it may afterwards be forked up, the sheep will scarcely ever by hunger be induced to touch, as it cannot but be soaked by the dung, urine, and dirt from the feet of the sheep.

"I find it then the best way to have my turneps pulled before they are given to my sheep; they go much farther, and do them more good.

"But in this method there is one seeming inconvenience, which is; that in frosty weather when the ground is hard, I cannot have them pulled, yet this difficulty is very easily removed, by laying up, at the beginning of the winter, a sufficient store of turneps, secured from the wet, and not much exposed to frost.

"I think it worth while to have a building particularly dedicated to this use, and find it answer well: it is built in form of a small barn, and boarded round.

"In the beginning of the winter, before the frost sets in, I have a large quantity of turneps pulled, and the dirt is carefully scraped off them; and, after cutting off the heads

and tap-roots; I cause them to be regularly laid in my store, with this caution, however, that all round the sides next the boarding, my men lay straw to keep out the frost. The heads, or tops, I give to all my cattle in general, as they are cut off; by which means I in fact suffer no loss.

"I find these stored turneps a happy resource when hard weather comes on; then I open my repository, and deal them out to my sheep in such a manner that there may be no waste; and as soon as the weather breaks, and the earth becomes less hard, I resort again to the fields, and have them pulled as usual.

"For some years I had another manner of storing my turneps, which was by digging a deep pit in a sandy, dry field, which being filled with turneps, they kept there very well; yet, as this method was subject to many inconveniences, I left it off.

"I have discovered another use for the turnep, besides feeding my sheep, oxen, and cows with it, which I must mention before I conclude this letter. I find it agrees remarkably well with hogs, which will eat of it greedily, and thrive on it apace.

"I have several times tried this, and have often killed fine young porkers that had for many weeks eat nothing but turneps boiled in swill, or wash, till they were tender.

"I have at other times given turneps to large hogs, that have been put up to fatten, in order to their being killed and salted for family use; and here I was not disappointed in my hopes; they always came on well: but I made it a custom to give them, for a week or two before they were killed, a few bushels of boiled peas, in order to harden their fat, that it might not boil away in the pot.

"I gave them boiled pease rather than raw, because, having been long used to eating the soft turnep, I found they did not afterwards take kindly to the hard, raw pea.

"Hogs may easily be brought to eat raw, unboiled turneps; but it is much better to boil them when the hogs are to be fattened; for though they will eat enough of them raw to keep them in tolerable good plight, yet they will not eat enough to fatten them apace." *Museum Rusticum*, vol. I. p. 335.

"I had last winter, says an ingenious clergyman of Northampton, a piece of turneps intended for feeding sheep; but my method of consuming them at first astonished my neighbours.

"I fed them off by the fold; but I first turned in some ewes, which greedily devoured all the tops and leaves; when they had finished them, I immediately folded my ewes on a fresh spot.

"After the leaves were eat off the first spot enclosed by the hurdles, by the ewes, I turned in some wethers, which eat with a very good appetite the apples of the roots, leaving, however, the lower part scooped out in the ground: these I had forked up, and they were eat by my store-sheep.

"My neighbours were convinced my method was right, because I evidently kept and fattened more sheep on the same quantity of land than they did; yet they begged I would give them my reasons for this my practice.

"I told them I would readily comply with their request, and the more so as it might be a means of tempting them to imitate what they saw practised with success.

"Continuing my discourse, I informed them that many years experience, and constant observation, had convinced me, that if you turn a parcel of sheep promiscuously into a field of turneps, the ewes and lambs would immediately attack the leaves; the fattening wethers would, for the most part, prefer the apple of the root; and the store-sheep not being nice, would indiscriminately devour both leaf and apple, and even eat the leavings of either of the others.

"I farther informed them, that I had frequently observed that when a parcel of wethers have been turned into a piece of turneps, the farmer, thinking to have no waste, generally kept them in till they have eat the roots up. But this is very bad husbandry; for after the wethers have eat the most delicious and sweet part of the root, they loathe the rest, which is generally gritty, dirty, and sodden, inasmuch, that nothing but absolute hunger will tempt them to taste it. In this period they pine and loose flesh; and by the time they are turned into a fresh bite of turneps, they are but little better than they were at first.

"The appetite of a beast that is fattening should be tempted, not palled; and undoubtedly, such of the sheep

as are most forward will be most delicate; and this delicacy, if the farmer is wise, he will indulge, as it will eventually turn out to his advantage.

"Thus, in my manner of feeding turneps, the ewes come first, because they prefer the leaves; the wethers that are to be fattened follow, and make the most pure and sweet repast; and the store-sheep, which are the least nice of any, come last, and clear off the remains; at least, as much of them as they ought to be permitted to eat; for I do not hold it good to oblige them to eat what are in a half putrefied condition, and fodden with dung and stale.

"My neighbours were so well pleased with my reasons, and so well convinced by what they saw, that they are determined to adopt my practice; and if any of your readers should be of the same mind, it would give me great pleasure, as I cannot feel a truer joy than what results from my endeavours to be of service to my fellow creatures." *Museum Rusticum*, vol. II. p. 231.

"I last year sowed some turneps, says a farmer near Chelmsford, on near ten acres of good light land. Some other business interfering, prevented my getting them hoed in due time, inasmuch that, by the latter end of August, they seemed to be almost covered with weeds.

"Being willing to endeavour at recovering my crop, I caused the field to be harrowed and cross-harrowed, which set them out pretty well, and cleared away a great number of the weeds, inasmuch that the turneps got a-head, and grew to be a tolerable crop.

"I send you this for the information of some farmers, who, when they have delayed hoeing their turneps for a few weeks, if the weeds get forward, think they have lost their crop; whereas, would they adopt this method, which has been more than once recommended, they would find it answer any reasonable expectation they could form. I have several times tried it, and it always succeeded with me more or less. The work costs but little, and the benefit resulting from it is considerable. I have known farmers plough up a crop of turneps which, by harrowing, would have yielded them a good return." *Museum Rusticum*, vol. V. p. 239.

"I have known many, says farmer White, of Suffolk, who intend feeding off their turneps with sheep, keep the turneps till they are too old to be applied with advantage to that use. Your readers may give me credit, for I speak from experience; and I can assure them, that one acre of young turneps is of more value for fattening sheep than two acres of old ones, as the wethers you turn in will get flesh and fat at least as fast again on the first as the last.

"Let this maxim be treasured up in the farmer's memory; and let him not at any rate be tempted, for the sake of spending a few weeds and grass on his fallows, to keep his turneps till they are of little worth.

"If any of your readers should be incredulous, let them try the experiment; it will be but little expence, and still less trouble. I did so myself before I adopted the practice, and was in a very short time convinced: this happened some years ago, and I have continued this method ever since." *Museum Rusticum*, vol. II. p. 279.

We shall conclude this article with the following letter we were favoured with from Mr. Mathew Cox of Wallhampton, near Limington, in Hampshire:

"I have, says he, inclosed you a draught of a hoe-plough, which I have found to answer very well for hoeing carrots and turneps, which may probably be improved by some of your society: the following is the particulars of its success this year 1766. I took possession of the farm I live on in April, and going soon after to London, ordered my servant to sow two acres of carrots with four pounds of seed; on my return, I found he had sown all the seed I had left him, being twenty-eight pounds. In May the carrots came up as thick as sand on the shore. The people here being entirely unacquainted with the method of hoeing, made my work very tedious, as I was obliged constantly to attend them. It cost me sixteen and six-pence per acre, and the work not half done; I then harrowed them, &c. according to Mr. Billing's directions, and in June found ten times too many to come to any size; but could not get the second hoeing performed under one guinea per acre: I then gave directions for this hoe, which I fixed to the common horse-hoe plough, and hoed my two acres in five hours with ease; next day I harrowed them with common harrows. About ten days after, I harrowed them again, and have kept nine horses on

them ever since August; except a quarter of oats in seed time.

Whoever uses this plough will find it answer the first hoeing extremely well, as it will leave whatever it hoes at two inches and a half distant; consequently the second hoeing, which must be by hand, will be very trifling; and often there will be no occasion for it. I first hoe the long way of the land and then cross it. The hoe I have is bare two inches; but I find it is too narrow.

a a, Plate XXVI. fig. 5. are the two out-sides of the hoe, which are flat, and so go on the outside of the block on the common horse-hoe at *A A*, fig. 4.

b, Goes on a mortice at the bottom of the block, at *b*. *c*, the pin goes through the holes on the flat side of the hoe at *a a* and the block *A A*.

d, d, d, The cutting parts two inches and a half wide; and leaves a space of two inches and a half.

E, A chain that hooks to a staple on the beam, and keeps all steady. I have ploughed ten inches deep with this hoe.

F, F, Two bars of iron worked in to the three uprights.

I always use the harrow belonging to the common horse-hoe with the above. I sometimes fix M. De Villier's cultivator to the above carriage: I have a field of twenty-two acres of wheat, in which is sixteen different ways of sowing, preparing the seed, and manuring the land."

Mr. Marshall, in his *Rural Economy of Norfolk*, vol. ii. says that "An experienced farmer in this neighbourhood has frequently found that steeping old turnep-seed in water and letting it lie a few hours in the sun before sowing, has brought it up much sooner than sowing it dry.

"He adds, that this year, having neglected to steep it, he had turnep-seed lay three weeks in the ground before it came up. He was advised to plough in the few straggling plants which appeared soon after sowing, under an idea that the fly had eaten off the remainder: but he judged from experience that the principal part of the seed was still in the ground; he accordingly waited until rain fell, and has now, I see, a very fine crop of turneps.

"This is a valuable incident; for it is highly probable, that in the beginning of the season, when old seed is obliged to be sown, many crops of turneps have been prevented by ploughing the ground prematurely."

In another part of the same volume he says, "What a variety of enemies have turneps in this country! The fly, the canker, the maggot at the root, and the anbury, have this year already destroyed myriads.

"The fly took them in their infant state; the grub and caterpillar, whilst their tops were yet small; and, now when their tops have almost got their full size, they are hourly dwindling with the anbury.

"The grub in itself would not perhaps be fatal; but the rooks, in order to come at it, pull up not only the plants which are attacked, but those also which are free from it; and by this means clear them as they go.

"The anbury is a large excrescence, which forms itself below the apple. It grows, it seems, to the size of both the hands; and, as soon as the hard weather sets in, or it is, by its own nature, brought to maturity, it becomes putrid, and smells very offensively.

"At present, the state of three specimens which I have taken up, and examined attentively, is this. The apples of the turneps are just forming about the size of walnuts in the husk while the anburies are already as big as the egg of a goose. They are irregular and uncooth in their form, with inferior excrescences (resembling the races of ginger) hanging to them. On cutting them, their general appearance is that of a hard turnep; but on examining them through a magnifier, there are veins, or string-like vessels dispersed among the pulp. The smell and taste somewhat resemble those of turneps; but without their mildness; having an austere and somewhat disagreeable flavour, resembling that of an old stringy turnep. The tops of those which are much affected turn yellow, and flag with the heat of the sun; so that, in the day time, they are obviously distinguishable from those which are healthy.

"It seems to be an idea among farmers, that the cause of the anbury is the soil's being tired of turneps; owing to their having been too often sown on the same land. This, however, is positively erroneous; for the piece from which I drew these specimens was an old orchard, and never before bore turneps in the memory of man.

"Quere—Is it not caused by the above-mentioned or some other grub, that, wounding the vessels of the tap-root, diverts the course of the sap; which, instead of forming the apple, forms this excrescence."

Mr. Marshall further states, in Minute 61 of the same volume: that, "A neighbouring farmer having one side of a close of turneps which he could not get off fast enough to be sown with wheat, he cut off their tops with a spade, gave the tops to his cows, carted the bottoms into a new-made adjoining ditch, (backing the cart and tipping them in) and covered them over with a little straw; and, over this, with bramble-kids, to keep the stock from them."

"Here they lay until wanted, in a frost, when the cart was again backed to the ditch, and the turneps loaded with a fork."

"He says, that his beasts eat them as well or better than fresh-drawn turneps; and that in general they came out as sound as when they went in. Had the tops been deposited with the roots, they would probably have brought on a fermentation, and have spoiled the whole deposit."

"Might not this practice be extended to the preservation of turneps in the spring?"

"Turneps, this year, began to run the beginning of January: they have now, in general, got spring shoots five or six inches long; and, if the present open weather continue, the roots must be considerably exhausted, and the land very much drawn, long before bullocks in general are finished, or grass begins to grow. But if they were now (when labour is cheap and plentiful) topped and carted into dry ditches, or formed into stacks with straw, their goodness might be preserved, and the land be got into forwardness for barley."

"If they were stacked in or near the yard, there would not, for shed or straw-yard bullocks, be any labour lost."

"Whether, after this remarkably mild winter, the spring prove very mild, or very severe, they would, by this means, be removed out of harm's way."

Mr. Young, in his *Annals of Agriculture*, vol. VII. inserts the following account of turneps by the Rev. Orbell Ray, of Postock:

"Your address to your correspondents, in Number 40, requesting them to inform you of the measures which they pursued for preserving their turneps, and relieving their land from the exhausting effects of their very rapid vegetation, during the late spring, determined me to send you the following account of my treatment of this root, the advantages of which I have experienced for many years, and which, with a few variations, is, I believe, the general practice of the Suffolk farmers. About the middle of February, I began to draw my turneps, cutting off the tap-root at the same time, and carried them to a pasture field, adjoining to my farm yard, where they were unloaded, and labourers employed to take the roots, one by one, and set them upon the grass, in as upright and close a manner as possible. I pursued this method through the month of March, until I had collected above an hundred loads; always availing myself of dry windy weather, when the tops are less brittle, and the roots in the cleanest state. The expence varies with the distance of carriage; the setting up, about three half-pence per load of 40 bushels. The growth of the top is not much interrupted by the loss of the tap-root, and is an ample compensation for the waste of the bulb. I carried about two loads per day to nine bullocks, which were confined in a farm yard, with suitable bins; and do not recollect that I ever experienced so profitable an expenditure of my turneps. The cattle did not leave the yard till the second week in May; when they were turned into a field of fresh luxuriant ray-grass; I observed that the succulent quality of the turnep-top was more acceptable to their palates than the grass; and I am moreover convinced of this very important circumstance, that the quantity of nutritious food is increased by this method."

Mr. Marshall, in his *Rural Economy of Norfolk*, gives the following remedy of destroying caterpillars; by which he says many hundred acres of turneps have been saved.

"Mr. Samuel Barber had, at one time, upon his farms, at Staninghall and Woodbastwick, near four hundred ducks at work: and, through their industry, has saved a principal part of his crop: had he begun to employ them sooner, he believes he should have saved the whole."

"The different detachments (some of them near one hundred strong) were kept by a boy or girl. They were regularly driven to water, and rested three or four times a

day: but had no corn nor any other food given them. After having drank, they would disgorge the caterpillars in great abundance; so that they soon fell to again with fresh appetites."

"Half or three-quarter-grown ducks are preferable to old ones, which are lazy, and will sooner eat the turnep-tops than run after the caterpillars."

"It is very amusing to see the young ones dart at their prey: these, however, when the caterpillars grow scarce, take to the turnep-tops, and after they have reduced the vermin to a certain ebb, do the turneps more harm than the caterpillars themselves do."

"This has been used as an argument against employing ducks; and, in respect to old ducks, it may have its weight: but if the caterpillars are so few as to tire the young ducks in looking for them, the plants cannot sustain any material injury from them."

"The fact seems clearly to be, that where one acre of turneps has been saved by any other means whatever (hand-picking excepted) an hundred have been saved by ducks."

"In the same Volume he says, 'Young Swann, of Suffield, had, the winter before this, some of the best turneps in the country. Seeing him, last summer, sowing some in what appeared to me a slovenly manner, the surface being covered with chick-weed, groundsel, charlock, and other rubbish pulled up by the harrows, I asked him why he did not give his land another earth before he sowed it. He answered, that the land was not foul; and that he, purposely, let the seed-weeds get to a head: having found, from the experience of two or three years back, that his turneps succeeded best when the seed was sown in that manner: saying, that he believed the wreck shaded the young plants, and kept the fly from them. I asked him if the rubbish was not in the way of the hoe: he said, not much; for being young, and tender, it withers away to little or nothing, before the plants be fit for the hoe.'

"Two or three days ago, I examined this close of turneps; the plants are thinner than one would wish, (perhaps owing to their being badly hoed) but there is not a squally patch in the whole piece."

"There may be two advantages arising from letting the soil lie some time before the last ploughing: it requires a degree of texture, and moistness, favourable to the infant plants; and is prevented, by the dead weeds, from being, afterwards, run together by heavy rains."

In the *St. James's Chronicle*, January 7, 1792, there appeared the following account of the Swedish turnep, or Ruta Baga, which promises to be a valuable article to the farmer. "It is a species of turnep that was discovered in Sweden by Linnæus; but the seeds of it only reached this country of late. It has been sold here by its Swedish name of ruta бага; and sometimes is called the Swedish turnep. Its appearance is not the most promising. It does not on ordinary loamy or light soils, grow to such a size as the common kinds of field turneps; scarcely, perhaps, does it equal in size the yellow turnep; but it seems to be better adapted to strong clay land, and thrives better in damp soils than any other kind of turnep. Its skin too is very thick, which is rather an unpromising appearance. Its flesh, however, when used at table, is excellent, very much resembling that of the yellow turnep; and all kinds of cattle are singularly fond of it. The leaves too, which exactly resemble those of the cole-seed plant, are an excellent green for the table, but are not nearly so abundant as those of other turneps, though more hardy with respect to frost; nor have we had any opportunity of yet perceiving that the bulbs are in any case affected by frost, or the young plant consumed by the fly."

"Its excellence, however, consists in two peculiar qualities, which it possesses: one of those is that of admitting of being transplanted with the same facility as a common colewort. It may therefore be either cultivated in the usual way, as turneps, or transplanted into the field from a seed-bed, as greens, according to circumstances. Experiments sufficiently numerous have been made fully to ascertain this fact beyond a doubt."

"But as the most singular quality of this plant (says the writer of this article) is one that I should not mention, because it is so contrary to the invariable experience of men in all cases of similar nature, were it not upon such authority as I consider to be indisputable. It is well known that turneps in general, and all other plants of this genus, when suffered to run to seed, become dry and sticky; and

as the seeds ripen, the heart of the bulb becomes withered and shrivels up, so as to leave a dry hollow ball, when the seeds are perfected. By the information I have received from a gentleman in Norfolk, whose name is well known, and highly respected in the literary world, I am assured that after this plant has fully perfected its seed, the bulb still continues fresh and succulent, and fit for use by cattle.

"On mentioning this fact to another gentleman, who had cultivated the Swedish turnep on a large scale, he confirmed this observation by the following fact, which accidentally came to his knowledge.

"He had saved some seeds of it in his garden; and his gardener, as usual on reaping the seeds of turneps, pulled up the bulbs, and threw them into a waste corner without the garden walls. There they were allowed to remain neglected above ground for several weeks. In passing that way, he accidentally struck one of them with his foot, and finding it firm, he took it up. The weight surprised him.

"On cutting it up, he found it fresh and fit for use. He carried it as a curiosity into the kitchen, where it was dressed, and served up to table; and my informant eat of it, and found it very good.

"On expressing my surprise at this singular quality to my Norfolk correspondent, he writes me, of date as late as the 6th of December, in these words:

"I have nothing to mention to you on the subject of experimental agriculture at present, except that I have had an eye-witness to the soundness of the bulbs of the rutabaga, after they had perfected their seeds, in a gentleman who is so near you, that I wish to refer you to him for an account of their appearance, on the first of September last. Doctor Andrew Coventry, the new Agricultural Professor at Edinburgh, having done me the honour to pay me a visit, I carried him to a place where they grew, and there finding some of the roots remaining in the ground, we pulled up one or two, and found them in the state I mentioned, not a little to his surprise as well as satisfaction; as they thereby promise to be a most valuable acquisition to the husbandmen. Every farmer will know how to estimate the value of such a plant. It promises to supply a desideratum in husbandry that has been sought for in vain, ever since the introduction of turneps."

TURNIP-CABBAGE, the name of a species of cabbage, so called because the stalk, at some distance from the ground, after rising of the usual thickness, and in the manner of those of other cabbages, enlarges suddenly to such a degree, that it forms a knob of a very large turnip: of which likewise it has sometimes the figure, though it is, in general, more oblong.

By this peculiar formation of the stalk, or production of the turnip-like knob, together with its being perennial, this species of cabbage is distinguished from all others. From the top of this turnip rise a number of leaves, of a greenish-red, or sometimes greenish-purple colour; which answer to the radical leaves in other plants. They do not, though this plant is truly of the cabbage kind, ever close together, and form a compact globular or oblong mass, as in the common species; but keep their erect growth, or turn outwards.

From among these leaves spring a number of other stalks, of which those that are nearer the extremity, branch, and send out flower stalks, spreading horizontally; and those that are more in the center, grow erect, and without branches. On these stalks are leaves, springing out alternately, and of the same colour with the others. The flowers are small and yellow, and succeeded by long pods, full of seed, of the size of that of mustard, and a light-brown colour. We have given a figure of this plant on Plate XXVI. fig. 6.

It may be justly doubted, whether or no this plant be originally a native of our country: though it is at present found growing wild in some places near Dover. But, from its general character, which does not agree with the indigenous plants of the same kind; from its being unknown to the earlier botanic writers, or, at most, known only in the view of an exotic; and from its being now to be met with wild, only in the one place mentioned, it is most probable, that what is there found was the produce of seed conveyed originally thither by some accident; and which has since propagated itself, and spread spontaneously, as it easily might, from its perennial nature and extreme hardiness. It is frequently cultivated in gardens, where there are collections of vegetables: but, for the most part, rather as a curious than an esculent plant. Though cer-

tainly, the turnip, or knob, is at least as wholesome as either any turnep or cabbage, and is much liked by some; and the leaves are also thought good by others; but, in general, both are said to be strong, and seldom admitted to the table with us. This plant, however, affords sprouts, which, after they have undergone the action of a strong frost, are exceeding good; and may consequently be had at that time when all others fail. The lying in very small room, proportionably to the quantity of solid substance, and the keeping good much longer than any other sort of vegetable of a similar nature, are qualities, moreover, which fit this plant in a most peculiar manner for the use of seamen, as is ingeniously remarked by Mr. Baker, in his report to the Dublin Society. See the article TURNIP.

It appears from Gerard, that there were, in his time, two kinds of this plant; one which he calls *caulorapum rotundum*, or round rape-cole; and the other *caulorapum longum*, or long rape-cole. The difference of these two kinds consisted only in the form of the knob or turnip, as is expressed by the names themselves; and in the long kind's shooting forth smooth indented leaves from the turnip part, which leaves the round kind wanted. I have here sent you a sketch of these two kinds, according to the prints Gerard has exhibited of them; and they may serve also to give some idea of the general figure of the plant, to those who have never met with it.

I have not however seen in any garden, nor find any traces in the late writers, of more than one kind of this plant: so that if the round and long kinds, mentioned in this manner by Gerard, were really different species, the long is now lost. But it seems more probable, that this was only a degeneracy of the plant, by means of the farina of the common kinds of cabbage; as the deviation from the round knob towards the plain stalk, and the breaking out of the leaves from it seem to indicate.

If there really were two original kinds, or this difference arose from a permanent seminal variation, it would merit attention under the present circumstances to recover them; since it frequently happens in correspondent cases, that where there are two allied species, the one has qualities which fit it to a particular purpose in a very superior degree to the other. This plant was rare in Gerard's time in our country; as he mentions his having the seed from Spain: and indeed it was so little known, that he says it is to be sown and set as cucumbers and melons; and that it was then accounted a dainty meat. It did not however make its way to the table in common, or even as a curiosity in gardens, much more at that time than since. For Parkinson, who wrote after Gerard, and enumerates many more species of cabbage than his predecessor, does not take the least notice of it. Tournefort, and most of the later writers, mention this plant under various names; but they do little more with regard to it, than give the name and description. Miller, in his Gardener's Dictionary, says, this kind of cabbage "never varies, for I have cultivated it many years, and have not found it to alter. It grows naturally on the sea-side, near Dover. It hath a perennial branching stalk, in which it differs from all other species. I have cultivated it these three or four years, and have eaten the young shoots, after they have been much frozen, when they were very sweet and good; but at other times they are very strong and stringy. In very severe winters, where the other sorts are destroyed, this is a very necessary plant, for the most severe frosts do not injure it."

'Till lately we see, therefore, this plant was only considered, either as a kind of curiosity in botanic or other gardens, where there were collections of different kinds of plants, or as an esculent herb: but in this latter view, it seems not to have acquired any great reputation, as it is so seldom, even notwithstanding Miller's recommendation, met with on the table here; though I am well informed, that in some of the factories in the East-Indies, it has been cultivated from European seed, and is much liked.

The first public notice I find taken of this plant, in the present view of cultivating it for feeding cattle, is in a pamphlet published by the late Mr. North, gardener, near Lambeth, who speaks of it under the article of cabbage; of which he says, "There are four species that may be cultivated to great advantage for cattle; to wit, the white cabbage, the lardy-curbed Savoy cabbage, the turnip-cabbage, and the green curled cabbage." When he comes to treat particularly of the turnip-cabbage, he thus expresses himself: "The turnip-cabbage is one of the hardestiest

diest roots that grow ; and I dare affirm, might be propagated to great advantage for feeding sheep, &c. For in the most severe winter that I can remember, when cabbages, favoys, turneps, &c. have all been demolished by the extremity of the weather, the turnep-cabbages have not been hurt. The turnep part grows all above ground, which is crowned with many large smooth leaves, like those of the red cabbage, but which grow open like the tops of turneps. They are a very solid juicy root, and do not grow spongy when they are old as turneps do. The tops may be cut off, and given to sheep, &c. in the spring, and the roots laid by in an out-house to feed them in April and May, when no other roots can be had. Sheep are so fond of these roots, that they will leave the best turneps for them. When they are given to sheep, they should be cut to pieces ; but they will eat them fast enough, tops and bottoms, as they are growing in the fields. After Michaelmas, when turnep-cabbages have their full growth, they will weigh from four to eight pounds a piece."

It may be proper here to caution against a misconception, from the inaccuracy of an expression of Mr. North, in calling the turnep-like part of this plant, a root ; for it is no more than an enlargement of the stalk in that part ; being, when the plants are large, several inches above the ground. It is proper to observe likewise, that Mr. North has under-rated the weight of these plants ; it appearing, by Mr. Baker's account, that some weigh fourteen or fifteen pounds. This is the first notice I find in any published work, of this plant's being considered as proper for feeding cattle : but it appears in the minutes of the Society's books, that some little time before the publication of this pamphlet, on the enquiry set on foot by the late Mr. Wych, concerning a proper food for cattle in hard winters, this plant, together with the Chinese or white vetch, and the Siberian medicago, were proposed to the Committee of Agriculture for their consideration, by a gentleman well known to that Society ; and this plant was particularly recommended for its hardiness in the ground, its quality of not rotting, though long kept, its nutritive property, and the fondness which cattle shew for it when offered to them as food.

Mr. Baker, nevertheless, whose report on this subject of the Dublin Society the reader will find under the article TURNEP, must have the honour of being the first who really introduced this plant into use, as an article of husbandry. For it was on the authority of his judicious experiments, related in that report, the same gentleman, who formerly recommended the turnep-cabbage, as abovemented, to the London Society, induced them last year to offer a premium for its culture : and there is no one object of a similar nature, hitherto taken into consideration, either by this Society, or that of Dublin, which bids fairer for being of great public utility : as this plant seems to answer all the ends of what was sought for, with so much pains and attention, in the research set on foot by Mr. Wych, after a proper winter pabulum (as it was called by him for cattle in scarce winters.

The turnep-cabbage may be cultivated in the manner of other cabbages ; of which the particulars may be seen under the article CABBAGE. But the success Mr. Baker had with his method, particularly in relation to the magnitude of the turnep, which seems to go far beyond Mr. North's notion, recommends strongly the trial of that manner ; except that, as he properly remarks, where the plants are raised in the spring, the seed should be sown in the very beginning of March ; the plantings, transplanted to a proper close bed, as soon as they are sufficiently strong to bear it ; and the final transplantation of them out into the field at the distances in which they are to grow, should not be deferred later than the beginning of June. This would both give more time for the plants to become large before winter, and a better chance to avoid a total want of rain, after transplanting ; the only accident, except the destruction by caterpillars, or other insects, to which this kind of crop is subject ; as the plants bid defiance, after they have firmly taken root, to all inclemencies of weather, either with respect to cold, wet, or drought.

It may be inferred from the above particulars, which, as we see, stand on unquestionable authority, that, considered as an article of husbandry, this plant must be a very valuable acquisition ; as it is of easy culture, and as little

subject to fail by accidents, as any crop whatever : as the produce with respect to quantity, is likely to prove, under favourable circumstances, thirty-five or thirty-six tons per acre, as appears from Mr. Baker's account : as its produce is greatly preferable either to turneps or other cabbages ; being much more nutritious, and less watery and cold ; a fault in the common turneps : as it may be depended on in the most rigorous and severe season, when every thing else but dry fodder fails, and may be taken from the place of growth, in case of exigence, whenever the ground is not covered with a very deep snow : and as it is much liked by neat cattle, sheep, deer, and hogs ; agrees perfectly well with all of them ; and fattens them in the most profitable manner. This is certainly very sufficient ground of recommendation, as an object of premium, to the London Society ; and it is hoped will be so, as a subject of experiment and trial to those gentlemen, or more liberal kind of farmers, who attempt improvements in husbandry.

I have thus endeavoured to give all the light I can into the nature of this plant, considered as an article of husbandry : but before I conclude, I must beg leave to subjoin a few words respecting it in another view, of such importance to a particular set of men, whose health and safety manifold reasons recommend to the care of the public, as makes it merit a very serious consideration. What I allude to is, the intimation given by Mr. Baker, of the probability that this plant might be rendered extremely serviceable to seamen in long voyages. As there can be no doubt of the just foundation of this opinion, it ought to be kept in sight as much as possible, till the matter be realized in practice. The putrid scurvy, arising from the eating salt provisions, is the great bane of a sea-faring life. The numbers disabled or carried off by it, particularly in time of war, are almost incredible ; and, if we considered the public value of lives so lost, both with respect to the natural power and expence, policy, as well as humanity, bids us listen to every feasible proposal for mitigating this evil. The use of vegetables in the diet along with the salt-beef or pork, is well known to be one of the most effectual means of prevention of this disease : and indeed, it has been so well understood, the great quantities of cabbages, &c. have been sent off to the fleets cruising in the bay, or elsewhere within reach, to the great relief and refreshment of the men. But this species of cabbage, abounding more in the saccharine juice than the other kinds, would be a more efficacious preventative or palliative of the scurvy ; and the solid compact texture of these turneps, which makes a considerable weight, lye in a small compass, together with their repugnance to that putrefaction, to which other turneps, cabbages, &c. are quickly disposed, renders it practicable to keep them on shipboard, in any climate, for many months ; provided they be preserved from the access of any extraordinary degree of moisture.

If this plant should be, therefore, generally cultivated the field-way, and consequently produced at a very cheap rate, as Mr. Baker has shewn, that betwixt thirty and forty tons may be obtained by an easy method of culture in one year, from one acre of ground, they might be purchased at a much cheaper rate than any other article of provision at present in use for the victualling of ships.

This seems to be an object very well worth the consideration of the India company ; as it might be a means of preventing that delay and ill success of some voyages, which arise from the sickness of the men ; and it is attended with no difficulty, but what regard the stowage. For the plant being already cultivated in some of the factories in the East-Indies, where it succeeds as well as here, and consequently might in all the others, as no climate or season appears injurious to its growth, it might be procured at a proportionably cheap rate, as well for the supply of the homeward or outward bound ships : and indeed, considering the nature and state of the provisions on board ships returning from India, it would undoubtedly be peculiarly beneficial in that case. *Museum Rusticum*, vol. VI. p. 46.

TUPETH, a species of the convolvulus or bindweed. See the article BINDWEED.

TWIFALLOWING, or TWYFALLOWING, ploughing the ground a second time, which is generally done in June.

V.

VALÉ, low ground ; a valley.

VAN, an instrument to winnow corn. *See the article* THRESHING.

VASCULIFEROUS PLANTS, such whose seeds are contained in vessels divided in the cells.

VAT, or FAT, a vessel for holding wine, ale, beer, cyder, &c. in the time of their preparation.

UDDER, that part of a cow, mare, ewe, &c. where the milk is prepared, answering to the breasts in women.

VEGETABLE, a term applied to all plants, considered as capable of growth, *i. e.* all natural bodies which have parts organically formed for generation and accretion, but not sensation.

Vegetables, according to the analyses made of them by chemistry, are distinguishable into two grand tribes, the acid and the alkaline ; the first affording a volatile acid, and the second a volatile alkali, upon a dry distillation : thus guaiacum, cedar, box, cinnamon, cloves, sorrel, mint, balm, &c. afford an acid ; but garlic, onions, horseradish, scurvy-grass, mustard, &c. afford an alkali, which, rectified, is hardly distinguishable from that of animal substances, so as nearly to resemble the spirit and salt of hartshorn.

VEGETATION, the act whereby plants receive their nourishment and growths ; of which, three principal functions are understood, *viz.* nutrition, increase, and generation.

From Scripture we learn, that the earth has been endued, from the beginning, with a certain seminal virtue to produce plants ; which virtue, proceeding from God, was not confined to the first production of things, but extends likewise to all future consequences of times ; and this faculty which the earth has of producing plants, is from this commandment of the Almighty : " Let the earth bring forth grass, the herb yielding seed, and the fruit-tree yielding fruit after his kind, whose seed is in itself upon the earth ; and it was so." Gen. i. 11.

Philosophers ask, what can be that virtue the earth is said to be endued with, if it be only the inherent quality whereby it produces, naturally, all sorts of plants, without the concurrence of seed ? or if a seminal virtue (or seed) must be administered to it ? Some follow the first opinion, for this reason, that earth dug up from a great depth and put into pots, after a set time or season, produces several sorts of plants of itself without seed ; but though this opinion be approved of by many, it has not, however, the least appearance of probability on its side ; for who (considering with attention the progress of nature, sees the marvellous mechanism of the organs of plants, the whole texture of their internal as well as external parts) could be persuaded to attribute it to a heavy and indigested mass of clay or earth : therefore, it is more rational to say, that plants have their origin from seeds, which being taken from the first plants, have propagated their species by the Creator's will, as far as our times, and will continue to do so (particularly where they are natives) to the end of the world.

The sun, rain, the exhalations of the earth, and the rest of the exterior causes, are capable to excite a certain motion or fermentation in the bosom of the earth ; but unless there be a seed which contains already the conformation of the plant, whose parts are unfolded by that fermentation, never such fermentation or motion can give origin to the plants ; therefore, we have great reason to think, that all plants have their origin from seeds, actually or potentially, since the first rudiments of a plant can be discovered no where else, nor by the naked eye, nor even by the help of a microscope ; so that the seed contains not only the coarser matter of the plant, with its organical parts, which have the ratio of a body, but likewise a certain spirit, that is, an active and vegetative substance, which may

be called the soul of the plant. Although, in some manner, it may be said to sleep in the grain or seed, yet when excited to motion by the heat of the sun, the warmth of the earth, and with rain impregnated with particles of volatile salts, it then unfolds its parts, and pushes the embryo plant forward.

A sprig or cutting must contain in it this seminal property, for being set at a proper season, it produces a tree with all its generative parts ; which it would not do were it not endued with some seminal virtues.

This generative or seminal faculty, is a power of the vegetative soul of a plant, by which it lives, and produces its likeness for the preservation of the species : but this faculty is not discernable from the seed itself, nor from the spirit contained therein, for as the seed is said to be a part of some substance, designed for the production of another substance of the same species, it is not absolutely necessary to distinguish that prolific virtue from the seed itself, nor from the spirit contained in it ; for after the seed is sown and softened by the warmth and humidity of the earth, its germ (wherein the plant is contained, as in an epitome) is unfolded by a gentle fermentation, and arises into a plant.

That the heat of the sun, and the temperate warmth and humidity of the earth, are the first principles of vegetation, appears from the sterility or fertility of the soil in those climates where these two principal agents act, or do not act in concert ; since, in the most northern countries, where the humidity of the soil is excessive, and its natural warmth is too much concentrated, the fermentation of the seed being made with too much precipitation, and without that gradation necessary for the easy and most perfect expansion of the different parts of the plant, thereby they are frustrated of that strength they should have before they come out of the matrix it has been formed in, to resist the injuries of the air and the inconstancies of the seasons, it perishes almost as soon as it appears on the surface of the earth ; for although the earth has in some measure, though very imperfectly, acted its part (as it cannot alone, and without the assistance of the sun, carry the plant to its last perfection) that tender parent of nature, by the obliquity of its situation, being reduced to the incapacity of darting its rays as favourably and abundantly in those climates as he does in others more happily situated, cannot either help the mother earth in her pregnancy, nor rectify what she has left imperfect in her productions, which therefore die almost as soon as nature itself is apprised of their existence.

Likewise in those other climates situated quite different from these, where the sun by being too profuse of its influences, penetrates the inmost parts of the womb of the earth, and by its too violent and too often repeated acts, and exhaling its salts, and evaporating its radical humidity, causes an excessive dilation of its pores, a disunion, and but too often an entire laceration of its generative parts, so as to render them quite sterile or barren, and therefore incapable to contribute to that fermentation absolutely necessary for the production of plants.

On the contrary, in those happy climates where the parts of the earth are so situated in respect to the sun as to be under his most favourable aspect, and exposed to none but his most benign influences, it almost always continues in its natural flourishing state, being seldom visited by the most powerful and penetrating beams of the sun, but at those regular and periodical times appointed by nature for its pregnancy, when they are necessary to excite her fecundity, or to nourish and cherish her productions when once brought forth.

Suppose our seed to have been sown in this last soil, and situation, the first things which present themselves to the imagination are the sun and earth concerting together, the

one by its heat, and the other by her moisture, how to rid the embryo of that hard tough substance it is enwrapped in, and which is the greatest obstacle to the bursting forth of its parts; therefore the earth, which is the first agent in this case, and which is to do the office of incubation, makes use first of its natural moisture to soften the outer rind or husk, by having it percolated through the pores or pipes of the said husk, whereby they are so opened and dilated as to facilitate the introduction of the different salts appointed to operate on the whole substance of the seed, by unfolding the different parts it contains, and disposing them severally towards assuming their respective forms.

It cannot be imagined that the earth acts alone in this first operation, that it could direct itself to action without the concurrence of the sun, which on this occasion excites, by a gentle warmth, the different salts the moisture of the earth is impregnated with, that they may be capable to conquer the stubbornness of the husk, by forcing themselves into its almost imperceptible pores, conquering all the obstacles and erasing all the obstructions which the several substances may meet with; by this means a free passage being opened for such a quantity of the moisture as is necessary to make a due separation of the husk from the more essential part of the seed, and salts employed in that operation being volatilized or already fixed on that essential part, leave the husk filled with nothing else but the lymph, which groweth turgid, and being deprived of the nourishment it received when united to the substance of the seed, begins to tend towards its destruction.

The following procedure in the vegetation of plants is exemplified by Malpighi in a grain of wheat; the first day the grain is sown, it grows a little turgid, and the secundine or husk, gapes a little in several places, and the body of the plant being continued by the umbilical vessel to a conglobated leaf (which is called the pulp or flesh of the seed, and is what constitutes the flour) swells, by which means not only the germ or sprout (which is to be the future stem) opens and increases, but the roots begin to bunch out, whence the placenta, or seed-leaf, becoming loose, gapes. The second day the secundine or husk being broken through, the stem or top of the future straw appears on the outside thereof, and grows upwards by degrees; in the mean time, the seed-leaf guarding the roots becomes turgid with its vesiculæ, and puts forth a white down, and the leaf being pulled away, you may see the roots of the plant bare, the future bud, leaves, and the rest of the stalk lying still hid. Between the roots and ascending stem, the trunk of the plant is knit by the navel-knot to the flower-leaf, which is very moist, though it still retains its white colour and its natural taste. The third day the pulp of the conglobated or round leaf becomes turgid with the juice it has received from the earth fermenting with its own; thus the plant increases in bigness, and in its bud or stem becomes taller, and from whitish becomes greenish, the lateral roots also break forth greenish and pyramidal from the gaping sheaf which adheres closely to the plant, and the lower roots grow longer and hairy, with many fibres growing out of the same; indeed there are hairy fibres hanging on all the roots, except on the tops, and these fibres are seen to wind about the saline particles of the soil, little lumps of earth, &c. like ivy, whence they grow curled about the latent roots, and then break out into two other little ones. The fourth day the stem mounting upwards, makes a right angle with the seminal leaf, the last roots put forth more, and the other three growing larger are clothed with more hairs, which straightly embrace the lumps of earth, and where they meet with any vacuity, unite into a kind of net-work; the conglobate or flower-leaf is now softer, and when bruised yields a white sweetish juice, like barley cream; by stripping it off, the root and stem of the plant are plainly seen, with the intermediate navel-knot, whose outer part is solid like a bark, and in the inner more soft and medullary. The fifth day the stalk still rising puts forth a permanent or stable leaf, which is green and folded, the roots grow longer, and there appears a new tumour of a future root, the outer sheath is loosened, and the seed-leaf begins to fade. The sixth day the stable leaf being loosened, the plant mounts upwards, the sheaf still cleaving round it like a bark; the seed-leaf is now seen sinuous or wrinkled and faded, and this being freed or cut from the secundine, the flesh, or pericarpium is found of a different texture, the outer part, whereby the outside of the seed or grain is heaped up, being more solid, but the inside vascular and full of humour, especially that part next

the navel-knot. All the leaves being pulled off, the roots torn, and the flower-leaf removed, the trunk appears; wherein, not far from the roots, the navel-knot bunches out, which is solid and hard to cut; above there is a mark of the sheath-leaf, which was pulled, and underneath, as in an armpit, the germ is often hid; the hind part of the plant shews the breaking forth of the roots likewise, with the faded placenta, &c. After the eleventh day, the seed-leaf as yet sticking to the plant, is crumpled and almost corrupted; within it is hollow, and about the secundine the mucus and white substance of the seed being continued to the navel-knot, forms a cavity, all the roots becoming longer, put forth new branches out of their sides, the second leaf withers, and its vesicles are emptied; the internodes, or spaces between the knots, grow longer; new germs appear, and the middle root grows several inches longer. After a month, the roots and stalk being grown much longer, new buds break out at the first knot, and little turnours bunch out, which at length break out into roots.

Thus, according to Malpighi, in this short space of time, the plant passes through all these various changes and mutations, which, though his observations may be real as here represented, yet it does not happen with such celerity in all sorts of plants, though in some kinds all these variations may come to pass in a shorter time.

The plant carried thus far, it still wants food for the future preservation of its vegetative life, which being deprived of such nutriment, it cannot exist; of which naturalists are so sensible, that their common opinion is, that water is the great vegetable food, which they endeavour to confirm by repeated experiments, especially by that made on a sprig of baum, mint, &c. which being set in a phial of pure water, without any mixture of earth, grow and put forth roots, leaves, and branches; without considering, that those sorts of plants being of a short duration, the juices which they have received from their mother earth in their first formation circulating through their vessels, being continually recruited by the salts the water they are set in is impregnated with, together with those they receive continually from the ambient atmosphere, are more than sufficient for the support of their short life in the water, which subsists no longer than that the water continues to supply them with salts, of which when once exhausted, it grows viscous, obstructs the pores of the vessels, and hinders thereby the admission of salts even from the atmosphere, imbecillitate by degrees the functions of the vegetative soul, which being forced for some time to feed on its own substance, becomes at last enervated and impotent, whereby the plant withers and dies for want of food, unless the water is changed before it comes to the last period, which appears at its growing offensive to the smell; even that precaution becomes useless at last for the greatest part.

Those salts, the water is impregnated with, being heterogeneous to those which enter into the composition of the juices, which circulate through the vessels of the plant, have soon, by disordering the whole frame of that mechanism, procured the extinction of the plant.

The great quantity of oleaginous particles those sorts of plants are composed of, which keep their pores extremely dilated for the admission of salts and other nutritive particles, contribute much towards the production of this phenomenon; but in plants of a closer texture, whose pores are so exiguous as not to be forced, but by the impetuosity of salts exalted and volatilized, best by the warmth of the earth and the heat of the sun, this experiment is of no effect; therefore, water cannot be simply considered as the great vegetable food, although it has a very considerable share in the nutriment of plants: but were it water alone, to which vegetables owe their increase, there would be no need of manures nor changing the kinds. The rain falls in all places upon the most barren land, as well as on the most fertile; nor could there be any reason why the same field should yield a large crop of wheat one year and not the next, since rain showers down nearly alike on the earth.

VILLING, ploughing, or cutting up the turf, or upper surface of the ground in order to its being burnt. See the article **BURN-BAKING**.

VENTILATOR, a machine by which the noxious air of any close place (as an hospital, jail, ship, chamber, granary, &c.) may be changed for fresh air.

The noxious qualities of bad air have been long known, though not sufficiently attended to in practice; but it is to be hoped, that the indefatigable pains taken by Dr. Hales, to see

set the mischiefs arising from foul air in a just light, and the remedy he has proposed by the use of his ventilators, will at length prevail over that unaccountable sloth or obstinacy, which, where particular interests are not concerned, seems to possess the generality of mankind, and which rarely allows them to give due attention to any new discovery.

The ventilators invented by that ingenious gentleman consist of a square box, A B C D (plate XXVI. fig. 7.) about ten feet long, five wide, and two deep; in the middle of which is placed a broad partition, or midriff, made to move up and down, from A to C, on hinges at the end E, by means of an iron rod Z R, fixed to the midriff at Z.

Another box, of the same size with the former, having a like midriff, bar, &c. is placed near the former (fig. 8.) with its rod, R Z. Both these rods are fixed to a lever F G movable on the center O; so that by the alternate rising and depressing of the lever F G, the midriffs are also raised and depressed alternately, by which means these double bellows are at the same time both drawing and pouring out the air.

That the midriffs may be rendered lighter, they may be made of four bars, lengthwise, and as many places across them, each about three inches broad, and an inch thick, the vacant spaces being filled up with thin pannels of fir board.

In order to make the midriffs move with greater ease, and without touching the sides of the boxes, there is an iron regulator N L (fig. 7.) fixed upright to the end A C of the box. As very little air will escape if the edges of the midriff be within one twentieth part of an inch from the sides of the box, there is no necessity for leathern sides as in common bellows. The end A C of the box must be somewhat circular, that it may be the better adapted to the rising and falling of the midriff; and at the other end of the midriff a slip of leather may be nailed over the hinges.

To the ventilators above described, eight valves are adapted for the air to pass through; these valves are placed at the hinge end I Q, fig. 8. numbered 1, 2, 3, 4, &c. The valve 1 opens inward to admit the air to enter, when the midriff is depressed at the other end, by means of the lever F G; and at the same time the valve 3, in the lower ventilator, is shut by the compressed air, which passes out at the valve 4: but when that midriff is raised, the valve 1 shuts, and the air passes out at the valve 2. The same is to be observed of the valves 5, 6, 7, 8, of the other box; so that when, by the motion of the lever F G, the midriffs are alternately rising and falling, then two of the ventilators are constantly drawing in the air, and two of them at the same time are blowing it out at their proper valves, the air entering at the valves 1, 3, 6, 8, and passing at the valves, 2, 4, 5, 7. To the ventilators, before the valves, is fixed a hook Q Q M M (fig. 9.) as a common receptacle for all the air that comes out of these valves, which air is conveyed away through the trunk P, passing through the wall of a building, &c.

It would be foreign to the intention of this work to point out the various uses of these machines in extracting foul air out of ships, hospitals, &c. but we must not omit the following

Experiments on the preservation of corn by ventilation.

M. Duhamel caused a case, or little granary of preservation, to be made of oak planks two inches thick, forming a cube of five feet every way. At six inches from the bottom was a flooring, or second bottom, of lattice work, placed upon joists five inches thick, and covered with a strong canvas. This small granary was filled quite full of good wheat, of which it contained 94 cubic feet, weighing 5040 pounds. It was covered with good oak planks, so closely joined, that neither rats, mice, or even the smallest insects could get in; leaving only some ventholes, with trap doors, or covers, fitted very exactly to them, as mentioned before.

This corn laid up without having been dried at all by fire, was not ventilated more than six days in a year, which was sufficient to keep it so well that the best judges allow it to be as good as could be. Even when the bellows had not been worked for several months, the corn was still allowed, by good judges, to look and smell perfectly well: but they objected that it did not handle well, that is, that there was some little dampness in it. The bellows were worked for half a day, and this objection was entirely removed.

This wheat was old, and had been as well dried as any

corn generally is in a common granary: therefore it being still damp, at the end of a considerable time, shews the necessity of taking away the superfluous moisture, and of reducing our corn to the same degree of dryness, as that of the hottest countries, in order to preserve it in great bodies.

Experiments on ninety-four cubic feet of wheat.

In May, 1743, ninety-four cubic feet of wheat were put into one of the little granaries before-mentioned. It was of the harvest of 1742, of an excellent quality, perfectly clean, and so dry, that a small parcel of it which was put, for a trial, into a stove heated to fifty degrees of M. de Reaumur's thermometer (123 of Fahrenheit's) lost but one sixteenth of its weight. This wheat was well cleansed from dust, and deposited in the granary, without being dried by any fire.

During the first three months, it was ventilated for eight hours once a fortnight: during the rest of the year 1743, and all 1744, it was ventilated once a month: all the year 1745, and part of the year 1746 it was ventilated half a day once a month; and after that, but once in two or three months.

In June 1750, the granary was emptied and the wheat looked and smelt very well, but felt a little rough in the hand, because, not having been stirred for six years, the little hairs that are at the extremity of the grain, and the particles of the bran were roughed up: but after passing twice through the wind screen, that objection was entirely removed. See the article THRASHING.

This corn was eight years old, during seven of which it was preserved in one of M. Duhamel's small granaries, without any sensible diminution, and without any damage from vermin or insects: we cannot say absolutely without any expence, because a man was employed from time to time to ventilate it. But this was a very trifling charge, and may be reduced almost to nothing, by working the bellows with swifts like those of a mill.

Experiments on seventy-five cubic feet of new wheat, extremely moist, ground, and which had already contracted a bad smell.

The harvest of 1745 was very rainy: almost all the wheat of that year was grown in the ear; the sheaves were extremely wet when they were housed; the grains adhered so closely to their husks, that they were greatly bruised by the flail; and if they were left but a very little while upon the barn-floor, before they were cleansed, they heated, and contracted a smell like that of pigeon's dung: in short, they were so very moist, that they lost an eighth part of their weight when dried in a stove heated to fifty degrees of M. de Reaumur's (one hundred and twenty-three of Fahrenheit's) thermometer; and when laid up in the common granaries, in the usual way, they were always in a state of fermentation, though but a foot thick, and turned every fourth or fifth day.

Seventy-five cubic feet of this grown wheat, which smelt very ill, and was so moist as to wet the floor of the granary where it laid but a few days, were put in this condition, and without being dried by fire, into one of M. Duhamel's little granaries, with small hopes of success.

As this corn was very hot when put into the granary, it was ventilated three or four times the first week, and once a week during December and January: and as it had then lost great part of its bad smell, it was ventilated but once a fortnight from that time till June. Then perceiving, by thrusting his hand into the top of the heap, that it heated, and concluding that it was going to be entirely corrupted, M. Duhamel ordered the granary to be emptied: but after the depth of about a foot had been taken from the top, he was greatly surprised to find the rest cool, with very little bad smell, and drier than that which was preserved in the common granaries.

The reason why the top of this corn was the worst, was, undoubtedly, that the moist vapours were always forced upwards in ventilation. It therefore might, perhaps, have kept very well, if, instead of emptying the granary, it had been ventilated oftener: for this would, probably, have dried away the remaining moisture, even at the top, as the following experiment will shew. But however that might have been, this teaches us one important thing, which is, that the top of the heap is most subject to heat in this sort of granary: so that if the grain taken out of the vent-holes

is in good condition, it may be concluded that the rest is still better.

Experiment on five hundred and fifty-five cubic feet of wheat very damp, mixed with smut, and which had contracted a bad smell.

The wheat of the year 1750 grew in almost continual wet; the harvest was very rainy; and the same weather continuing all the year 1751, no pains that could be taken to turn the corn laid up in the common way, could dry it, or prevent its heating and contracting a bad smell. The wheat of this crop was likewise mixed with a considerable quantity of blighted and smutty grains, which always contain a great deal of moisture, doubly difficult to be exhaled from them, and which soon makes them contract a bad smell, which they speedily communicate to the sound corn.

Five hundred and fifty-five cubic feet of this wheat were deposited in one of M. Duhamel's granaries of preservation, after being cleansed with such perfect care, that scarce any mark remained either of blight or smut among it; though these faulty grains amounted to near a sixth part of the crop. But there still remained a fine dust, or powder, occasioned by the moisture, so closely adherent to the corn, that it could not be taken off by any means.

This wheat was laid four and a half or five feet thick in one of these granaries, the bellows of which were worked by a wind-mill; and as there was no want of wind during all the year 1751, and till the spring of 1752, the corn was often ventilated, without trouble or expence; by which means it was not only well dried, but also cleared of great part of its bad smell. It was indeed, when taken out of the granary, very full of dust, which had fallen off the grains as their moisture was exhaled: but this was then easily separated by proper screening; and the wheat proved so good, that the bakers bought it at the highest market price.

This experiment proves, that even very moist corn which has a great disposition to ferment, may be preserved by ventilation only: and as to the smutty grains with which this was mixed, the reverend Dr. Hales, after rightly observing that kiln-drying is apt to make wheat grind unkindly, proposes the following method of drying smutty corn, after it has been washed; cold air not hurting it, as kiln-drying is found to do. "That I might be well assured, says that friend to all mankind, of the good effect of thus drying smutty corn, having procured a quantity of very smutty wheat, which weighed seven pounds and fifteen ounces, on the 26th of May, at five in the morning, it was washed clean in four several waters, which was done in a few minutes, and was then laid to drain in an oat-sieve, till half an hour after five; when it had increased in weight, by wetting, ten ounces, besides the moisture that was equal to the weight of the smutt-balls and smut that was washed from the wheat. It wasted but two ounces and an half, by the first two hours ventilating; two ounces and five drachms in the second two hours, viz. from eight to ten; in the next six hours, viz. from ten to four in the afternoon, it wasted at the rate of four ounces every two hours; from four to six, two ounces and an half, and from six to eight, one ounce and an half: in all, about twenty ounces; some allowance being made for what corn was wasted by handling and biting some of it from time to time. It was ventilated in these fourteen hours with about forty thousand gallons of air, which passed upwards through it, and made it sufficiently hard and dry, so as to be fit for grinding: it was well coloured, and handled well; and, from flinking, as smutty wheat does, it became much sweeter. The visible dewy moisture was blown off in three hours; but it continued damp and cold to the feeling till two o'clock, when some little dust began to fly off it.

"And whereas it wasted off much less moisture during the first four hours ventilation, when it ought to have wasted the most, on account of its being then wettest, this was owing to the foggy haziness of the morning: which as it went off, and broke out into fine warm sunshine, towards ten o'clock, so the air being thereby become dry, it imbibed moisture more strongly from the corn; and that this was the true cause of the difference, is farther confirmed by a like experiment which I had before made on a gallon of wheat, April the first, there being then a very dry north-east wind.

"It will be advisable to begin to ventilate corn as soon as

possible after washing, that the moisture may have the less time to soak in: for the less moisture soaks in, so much the sooner the corn will dry.

"If the moisture is so easily carried off from wet wheat, by ventilation, this method will doubtless much improve what is called cold wheat, viz. such as is grown, and has been housed in a cold wet season; and will therefore soon carry off the moist vapours which arise from corn, and which cause it to heat and grow musty.

Other experiments on the preservation of corn by ventilation.

The prior of the royal abbey of St. Stephen in Caen, filled a granary of preservation twelve feet wide, thirteen feet long, and six feet deep, which forms a parallelepiped of nine hundred and thirty-six cubic feet, constructed according to M. Duhamel's directions, with wheat that had been kept all the winter in a common granary. It was cooled from time to time by two bellows, which two men worked by means of a lever; and though the place where this granary of preservation stood, was neither so dry nor so airy as might have been wished, the corn kept perfectly well in it.

In the beginning of September, 1754, M. Vaudusfel filled one of M. Duhamel's granaries of preservation, seven feet square and six feet deep, with good wheat, undried. It heated a little at the end of eight days; but two men, with a small double ventilator, cooled it in two hours time. It began to heat again about week after, when he repeated the same operation, which cooled it presently. By the 20th of October it was quite cool, though it had not then been ventilated for fifteen days; and according to a letter of his writing to M. Duhamel, dated the 14th of October, 1756, it still continued in the same good condition. Corn of the year 1754 and 1755, not dried, but only ventilated, had likewise kept with him as well as could be wished.

VERJUICE, a liquor obtained from grapes or apples too acid for wine or cider. It is generally made in England from the juice of the crab, or wild apple.

VERMIN, a collective name including all kinds of small animals, that are troublesome to men, beast, corn, fruits, &c.

Mr. Young in his *Annals of Agriculture*, vol. XIII. says, "My present subject shall be confined to those destructive vermin, rats and mice, which I have often considered as of greater consequence, and much more prejudicial than the generality of farmers are aware of. In proof of this opinion, it will probably be admitted, that a single rat eats, and destroys, a quart of corn per week; I think this much under the real damage; which, notwithstanding it amounts per year to the large quantity of twenty quarters, two bushels, and four gallons, for the maintenance of one hundred rats; and I believe there are very few capital farmers but have many more than that quantity of rats belonging to them.

"The damage sustained by farmers from mice, is probably nearly equal to that of rats. But an experiment may easily be made, and a more just idea of the expences attending those destructive vermin, ascertained, by confining a single rat and mouse, and feeding them with corn. Such an experiment would be of great public utility; as it would certainly induce farmers to be much more vigilant than they are, in the destruction of those vermin, if they formed proper ideas of the losses sustained by them; which, on the most moderate calculation, will be found to amount to the sum of forty pounds per annum to every capital farmer, and half that sum to a small farmer. So that the total value of the corn destroyed, amounts to such a sum of money as to be of great consequence to the nation."

Mr. Marshall, in his *Rural Economy of the Midland Counties* gives the following striking instance of the industry and mischievousness of mice, which occurred in an intended plantation: "This field was in autumn sown with wheat: the nook, an oat stubble, and has not borne wheat for many years: yet, on digging it, a large board of wheat was found, some four or five yards from the fence of the wheat field, and between which and the nook is a very high bank and deep ditch across which every grain must have been carried, and perhaps, one at a journey!

"The workman thinks the board consisted of near half a gallon of wheat; if of one quart, it corroborates, strongly, the idea of mice being more mischievous than moles, to the farmer."

In his *Rural Economy of Yorkshire*, Mr. Marshall observes

serves that, "The different species of vermin which have more particularly excited notice in that district are mice, rats, and dogs.

"The mouse rivals the sparrow in mischievousness toward the farmer. In the field, the barn, and the dairy, mice are equally troublesome and destructive. In the field, the quantity of destruction is not easily to be ascertained; but it is probably much greater than the unobservant are aware of. At seed time and at harvest they not only feed freely upon corn, but fill their granaries with it, as a resource in less plentiful seasons. Much care is bestowed on the destruction of moles; and it might be worth while to endeavour to lessen the number of field-mice, which, I am of opinion, are in their nature more injurious to the farmer than moles are.

"In the rick-yard, the barn, the dwelling-house, the garden, and the nursery-ground, their mischievousness is too obvious to be overlooked; and the utility of lessening their number in these places is too well known to require an enumeration of facts to prove it.

"The method of destroying mice is a subject not unworthy the attention of any man who is interested in rural affairs. If some art or some natural enemies were not employed in lessening their number, the entire supply of human food would not be sufficient to support them. Even in their present state, I have heard it intimated by a man whose observations are frequently just, that it is a disputable point whether the mouse or tithe-man is a greater enemy to the farmer. This idea, however, is more applicable in a grassland country, where corn, being less in quantity, is more liable to be destroyed by mice, than it is in an arable country, where the proportion of corn is greater; where the barn is oftener emptied; and where pillar stack-frames and pillar granaries are generally more in use.

"The barn and the stackyard are usually put under the care of the cat: to let a mouse-trap in a barn full of corn has perhaps been considered as a thing so unlikely to be effective, that it has seldom been tried: I have never met with an instance of it, excepting one in this district, in which its success has been extraordinary. A barn, which for many years had been remarkably infested with mice (notwithstanding a numerous guard of cats), has by a proper use of traps, been kept in a manner wholly free from them.

"It having been observed, during long experience, that these mischievous animals, uncontented with their destruction among the corn, attacked leather, grease, or other animal food, which happened to be left in the barn, traps were set in their runs and natural hiding-places, and baited with these substances. The success was every thing to be desired; for although a total extirpation has not taken place, an annual saving of some quarters of corn has been the consequence.

"Under an idea that it was a change of food which in the barn constituted the bait, the same principle was applied in the cheese-chamber, and with the same success. Here traps baited with corn were taken with avidity.

"In the garden it was observed, that much depended on the season of the year: therefore, here, natural hiding-places were sought for; and if convenient ones could not be found, artificial ones were made, in different parts of the garden, with logs, stones set hollow on-edge, boards, &c. In these hiding-places a variety of food is laid for several days, whenever mice become troublesome; and whatever food is preferred, with that traps are baited.

"By these means the entire premises have been kept in a manner wholly free from mice.

"While the number is great, almost any kind of trap may be used, provided it be properly baited: for taking a remaining artful few, a common shaped round steel trap, adapted to the size of the mouse, has been found to be the most effectual.

"The rat. This animal, equally artful and mischievous, is difficult to be taken by stratagem. In farm-homesteads situated near water, it is become almost impossible to keep down their numbers. In every country they are a growing evil, not only in rural economy, but in manufacture and in domestic life. Should their numbers continue to increase with the same rapidity they have done since the present breed got footing in the island, they will in no great length of time become a serious calamity. They are perhaps at present an object of national attention. A simple and certain method of destroying them would indisputably be a public

good of no small magnitude: and the nation's purse might be worse employed than in giving a reward for so desirable a discovery. Some years ago the French government offered a premium for a speedy and effectual method of destroying ants in one of their West-India Islands, and it had the desired effect.

"It is not through an antipathy to dogs that I class them here among vermin. I am led to it by facts, which, though not extraordinary, ought to be known.

"A few years ago the whole country was alarmed with the apprehension of canine madness. A considerable proportion of the dogs kept in it were actually mad. Much live stock and several persons were bitten. Fortunately, however, thus far none of these have been attacked by that horrid disorder; but they still live under the dreadful apprehension of their being every day liable to be seized by the greatest calamity human nature is liable to. "Since writing the above, no less than seven persons were, in one place, bitten by one dog! much live stock has also lately been bitten. In a neighbouring village, a calf which had been bitten, was seized with madness, and bit the person who had the care of it.

"What aggravates the first-mentioned instance is, that the person to whom the dog belonged knew that he had been bitten a few weeks before, yet suffered him to go loose, though urged to the contrary. Surely, on culprits like this, some severe penalty or some severe punishment ought to be inflictible. A general law against every man whose dog is suffered to stray in a state of madness, might have a good effect.

"If the practice of worming be really effectual in preventing the mischiefs of canine madness, a severe penalty is due from every owner of a dog, which has not undergone so salutary an operation.

"Several instances are related of persons to whom canine madness has proved fatal in a neighbourhood. And the instances of live stock which have suffered by the same means are innumerable.

"In the course of last winter (1786-7) the value of sheep worried by dogs, in one township alone, was calculated at near one hundred pounds. A small farmer, whose entire flock did not amount to more than forty, had thirteen sheep and eleven lambs worried in one night.

"These are not mentioned as singular facts: every district and almost every year afford instances of a similar nature; nor do I mention them to excite a momentary indignation in the breast of the reader; but in hopes that they may be instrumental in rousing the humanity of those who have it in their power to mitigate the danger, and lessen the quantity of evil.

"The quantity of human food which is annually wasted on useless dogs is itself an object of national attention. When the horrors of canine madness, the wanton torture of innocence, and the wanton destruction of one of the first necessities of life are added, the object becomes of the first concern to the nation. Who, even in these days of public economy, would think ten thousand pounds a-year ill bestowed in doing away such an accumulation of public evil? Yet who does not know that in doing it away ten times ten thousand a-year might be drawn into the national treasury! Let not the patriotism of princes, the ability of ministers, nor the wisdom of parliament, be spoken of in this country, until a national absurdity so glaringly obvious be removed.

"There are men whom friendship inclines to the cause of the dog. Far be it from me to damp the flame of friendship. But is not the lamb equally, at least, entitled to our friendship? Who sees the little innocent dragged to the slaughter without regret; and who, without remorse, could see one lie mangled in the field, half alive; half eaten up, by the merciless, yet befriended dog.

"But the operation of a tax upon dogs would probably be different to what is generally conceived. I am of opinion, that were such a tax to be laid on judiciously, the immediate destruction of dogs would be inconsiderable. The tie of affection must be weak which a shilling a year would dissolve: even the poor man's dog would die a natural death under those easy circumstances. But what poor man would think of paying even a shilling a year for a dirty troublesome puppy for which he had not yet conceived any particular affection? Thus the number of dogs would annually and imperceptibly decrease.

"In six or seven years the tax would require an advance:

its productiveness would be lessened, and the rearing of another class of dogs would require prevention. In a few years more it might receive its final advance.

"The productiveness of the tax ought not to be considered as the primary object of a tax upon dogs. The removal of the public evils which have been enumerated should be at least jointly considered. Five shillings a head would reduce the number of dogs; and would, perhaps, be found to be more productive than a lower tax.

Dogs necessary in husbandry, manufactures, &c. and hounds kept in kennel ought, perhaps, to be exempted from the tax.

To kill Rats and Mice.

Rats and Mice may be destroyed by the following methods: to the powder of arsenic, commonly called rats bane, add fresh-butter, made into paste with wheat or barley-meal and honey. Spread pieces of this mixture about those parts of any house they most frequent; they will eagerly eat it, and having done so, will drink to that excess as to kill themselves. It should be cautiously laid to prevent young children's getting at it; and the person who prepares it should take particular care to clean their hands after it, as it is so strong a poison. Unslaked lime and oatmeal mixed together will likewise destroy them. Oatmeal and powdered glass mixed, or you may add to them some fresh-butter and lay it near their haunts. Filings of iron mixed with oatmeal, or with dough, or wheat-flower, will have the same effect.

Fry a piece of rusty bacon, lay it on in the middle of a board three feet square, covering the board pretty thick with bird-lime; only leaving some narrow passes in the board for the mice or rats to get at the bacon; in doing which they will frequently get among the bird-lime and be caught. In Staffordshire it is customary to put bird-lime about their holes, and they running among it, it will stick to them so that they will not leave scratching till they kill themselves. Or take oatmeal-flower and colocintida, make it into a paste, and lay it in the places where they haunt.

The seeds of wild cucumbers, and black hellebore, mixed with such food as they eat, will kill them. Or powdered hellebore mixed with wheat, or barley-meal only, made into a stiff paste with honey, and laid where they come, occasions their present death. But let the person who mixes this preparation, be cautious in the use of it.

When you have caught a rat or mouse, cut or beat him severely, and let him go, and he will make such a crying noise, that his companions will leave the place. Some persons flea off the skin of their heads: but this appears to be too cruel to practise.

Mix honey, metheglin, bitter almonds, and white hellebore, with wheat or barley-flour; make the whole into a strong paste; throw it into their holes, and it kills them. Some persons destroy them by putting hemlock-seed into their holes.

Make a paste of bitter almonds, colocintida, barley, wheat, or oat-flour, with mead or honey, and put it in their holes, or lay it where they frequent, and it will certainly destroy them.

Mix filings of iron or steel with a stiff paste made of wheat or barley-meal, and honey or mead; and they will be destroyed as surely as they eat of it. Some persons say that laying the skin of a deer in a room where they use to frequent, will drive them away.

If hog's-lard be mixed with the brains of a weasel, and distributed about a room in bits as big as a nut, they will not come thither. If oak-ashes are put into their holes, they will run amongst them, by which means they will get the scab, of which they will die.

Smallage-seed, nigella, origanum; the fumes of any of these burnt, will drive them out of your houses. Likewise lupins, or green tamarinds burnt in the room will rid you of these vermin.

Cork cut into small slices, and fried in suet, will certainly kill them, if it be laid where they come.

To kill Field-Mice and Rats.

Go out in the dog-days, when the fields are tolerably bare, and having found their nests or holes, which are in shape and size like an augre-hole, into which put hemlock-seed, or hellebore mixed with barley, and they will eat of it so as to destroy themselves.

To prevent your seed-corn from being destroyed by

these vermin, steep it in bull's-gall, and they will not touch it; or powder green glass, and mix with it as much copperas, beaten fine: add also as much honey as will make the whole into a paste, and all the rats and mice will quit your fields.

Fill up their holes with laurel or rose-leaves; or use a mixture of black hellebore, bitter almonds, wild cucumber, and hen-bane-seed, beat together, and made into a paste with barley-meal or oil. This will destroy them, if put into their holes, in fields or houses.

These vermin are very fond of artichokes: to prevent their devouring them, therefore, wrap wool about the roots, and they will decamp; or they may be driven away by strewing plenty of horse-dung or fig-tree ashes.

The best method to catch them in the field, is to fill an earthen pot half full of water, and put it in the ground, covered over with a board that has a hole in the middle; then cover the board with straw, hay, or such like, under which the mice taking shelter, creep to the hole, and will be drowned by falling into the water.

Some persons mix sand with their corn, which deters them from burrowing in it, by falling into their ears. See RATS, MICE, MOLES, &c.

VERNAL, something belonging to the spring season.

VETCH, the name of a well known plant, much cultivated in many parts of England, and of which there are several species.

Some sorts of this plant, the seeds of which ripen in autumn, grow naturally in most parts of England, in shady places among bushes, and by the sides of woods. The roots of these are perennial; but their stalks are annual, weak, and grow to so great a length, (for they will climb up to the height of six or eight feet wherever the tendrils which proceed from the end of their leaves can lay hold of boughs, branches, or the side of a hedge, to support them) that they are hardly fit to be cultivated in the field, though some writers have recommended them for this purpose: for as they cannot be supported there, they will trail so much upon the ground, that they will be apt to rot: nor do their shoots, which are less succulent than those of the vetch commonly raised, grow to a sufficient height to be cut for use till late in the spring, when there is a little want of green food for cattle.

Mr. Miller, after sowing for many years the common vetch or tare, which is much cultivated in the fields for fodder, seems to think that which has black seeds, a distinct species from the white; for he has never found either of them vary. Both these are annual, and perish soon after they have perfected their seed. Their stalks are angular, streaked, and hairy: they are weak, and want support, and generally trail upon the ground when they do not find any thing to fasten themselves to. Their leaves are composed of several pair of blunt lobes, and are terminated by tendrils. The flowers, which are pretty large, proceed from the wings of the stalk, and sit very close to the base of the foot stalks of the leaves. Two of these flowers generally spring from the same joint: those of the black seeded sort are purple, and those of the white seeded are white. They appear in June and July, and are succeeded by erect pods, containing three or four round seeds in each, which ripen in August and September.

The white vetch is rather the more succulent plant of the two, and therefore it is best for fodder: but many are unwilling to cultivate this sort, because their seeds, being white, are much sooner discovered by rooks and other birds, than those of the black, which bear a nearer resemblance to the colour of the ground. This objection may, however, be easily removed, by sowing them in drills, and then covering them carefully, instead of the usual method of scattering them with a broad-cast, and plough them in lightly.

The small black-seeded vetch, which some call rath-ripe, and others pebble, goat, or summer vetch, is much tenderer than either of the former, and therefore less cultivated. This must always be sown in the spring: whereas, the others may be sown in the spring or autumn.

But another species of vetch, viz. the Siberian, hardly known to the generality of farmers in this country, bids fair to become, perhaps, the most useful of all for fodder; for its stalks grow to a great length, and are well furnished with leaves, which do not decay in autumn, like those of the other sorts, but continue green all the winter, in defiance of the hardest frost: so that in February and March when there often is a scarcity of green fodder for ewes and

and lambs; this may be of singular service, especially if these plants are supported from trailing upon the ground. Their flowers, which appear in July, are of a light blue colour.

This, like our common vetch, may be sown in the spring, or in autumn; and when the plants are come up, they will not require any other culture than keeping them clear from weeds; a work which, if the seeds are sown thin in rows four feet asunder, as Mr. Miller rightly advises, may be easily done with the Dutch hoe, while they are young, and afterwards with the hoeing plough. By this thin sowing, the stalks of these vetches, which send out many branches, and extend very far, will be kept from matting so closely together as to rot each other by excluding the air; and by earthing up their stems in the same manner as should be done for peas and beans, they will be greatly strengthened, their leaves will grow the larger and more succulent, and they will consequently yield an increased quantity of fodder. The repeating of this as often as it may be found necessary to destroy the weeds in summer, which may be done at a very small expence, and is particularly proper when the growth is intended for the green food of cattle, will be attended with the farther important advantage of preparing the ground thoroughly for whatever other crop may afterwards be put upon it.

As the plants of this kind of vetch will not be in danger of being hurt by frost, they should not be cut till the spring, when the best way will be to take them as they may be wanted, green, for the feeding of ewes: but some of them should be left untouched, for seeds: for if those which are cut do shoot out again, they will flower so late in summer, that their seeds will not ripen, unless the autumn proves very warm. A better way will therefore to be sow a proper quantity of seeds for this purpose in a separate spot of ground: because when the other is cut, the ground may be ploughed for other crops; and if the seasons should be so mild as to produce a sufficiency of green food independent of this, the vetches may be ploughed into the ground, to which they will be an excellent dressing for other crops.

Mr. Miller, who has a high opinion of this sort of vetch, and whose recommendation of it ought to have very great weight, is now beginning to try it in the field, where he has not yet had experience of its culture; but the experiments which he has made with it for six years past, on small patches of it sown in gardens, in different situations, have fully answered his expectation: for he has found these plants continue in great verdure in all those places, when most of the perennial plants in the same situation have suffered greatly by the frost, and could have cut from only eight of them as much fodder as would have been equivalent to half a truss of clover.

Some years ago I had a few seeds of Mr. Miller of the Siberian vetch, and sowed them in a garden, against a south wall; they came up weak, and slender, and I found required to be supported. They run up pretty high, and the second year advanced to about five feet, and produced some seed. But they had very few leaves on their stems, and those which came out near their tops, were thin and dry; the stems and branches were also dry and wiry; so that I had no opinion of them for fodder to cattle, especially as they wanted to be supported; and therefore did not proceed in the culture of them: perhaps they were in an improper situation.

Vetches are generally sown either in autumn, or early in the spring: but the best time, in this country, is toward the beginning of August; because the rains which usually fall about that season will bring them up in a short time, and the plants will get strength before winter, and be fit to cut for the food of cattle early in the spring, when green fodder is most wanted; and if they are designed for seed only, these early sown vetches will come early into flower, and their seeds will ripen early, so that they may be cut and stacked in good weather, which is a great advantage; for those which ripen late are often stacked or housed wet, and then their seeds frequently sprout in the mow, and are spoiled.

Vetches will do well in almost any ground; not excepting even such as can scarcely produce any other plant. The common method of sowing them is in broad-cast, ploughing them lightly in, as was observed before; and the usual allowance is two bushels of seed for an acre of land, though some sow two bushels and an half. Either of these practices may do well enough for those vetches

which are intended to be cut for fodder in the spring, but when they are sown with a design to let them stand for seed, it will certainly be much better to sow them in drills, in the same manner as is practised for pease; and in this case less than half of the above-mentioned quantity of seed will be sufficient: for the rows should be at least three feet asunder, that the hoe-plough may have room to go between them, to destroy the weeds, and earth up the plants, which, when thus managed, will produce a much greater crop, and ripen better and earlier, than in the common way. These drills should be of about the same depth as for pease, and the seeds should be scattered at about the same distance in the drills, in which they should be carefully covered over as soon as they are sown; for otherwise the rooks will discover them; and when those voracious creatures once find the rows, they will speedily destroy them entirely, if they are not carefully watched. The preventing of this is another advantage which attends the sowing of vetches early in autumn, rather than in the spring: because there is more food for rooks and pigeons in the open field in the former of these seasons, and the plants will then appear much sooner above ground. Toward the end of October, by which time the plants will have acquired considerable strength, the horse-hoe should begin to work between the rows, provided the weather be dry: and in doing this, particular care should be taken to lay the earth up as high to the stems of the plants as can possibly be, without covering their tops. This will help to secure them against frost, and clear the ground of weeds at least till March, when the plants should be earthed up a second time, and the intermediate spaces between their rows be cleaned again, in the same manner as before. This will make them grow so vigorously, and they will meet and cover those spaces in a little time: whereas those sown in the spring will not grow to half this size, and will be very late in flowering.

When vetches are intended only for fodder, of which they generally afford two good crops in the year, in hot countries, or when the farmer designs them for ploughing in, by way of manure, they need not be sown in drills, or husbanded in the manner directed: the common broadcast way will then do well enough: but still it is most advisable, in either case, to sow them early in autumn; because, in the first place, they will produce the desired green fodder much earlier in the spring; and in the second, they will be fit to plough in much sooner the following year, and thereby have time properly to meliorate the land and prepare it to receive the ensuing crop, which they are generally allowed to do even more effectually than pease. Stiff clays are peculiarly benefited by this dressing; but it surely is bad husbandry to sow vetches for green fodder, where lucerne will thrive; because this last will yield greater plenty of still more nourishing food.

In some countries, especially abroad, they mix oats with their tares or vetches, an equal quantity of each, and sow them in February. The vetch, supported in some measure by the oat, grows the higher for it: and, about the middle of May, this mixture is moved, and given to horses and other cattle, which it fattens greatly. Mr. Mortimer likewise thinks it a good way to sow horse-beans and tares together: their seeds are easily parted with a riddle: and another observation, in which he agrees with the *Maisons Rustiques*, is, that more vetches should not be sown at any one time than can be covered the same day, because the dew is apt to spoil them: consequently they should not be sown till two or three hours after the rising of the sun; by which time the moisture will be exhaled from off the surface of the earth. But though their seeds cannot bear dampness, which would soon rot them, their plants, especially in sandy land, often perish in dry years, for want of water. To make them flourish well, they require a shower of rain every ten or twelve days. One ploughing to turn in the stubble of the preceding crop, and another at the time of sowing, are sufficient for this plant: but those who give only one ploughing, which is when they sow, and afterwards harrow in the seed, neither have, nor can expect, an equally good return.

When vetches are cultivated for their seeds, they should be cut soon after the pods turn brown, and stacked as soon as they are dry: for if they are suffered to lie out in the field, till they receive wet, and there then comes a hot day, most of the pods will burst, unless they happen to have been blighted; in which case they will not open so easily.

easily. Their haulm, when dry, and threshed, is esteemed good food for cattle, and some say that their seeds are as good for horses, as beans; which, if true, should render them the more valuable, because these will grow on the lightest sandy land, where beans will not thrive; and may therefore, as Mr. Miller observes, be a good improvement to some counties in England, where they do not even attempt to cultivate the bean. About three loads from an acre are reckoned a good crop.

Vetches, when threshed out, will be as good for sowing at the end of five or six years, as at first, if care be taken to turn them in the heap from time to time. Mr. Mortimer cautions the husbandman to lay them by themselves in some convenient place, separate from his other corn, because they will otherwise be apt to foul it.

It is commonly said, that the farmer cannot sow any thing more profitable than vetches; for that, besides enriching the land, a load of them will go farther than two loads of hay: but Mr. Lisle has a calculation tending to prove, that an acre of broad clover is worth twenty shillings a year more than an acre of any vetches, and that the clover should therefore be preferred, wherever the ground will bear it well.

"It would certainly, says Mr. J. Smith, an ingenious farmer of Essex, be of great national advantage, could our stock of cattle and sheep be increased without diminishing the quantity of our lands that are in tillage.

"This can no otherwise be done, but by encouraging the growth of artificial pastures, which the farmers have of late years fallen into.

"The turnep husbandry is not of very old standing in this island, yet has it made a very rapid progress. The immense utility of it, when properly practised, cannot but be evident, even to an ignorant common farmer, on the slightest inspection. This evident utility of it has occasioned its being almost universally practised in the counties of Norfolk, Suffolk, and Essex, whence it has spread to other parts of England, and is of late even adopted in Ireland, where I am informed, the gentry are very intent on improving their estates.

"The cole-seed plant has also its utility, and in many places is as universally sown as the turnep. I have, myself, very often raised this crop, as well for feeding sheep, &c. as for the sake of its seed, and have had no little success in this husbandry, being very fond of it, as cole-seed is an excellent crop to overpower, choak, and destroy weeds.

"I wish the burnet grass, so strongly recommended, may answer every purpose that is expected from it: it seems to promise very fair from the accounts given of it by Mr. Rocque; and if it has not too much prejudice to encounter withal, it may probably succeed, and the culture of it become as universally adopted, as is that of the turnep, or cole-seed plant, already mentioned.

"So much in general; but the particular reason of my now writing to you, was to recommend to the industrious farmer the cultivation of vetches as food for cattle.

"I have often sown this crop with great success, to prepare my land for wheat, and have always found that by growing to a large cover they destroy and choke up a great number of weeds, which would otherwise do me immense damage: indeed, I think them, for this purpose, next in rank to a hoeing crop.

"When I sow vetches before wheat, I always, in the spending my crop, have regard to the condition of my land. If my land is not in good heart, but wants mending, I not unfrequently fold my sheep on it, and feed off my crop in the field; but if it is inclined to be rank, or the wheat which is sowed on it, is apt to run much to straw, I often cut my vetches green, and feed my horses in the stable with them. I find no food agree better with them; they thrive well, grow fat, and are always in good health and spirits when thus fed.

"I sometimes also mow my vetches when they are in bloom, and make them into hay, in the same manner I manage my clover and meadow grass; all which I leave in grass cocks in the field, whilst it is haying, very seldom spreading it, for fear of rain; and after two or three turns it is generally fit to carry.

"The great art, in making hay of vetches, is to contrive in such sort, that the leaves do not drop off the plants, which, if left too long, or dried too suddenly, they are apt to do; and the farmer is to understand, that great part of

the peculiarly nourishing quality of the hay resides in the leaf.

"I say peculiarly nourishing, because almost every kind of cattle, as horses, oxen, cows, and sheep, are fond of it, and they all thrive on this food amazingly: this I have often experienced, and moreover observed, that they make no waste even of the stalks, which they eat with an appetite.

"In this manner I manage for my hay when I am inclined to have it very fine and fit for my cows and sheep; and in this manner it is no difficult matter to get it in good order, sweet, and wholesome: but when I intend it only for my horses, I generally let my crop stand something longer; that is, till the kid, or pod, is formed, and the seed about half grown within it.

"When the hay is made in the last way, the business is much more ticklish, and constant observation must be made to see when the crop is in proper order to cut, because if it is left too long, the stalks grow hard and sticky, and the leaves are apt to drop off.

"This hay is more nourishing, when cut in this last method, than I can well describe: it answers both for hay and corn; and with this food my horses will be in good flesh, health, and spirit, and be able to do a great deal of work. I have often proved this to be true, and can therefore the better venture to assert it.

"I have still another method of making these vetches into hay, which is to leave the crop, till the seed is grown to its full size in the pod, though not ripe: I then mow them, and, when dry, thresh them on a cloth in the field; by which means I procure a considerable quantity of pigeons meat, which fetches me a tolerable good price; and this pigeons meat sells better at market, than if the vetches had stood till the seed was thoroughly ripe: for by cutting the crop when the seeds are barely full grown before they begin to harden, they shrink in the drying, and thereby become of a smaller size than they are by nature, and consequently more proper food for pigeons than if they were larger.

"I own, the hay in this last method is not quite so good, as many of the leaves will, in spite of all the care that can be taken, drop off, and the stalks will be a little sticky: yet, after all, it serves very well for my ordinary cattle, and even for my plough and cart-horses, with the assistance of a few oats.

"Vetches are a very good plant to sow thick on land, and when they have formed a perfect cover, to plough them in, in order to the land's being sown afterwards with wheat on the ploughing. In this intention they answer to the full as well as buck-wheat, or clover.

"When a farmer intends to plough in his vetches, I would by all means advise him to do it some weeks before he sows his wheat, that they may have time to ferment and rot, or the consequences may be fatal to this crop: I once, myself, lost the chief part of a fine field of wheat by this oversight. *Museum Rusticum*, vol. II. p. 169.

"Vetches, says a gentleman farmer of Surry, are a grain often overlooked by the farmer; yet are they, when properly cultivated and applied to proper uses, highly valuable, and very beneficial.

"They are a very hardy grain, and resist the severity of a severe winter better than most other crops; besides which, they have the additional advantage of growing in almost any soil; but then the farmer is to expect a produce in proportion to the goodness of his land.

"I would by all means advise, where it is intended for early seed, or to stand for seed, that the small winter vetch be cultivated in preference to every other sort, because it is not only hardier, but also, being sown about Michaelmas, it is forwarder, to serve as fodder, or will be earlier ready to mow for seed, which is no inconsiderable advantage; for the vetch being a succulent plant, and forming a very thick cover on the land where it is a full crop, it will be in danger of rotting instead of drying, if it should be cut late, or the harvest weather should be very rainy; but if the winter vetch is sown early, it will, in general, be fit to mow in July, or the very beginning of August, when there is less danger.

"Few farmers allow more than one ploughing for vetches: I always allow two, notwithstanding what the neighbouring farmers tell me of turning the fresh soil again down to the bottom of the furrow: I find an advantage in this practice, and shall therefore continue it.

"I have generally experienced the first week in October, if

if the weather is fine, to be the very best time for sowing vetches; and I allow only two bushels of good seed to every acre, which I find full sufficient.

"I sow them broad-cast on the rough land, as the plough leaves it after the second ploughing, taking care to harrow the field length-ways and cross-ways, in order to cover the seed the better; after which I pass over it a roller, heavier or lighter, according to the nature of the soil and the dryness of the weather, observing, that if the weather is dry, and the soil light, I use a heavy roller, in order to close the pores of the light earth; but if the soil is stiff, and the weather damp, I use a lighter roller, lest I should knead and crust the field over, so as to stop the young shoot of the vetch.

"This crop will, in general, choke all the weeds that come up with it; but this must, however, be understood of the smaller sorts, for if there are many large rampant weeds, it will be necessary to have them extirpated with the hook.

"Vetches afford excellent food for sheep in the spring, make cows give a great deal of good milk, and horses are fonder of them, cut green, than almost any other food.

"The best way is to cut them fresh and fresh every morning as they are wanted; and if the farmer has occasion for them for this use only, he may sow in the spring, to great advantage, the large vetch, at different times; by which means he will have a succession of crops, which, to give green to his cattle, he should always cut just before the plant flowers, for it is then in its tenderest and most succulent state, and will afford most nourishment; whereas if he leaves it till the seeds are nearly ripe, the stalks harden, grow sticky, and are of far less value; besides that many of the lower leaves will, by this time, be withered, or dropped off, and entirely lost.

"I must not conclude without mentioning an important use to which vetches are often applied; I mean, a full crop of them is frequently ploughed into the land as manure, to prepare it for a succeeding crop of wheat.

"When vetches are sown with this intention, I would recommend the large sort, and that four bushels of good seed should be used, to be sown broad-cast twice in a place: but my way of sowing it is somewhat peculiar when I mean to plough it in; therefore I think it may not be amiss to relate it.

"Most farmers sow it by casting it twice in a place, immediately after the land is ploughed, and then harrow and roll the field; but I proceed as follows:

"As soon as the field is ploughed, I sow two bushels, broad-cast, on every acre; after which I harrow it length-ways and cross-ways. When this is done, I sow the remaining two bushels, and then harrow it twice again with a pair of heavier harrows, and finally scratch it twice over with light harrows to raise a mould, concluding my work by passing a roller over the whole field. By this management I scarcely ever miss of a full crop, which covers the whole land, chokes the weeds, and serves as excellent manure for the wheat that is to follow.

"I have always found that this husbandry succeeded best in light, hungry, sandy, or gravelly loams; and a brother of mine, who lives in Bedfordshire, tells me it does very well on a chalky soil provided there is any heart in it.

"The time I choose to plough in the vetches is just after the blossom fades, and the kid begins to form; and it is really surprising to see what a strong fermentation they raise in the soil.

"I have sometimes had my crops so heavy that I have been obliged to mow, or hook up, the vetches before I could plough the land: but this is not often the case; when it is, the farmer has reason to rejoice.

"There are, as I hinted in the beginning of this account, scarcely any soils but the vetch will thrive in, though ever so various in their nature. I am an old man, and in the course of many years experience have sown vetches often on a sandy and gravelly loam, a chalk, though not for ploughing-in, a gravel, a low damp clay, and a perfect brown loam. On all these varieties of soil have they succeeded with me; but I must note, that the farmer may expect a larger crop from a gravel (I do not mean a pure gravel) that has some heart and strength in it, than from the finest loam, which has been by a long-continued course of bad culture, starved and impoverished.

"The large vetch may be sown in January, February, March, April, or even the beginning of May, when designed for green fodder; but I would, by all means, have the industrious farmer avoid sowing it before Christmas, for

it is a tender plant, and if hard frost ensue, he may chance to lose his crop." *Museum Rusticum*, vol. III. p. 185.

Mr. Marshall, in his *Minutes of Agriculture*, says, "that the idea of tare-haymaking, is if the weather happens to be fine the fodder is incomparable, but one shower of rain sends it immediately to the dung-hill; but he is convinced from experience, that if tares are cut at a proper age, (that is while the underpods are filling and the halm still green at the bottom), it is not a shower that will hurt them, nor a whole day's rain that will spoil them. That with proper management nothing but a fortnight or three weeks rain can fit them for the dung-hill; and the chance is ten to one that such weather does not happen in July; therefore it is ten to one but tare-hay may be got in tolerably."

In his *Rural Economy of Norfolk*, he says, "when we consider the nature of the Norfolk soil, and the excellency of the Norfolk husbandry, we are, at the first sight, surprised that vetches are not more in use, as summer-food for farm-horses; and nothing, perhaps, but the established prevalence of clover can account for it. Clover is not only mown for foiling horses in the stable; but, as has been already noticed, horses are frequently roped or teddered on clover; as well as turned upon it loose.

"This practice was, probably, established when clover was new to the soil, and the crops of course large and luxuriant; and it was then no doubt the most eligible management: nevertheless, it may, now, when the soil is no longer the favorite of clover, be worth the attention of farmers, of the present day, to try whether more vetches, and proportionably less clover, would not be the most eligible management."

VINES; the following observations and directions relating to the culture of VINES, were made by a British merchant who resided many years in Madeira.

The best situation is on the sides of hills which have a south exposure, and the best soils are the rich and light of a reddish colour, or a mixture of the red and black, and which are not liable to receive and lodge drains of water which make the wine weak; for which reason flat lands and bottoms, though rich, seldom produce good wine, except in very dry summers.

The season for planting is from the middle of November to the end of February; the slips or cuttings are to be from a foot and a half to two feet and a half long; they are to be set two feet in the ground, about three feet distant, in straight rows or trenches about four or five feet asunder. After one trench is opened, and the earth taken out or laid on one side of it, forming a bank, the butt ends of the vines are to be put into the bottom of the trench, and the small ends extended sloping up the bank, then the trench is to be filled with earth dug from the sound land, the depth of the trench, breaking the clods, taking out the stones, hawling all the earth towards the vines, and thus making a second trench at the distance above mentioned from the first; in the same manner proceed to plant the whole vineyard. Thus the ground will be lightened all over as well as where it touches the vines, will be cleared of stones, the roots of trees, shrubs and grass, which are all to be carefully picked out. A vineyard planted in this manner will last fifty or sixty years in Madeira.

They are not to be pruned till they have been two or three years planted. The season for pruning is from the middle of November to the end of January, or later; in doing this, no part of the vine is to be cut, but the new shoots which are to be cut off every year, at the end of every second or third joint. The largest of these cuttings are to be saved for planting, and will keep several weeks above ground; but if they should be cut early, and not planted till late, the butt end should be covered with earth.

Supporting the vines, &c. is done three or four feet high, by sticking stakes in the ground from end to end of the rows, then lashing long slender poles near the heads of them, and across the poles are to be laid, both ways, reeds or canes, at the distance of two or two feet and a half, which are to be tied to one another and the poles where they cross, with split willow-twigs; the canes, if full grown and hard, will last two or three years. The second or third year after planting vines, they are to be raised and fastened to the stakes and poles with twigs, and the branches spread open, and loosely tied to the poles and canes, so that they may not be too thick in some places, and too thin in others.

The vineyards should be dug-up with narrow billing hoes every spring and fall, and the clods broken; this work is very laborious, as the people are obliged to perform it on their knees under the canes; but sometimes the canes are uncid, and after the ground is dug, tied on again.

The third year after the vines have been planted they generally produce a pretty good crop of grapes fit to make wine. When they are almost come to their full size, they are to be gradually exposed to the sun, by frequently thinning the leaves, till every branch lies open to the sun some part of the day; but if this should be done while the fruit is green, or; all at once, when near ripe, it would wither, and the juice would never be rich. The grapes must hang till they are very ripe, and many, on almost every branch, begin to turn to raisins, otherwise the wine will always be weak, harsh, or rough, and without much flavour; hence, it is evident, the grapes should not always be promiscuously gathered, all at once, but two or three vintages made, gathering only what are ripe each time.

The vine-press is a vat from six to nine feet square, according to the largeness of the vineyard, made of planks about eighteen or twenty inches broad, and two and a half or three inches thick, so fixed to a bottom of the same, or greater thickness, that they may be pressed close to it, and one another, at the corners, by the help of posts or studs, and wedges; it may also be caulked, if necessary.

On one side of the vat a spout is to be placed, on which a wicker basket is to be hung to strain the wine as it runs into a tub, which is commonly placed half way in the ground to accommodate it to the height of the vat. When the grapes are gathered they are thrown into the vat, and may rest near twenty-four hours, if so much time be required to fill it; then, the spout being stopped, people go into the vat and tread the grapes very well with their bare feet, then they open the spout and draw off the juice as long as it will run without pressing; when the spout is to be re-stopped, the grapes trod over again, then gathered to a heap in the middle of the vat, and confined with a large white rope tied round them, or with a haircloth, or layers of straw, and then with short planks and piles of blocks, laid across each other, pressed by a large beam, assisted with weights at the end, with a screw, or otherwise in the manner of a cyder press. The wine which runs without pressing is not so good as the first pressing, but better than the second or third. From the tub it is put into casks free from mustiness or any ill smell. To every pipe, which should not be above three-fourths full, there must be put two or three pounds of the powder of jesso, which is to be well mixed by stirring the wine strongly with a staff reaching to the bottom of the cask, and a little flatted on the sides towards the lower end; this stirring is to be repeated twice a day, for five or six minutes each time, till the wine has done fermenting, which may be known by listening at the bung, and by observing it to settle and clear; also by the taste.

Care should be taken to prevent any body from smelling at the bung or a vent-hole while the wine is working, the vapour being sometimes so strong as to kill people on the spot.

The jesso is a greyish soft stone, with a mixture something like chrystal; it is brought from Spain, and sold at Cadiz for six or eight ryals the quintal; it is prepared by breaking it into small lumps, then burning it for a short time in an open wood fire; it is then to be powdered in a mortar, and sifted through a common hair sifter, when it becomes as white as lime. The use of the jesso is to break the viscidty of the must or new wine, which is often so nearly of the consistence of a syrup, that its particles settle to the bottom of the vessel, and cannot, by their own gravity, disentangle themselves and bring about that motion called fermentation, without which the liquor would never be wine, but remain sweet or vapid; thus we see melasses, till thinned by water, will not ferment enough to yield much spirit by distillation, if any. From these considerations it is evident, that the quantity of jesso, necessary for a rich sweet must, would be too much for a poor thin one, would carry down too much of the sweetness, make it overwork, and leave it harsh, or perhaps turn it to vinegar, which is the usual effect of an over fermentation, or of a second one, without one of which good vinegar cannot be made; as the best wines may be, or are thus easily, turned to vinegar, it is of use to know how to prevent it, which may be done by racking the wine, when it appears to have worked enough, into another cask, well smoaked with a brimstone match hung by a wire in the cask till it is extinguished, the bung being lightly stopped all

the time. This operation is to be repeated once or twice, if this fermentation does not stop the first time. I have used this with success, but it is not practised by the Portuguese in Madeira. If the wine should have overworked and turned before this method is taken, it cannot be recovered.

Here I must give a caution never to smoak, with a match, a cask that has had rum in it, or any spirit, without washing it well with water; for the spirit would take fire, and, if the bung did not fly out immediately, would burst the cask.

When the wine is settled, and quite clear, it may be racked into clean dry casks as soon as you please, and if it has a finariness, like brisk cyder, the casks may be smoaked as above, to prevent a new fermentation.

Some people think it injures new wine to draw it soon from the lees, but it should never be suffered to stand longer on them than the beginning of the next spring after it was made, lest in the hot weather the lees should excite a new fermentation. The lees should be saved for distillation, and will yield a fifth or sixth part of brandy.

In Madeira the grapes are destroyed, when in flower, by foggy weather, misty rains, or when just beginning to knit, and such as do not fall grow no bigger than small currants. They are always hurt by rain after June; and, in general, the hotter and drier the summer, the better the wine is both in flavour and strength.

No good wine can be made in moist lands, or above one third of the distance from the sea towards the mountains, or on the north side of the island, though the lands there are good, and only the best sort of grapes are cultivated.

Wine is not to be attempted in countries subject to much rain in the summer season. A single shower of rain, if sufficient to reach the roots of the vines, will spoil a whole vintage, if the grapes are near ripe, unless they are suffered to hang till the new watery juices, acquired by the rain, have time to ripen again.

While the wine is working, the bung-hole is to be covered with a piece of loose board, and afterwards lightly stopped. The casks, after the wine is racked, should never stand full, but want four or five gallons.

After wine is drawn from the lees, it should be carefully racked every eight or ten weeks, for a year or longer, and the turbid wine in the bottoms put together to clear; but this wine will never be so good as the wine it came from, often turning sour.

The most convenient way of racking is by a large hole near the bottom of the head, which is to be stopped with a plug, wrapped round with a flag or banana bark; when this is taken out for racking, a short piece of cane is to be introduced in its room, to draw the wine through in pails or buckets.

The pipe should be gently tilted before any wine is drawn out of it, and secured by blocks or chocks to prevent its being disturbed. The driest and warmest stores are best for wine, and in warm countries those above ground are better than cellars. The brimstone matches are made by dipping a piece of linen rag, about three fingers broad and five in length, into melted brimstone, or is better done by dipping a long strip of linen, and gently twisting it round, to make it the easier to pass into the bung-hole than a broad flat piece would, cutting it when cold into proper lengths.

VINEGAR, an acid penetrating liquor, prepared from wine, cyder, beer, &c. of considerable use both as a medicine and sauce.

The process of turning vegetable matters to vinegar, is thus delivered by Dr. Shaw: take the skins of raisins, after they have been used in making wine; and pour three or four times their own quantity of boiling water upon them, so as to make a thin aqueous mixture. Then set the containing cask, loosely covered, in a warmer place than is used for vinous fermentation; and the liquor in a few weeks time will become a clear and sound vinegar; which being drawn off from its sediment, and preserved in another cask, well stopped down, will continue perfect, and fit for use.

This experiment shews us a cheap and ready way of making vinegar from refuse materials; such as husks of grasses, decayed raisins, the lees of wine, grounds of ale, beer, &c. which are frequently thrown away as useless. Thus, in many wine countries, the marc, rape, or dry pressing of grapes, are thrown in heaps, and suffered to putrefy unregarded, though capable of affording as good vinegar as the wine itself. In some places they bury copper-plates in these husks, in order to make verdegis; but this practice seems chiefly confined to the southern parts of France.

Our

Our present experiment shews us how to convert them to another use ; and the direction extends to all the matters that have once undergone, or are fit to undergo, a vinous fermentation, for that all such matters will afford vinegar. Thus all our summer-fruits in England, even black-berries ; all the refuse washings of a sugar-house, cyder-pressings, or the like, will make vinegar, by means of water, the open air, and warmth.

The whole process, whereby this change is effected, deserves to be attentively considered ; and, first, the liquor to be thus changed, being kept warmer than in vinous fermentation, it begins, in a few days, to grow thick or turbid ; and without throwing up bubbles, or making any considerable tumult, as happens in vinous fermentation, deposits a copious sediment.

The effect of this separation begins to appear, first, on the surface of the liquor, which gathers a white skin that daily encreases in thickness, till at length it becomes like leather ; and now, if continued longer in this state, the skin turns blue, or green, and would at last grow solid, and putrefy : therefore, in keeping down this skin as it grows, and thrusting it gently to the bottom of the vessel, consists much of the art of vinegar making, especially from malt. For the difference between vinous and acetous fermentation, see the article FERMENTATION.

Method for making Cyder-VINEGAR. The cyder (the meanest of which will serve the purpose) is first to be drawn off fine into another vessel, and a quantity of the must, or pouz of apples, to be added : the whole is set in the sun, if there be a conveniency for the purpose : and, at a week or nine days end, it may be drawn off. See CYDER.

Method of making Beer-VINEGAR. Take a middling sort of beer, indifferently well hopped ; into which, when it has worked well, and is grown fine, put some rape, or husks of grapes, usually brought home for that purpose : mash them together in a tub ; then, letting the rape settle, draw off the liquid part, put it into a cask, and set it in the sun as hot as may be (the bung being only covered with a tile, or slate-stone and in about thirty or forty days, it will become good vinegar, and may pass into use as well as that made of wine, if it be refined, and kept from turning musty.

Or thus : to every gallon of spring-water add three pounds of Malaga raisins ; which put into an earthen jar and place them where they may have the hottest sun from May till Michaelmas ; then pressing all well, tun the liquor up in a very strong iron-hooped vessel, to prevent its bursting : it will appear very thick and muddy, when newly pressed ; but will refine in the vessel, and be as clear as wine.

Thus let it remain untouched for three months, before it be drawn off, and it will prove excellent vinegar.

Method of making Wine-VINEGAR. Any sort of vinous liquor, being mixed with its own faeces, flowers, or ferment, and its tartar, first reduced to powder : or else with the acid and austere stalks of the vegetable from whence the wine was obtained, which hold a large proportion of tartar : and the whole being kept frequently stirring in a vessel which has formerly held vinegar, or set in a warm place full of the steams of the same, will begin to ferment a-new, conceive heat, grow sour by degrees, and soon turn into vinegar.

The remote subjects of acetous fermentation are the same with those of vinous ; but the immediate subjects of it are all kinds of vegetable juices, after they have once undergone that fermentation which reduces them to wine : for it is absolutely impossible to make vinegar of must, the crude juice of grapes, or other ripe fruits, without the previous assistance of vinous fermentation.

The proper ferments for this operation, whereby vinegar is prepared, are, 1. The faeces of all acid wines. 2. The lees of vinegar. 3. Pulverised tartar, especially that of Rhenish wine, or the cream, or crystals thereof. 4. Vinegar itself. 5. A wooden vessel well drenched with vinegar, or one that has been long been employed to contain it. 6. Wine that has often been mixed with its own faeces. 7. The twigs of vines, and the stalks of grapes, currants, cherries, and other vegetables of an acid austere taste. 8. Bakers leaven, after it is turned acid. 9. All manner of ferments, compounded of those already mentioned.

The French use a method of making vinegar different from that above described. They take two large oaken vessels, the larger the better, open at top ; in each whereof they place a wooden grate, within a foot of the bottom ;

upon these grates they first lay twigs, or cuttings of vines, and afterwards the stalks of the bunches, without the grapes themselves, or their stones ; till the whole pile reaches within a foot of the brim of the vessels : then they fill one of these vessels with wine to the very top, and half fill the other ; and with liquor drawn out of the full vessel, fill up that which was only half full before ; daily repeating the same operation, and pouring the liquor back from one vessel into another ; so that each of them is full, and half full, by turns.

When this process has been continued for two or three days, a degree of heat will arise in the vessel, which is then but half full, and increase for several days successively, without any appearance of the like in the vessel which happens to be full, during those days ; the liquor whereof will still remain cool ; and as soon as the heat ceases in the vessel that is half full, the vinegar is prepared : which, in the summer, happens on the fourteenth or fifteenth day from the beginning ; but in the winter, the fermentation proceeds much slower : so that they are obliged to forward it by artificial warmth, or the use of stoves.

When the weather is exceeding hot, the liquor ought to be poured off from the full vessel into the other twice a-day : otherwise, the liquor will be over-heated, and the fermentation prove too strong ; whence the spiritous parts will fly away, and leave a vapid wine, instead of a vinegar, behind.

The full vessel is always to be left open at the top, but the mouth of the other must be closed with a cover of wood, in order the better to keep down and fix the spirit in the heat of fermentation. The vessel that is only half full seems to grow hot, rather than the other, because it contains a much greater quantity of the vine-twigs and stalks, than that, in proportion to the liquor ; above which the pile, rising to a considerable height, conceives the more, heat and so conveys it to the wine below.

Vinegar is a medicine of excellent use in all kinds of inflammatory and putrid disorders, either internal or external : in ardent bilious fevers, pestilential and other malignant distempers, it is recommended by Boerhaave as one of the most certain sudorifics. Weakness, fainting, vomiting, hysterical and hypochondriacal complaints have also been frequently relieved by vinegar applied to the mouth or nose, or received into the stomach. Distilled vinegar has the same virtues, only in a stronger degree.

There are also medicated vinegars, as vinegar of antimony, of elder, litharge, roses, squills, treacle, &c. which derive their chief virtues from the vinegar.

VIPER, the name of a well known serpent, common in many parts of England.

The bathing the part bit by a viper with olive oil, or its own fat, is said to effectually prevent the fatal consequences that would otherwise attend it.

VIVES, a disease in horses, which differs from the strangles only in this, that the swellings of the kernels under the ears of the horse (which are the parts at first chiefly affected) seldom gather, or come to matter, but by degrees perspire off, and disperse, by warm cloathing, anointing with the marshmallow ointment, and a moderate bleeding or two. But should the inflammation continue, notwithstanding these means, a suppuration must be promoted by the methods recommended in the strangles. See the article STRANGLES.

When these swellings appear in an old or full-aged horse, they are signs of great malignity, and often of an inward decay, as well as forerunners of the glanders.

The mercurial ointment mentioned in the article STRANGLES may be prepared thus :

Take of crude mercury, or quicksilver, one ounce ; Venice-turpentine half an ounce ; rub together in a mortar till the globules of the quicksilver are no longer visible ; then add two ounces of hogslard.

Some authors recommend this ointment to be used at first, in order to disperse the swellings, and prevent their coming to matter ; bleeding and purging at the same time for that purpose ; but as in young horses they seem to be critical, the practice by suppuration is certainly more eligible and safe ; for want of properly effecting which, the humours frequently settle, or are translated to the lungs, and other bowels ; or falling on the fleshy parts of the hind quarters, form deep imposthumes between the muscles, which discharge such large quantities of matter, as sometimes kill the horse.

horse, and very often endanger his life. *Bartlett's Farriery*, p. 99.

Another author speaks of them as being "certain flat kernels much like bunches of grapes, growing in a cluster, close knitted together in the part affected."

"They center from the ears, and creep downwards between the chap and the neck of the horse towards the throat, and when inflamed they swell, and not only are painful to the horse, but prove mortal by stopping his wind, unless a speedy course be taken for the cure."

"They cause such a difficulty of breathing, and uneasiness, that he will oftentimes lie down and start up again, and tumble about after a strange manner."

"This distemper is occasioned by drinking cold water, after a violent heat; which causing the humours to melt down, they fall too plentifully upon the natural glands or kernels; also by eating too much barley, oats, rye, rankness of blood, &c."

"The cure. If the vives are not grown so large as that the horse is in immediate danger of being stifled, do not open the tumours, but rather endeavour to rot them, by taking hold of the kernel with a pair of pincers or pliers, and beating the swellings gently with the handle of a shoeing hammer, or bruising them with your hand, till they become soft enough, and they will afterwards disappear; but this is not to be done till the swellings are pretty ripe, which may be known by the easy separation of the hair from the skin, if you pluck it with your fingers."

"Having rotted (or in case of necessity) opened the vives, let the horse be let blood under the tongue, and afterwards in the flanks; wash his mouth with salt and vinegar; and blow some vinegar into his ears, rubbing and squeezing them hard to make it penetrate; for this will considerably assuage the pain which it communicates to the jaws."

"Then give the horse to drink a quart of wine with two handfuls of hemp-seed pounded, two nutmegs grated, and the yolks of half a dozen eggs, and wash him gently after for an hour."

"About an hour after giving him the draught inject the following glyster; boil an ounce and half of sal polychrestum, finely powdered in five pints of beer; when you have taken it off the fire, put it into two ounces of oil of bays, and squirt all in blood warm."

"As to our practice in England in the cure of this distemper; some cut holes where the kernels are, and pick them out with a wire, then fill the hole with salt, and at three days end it will run; and afterwards wash it with sage juice, and heal it with an ointment made with honey, butter, and tar, or with green ointment, and also use other means with it; but the efficacious receipts are these following:

Take tar, tried hog's-grease, bay-salt and frankincense powdered, of each as much as will suffice; melt them together; and with a clout fastened to a stick, scrub the place four or five mornings, until the inflamed part become soft and ripe; then slit the skin with your incision-knife, let forth the corruption, and heal it with tried hog's-grease, and verdegris, made up into fine powder: melt them upon a fire, and let not the stuff boil more than a walm or two; then put in some ordinary turpentine, and so still all together till it be cold, and then carefully anoint the sores therewith till it is healed."

"Another excellent way is, to take a pennyworth of pepper beaten into fine powder, a spoonful of swine's grease, mix them very well together, and convey the stuff equally into both the ears of the horse, so tie or stitch them up, then shake them that the medicine may sink downwards, and this being done, let him bleed in the neck-vein and temple-vein."

"But the most common way of cure, and such as our farriers use, is to let him bleed on both sides the neck-veins, then to scar the swelling with a small hot iron, from the root down to the bottom of the ear, till the skin looks yellow; the same iron being in shape somewhat like an arrow's head, with three or four small lines drawn from the body of it; and after searing, in order to take out the heat of the fire, and to make it sound again, anoint it with fresh butter, or with hog's-grease, and he will do well."

ULCER, a solution of the soft part of an animal body, together with the skin.

The first intention in the cure of ulcers is bringing them

to digest, or discharge a thick matter; which will in general be effected by the green ointment, or that with precipitate; but should the sore not digest kindly by these means, but discharge a gleety thin matter, and look pale, you must then have recourse to warmer dressings, such as balsam, or oil of turpentine, melted down with your common digestive, and the strong beer poultice over them; it is proper also in these kinds of sores where the circulation is languid, and the natural heat abated, to warm the part, and quicken the motion of the blood, by fomenting it well at the time of dressing; which method will thicken the matter, and rouse the native heat of the part, and then the former dressings may be re-applied."

If the lips of the ulcer grow hard or callous, they must be pared down with a knife, and afterwards rubbed with the caustic."

Where soft fungous flesh begins to rise, it should carefully be suppressed in time, otherwise the cure will go on but slowly; if it has already sprouted above the surface, pare it down with a knife, and rub the remainder with a bit of caustic; and to prevent its rising again, sprinkle the sore with equal parts of burnt allum, and red precipitate; or wash with the sublimate water, and dress with dry lint even to the surface, and then roll over a compress of linen as tight as can be borne; for a proper degree of pressure, with mild applications, will always oblige the spongy excrescences to subside, but without bandage the strongest will not so well succeed."

All sinusses, or cavities, should be laid open as soon as discovered, after bandages have been ineffectually tried; but where the cavity penetrates deep into the muscles, and a counter opening is impracticable or hazardous, where by a continuance, the integuments of the muscles are constantly dripping and melted down; in these cases injections may be used, and will frequently be attended with success. A decoction of colcothar boiled in forge-water, or solution of lapis medicamentosus in lime-water, with a fifth part of honey and tincture of myrrh, may be first tried, injecting three or four ounces twice a day, or some resin melted down with oil of turpentine may be used for this purpose: if these should not succeed, the following, which is of a sharp and caustic nature, is recommended on Mr. Gibson's experience."

Take of Roman vitriol half an ounce, dissolve in a pint of water, then decant and pour off gently into a quart bottle; add half a pint of camphorated spirit of wine, the same quantity of the best vinegar, and two ounces of Ægyptiacum."

This mixture is also very successfully applied to ulcerated greasy heels, which it will both cleanse and dry up."

These sinusses or cavities frequently degenerate into fistulæ, that is, grow pipey, having the inside thickened, and lined as it were with a horny callous substance. In order to their cure, they must be laid open, and the hard substance all cut away; where this is impracticable, scarify them well, and trust to the precipitate medicine made strong, rubbing now and then with caustic, butter of antimony, or equal parts of quicksilver and aquafortis."

When a rotten or foul bone is an attendant on an ulcer, the flesh is generally loose and flabby, the discharge oily, thin, and stinking, and the bone discovered to be carious, by its feeling rough to the probe passed through the flesh for that purpose. In order to a cure, the bone must be laid bare, that the rotten part of it be removed; for which purpose, destroy the loose flesh, and dress with dry lint; or the doills may be pressed out of tincture of myrrh or euphorbium: the throwing off the scale is generally a work of nature, which is effected in more or less time, and in proportion to the depth the bone is affected, though burning the foul bone is thought by some to hasten its separation."

Where the cure does not properly succeed, mercurial physic should be given, and repeated at proper intervals; and to correct and mend the blood and juices, the antimonial and alterative powders, with a decoction of guaiacum and lime-waters, are proper for that purpose. *Bartlett's Farriery*, p. 253."

ULIGINOUS, an appellation given to a moist, moorish, and fenny soil."

UMBEL, the extremity of a stalk or branch of a plant, divided

divided into several peduncles, or rays, beginning from the same point, and opening in such a manner, as to form an inverted cone.

UMBELLIFEROUS Plants, those whose flowers are produced in an umbel, on the top of the stalks, somewhat resembling an umbrella. Of this kind are the fennel, parsley, parsnip, carrot, hemlock, &c.

UNDER-DRAINING. See **DRAINING UNDER.**

UNDERWOOD, coppice, or any wood not accounted timber. See the article **COPPICE.**

VOOR, fallow land. See the article **FALLOW.**

URE, the udder of a cow, sheep, &c.

URINE, a ferous and saline matter separated from the blood of animals, and emitted by the canal of the urethra.

It is of excellent use as a manure, when deprived of its hot fiery particles by time, which will so alter its nature as to render it an extraordinary fertilizer of every kind of soil. Columella certifies that old urine is excellent for the roots of trees. Mr. Hartlib commends the Dutch for preserving the urine of cows as carefully as they do the dung, to enrich their lands; and instances a woman he knew near Canterbury, who saved in a pail all the urine she could, and when the pail was full, sprinkled it on her meadow, the grass of which looked yellow at first, but afterwards grew surprisingly. Similar to this is what Mr. Bradley relates, as of his own knowledge. Human urine was thrown into a little pit constantly every day, for three or four years. Two years after, some earth was taken out of this pit, and mixed with twice as much other earth, to fill up a hollow place in a grass walk. The turf which was laid upon this spot grew so largely and vigorously, besides being much greener than the rest, that, by the best computation he could make, its grass, in a month's time, was above four times as much in quantity as that of any other spot of the same size, though the whole walk was laid on very rich ground. The author of the English Improver is therefore very right in saying that human urine is of greater worth, and will fatten land more than is generally imagined by our farmers, whom he advises to take all opportunities of preserving this, and every sort of urine, for their ground, as carefully as is done in Holland.

Sometimes a horse is seized with an excessive flux of crude and undigested urine, resembling water, by which his strength is drained by degrees: it proceeds from heat and sharpness of the blood, or an inflammation in the kidneys, which, like a cupping glass, suck in the concocted serum from the veins.

The remote causes, are the immoderate and irregular working of young horses, cold rains in the beginning of winter, eating of oats brought over by sea, which, being spongy, draw in the spirits of the salt water.

As for the cure, the horse is to be fed with bran instead of oats; giving him a cooling glyster; next day let him bleed; the day following inject another glyster; the next day after that, bleed him again, not taking away above the quantity of two pounds of blood at a time; this done, boil two quarts of water, and put it into a pailful of common water, with a large handful of oriental bole beat to powder: mix

all well together, and let the horse take it luke-warm for his ordinary drink morning and evening, giving him full liberty to quench his thirst, which, in this disease, is excessive; for the more he drinks, he will be the sooner cured.

As for remedies to provoke urine in horses, which are often necessary,

Take about four ounces of dried pigeon's dung in powder, and boil it in a quart of wine-water; after two or three walms strain out the liquor, give it the horse blood warm, then walk him for half an hour, and he will stale if it be possible.

Another good remedy for a horse that cannot stale, is to lead him into a sheep-cote, and there unbridle him, suffering him to smell the dung, and roll and wallow in it; for he will infallibly stale before he comes forth, if he be not past cure.

This quick effect proceeds from a subtle and diuretic salt, that streams out from the sheeps-dung, and strikes the brain; since by reason of the correspondence of that with the lower parts, it obliges the expulsive faculty to avoid the urine.

The urinary passages are frequently stoppt by thick phlegm, which will scarce give way to the above-mentioned medicines, and therefore recourse may be had to the following receipt:

Take an ounce of saffra-wood with the bark, cut it small, and infuse it in a quart of white wine, in a large glass bottle well stoppt, so as two-thirds of the bottle may remain empty: let it stand on hot ashes for about six hours, then strain out the wine, and give it the horse in a horn.

This remedy will certainly afford relief, either by urine or sweat, the matter of which is known to be the same.

To cause a horse to stale for his benefit in some cholics, put two ounces of sugar of dialthæa to a quarter of a pound of Castile soap, beat them well together, make pretty big balls, and dissolve one of them in a pint and a half of strong beer scalding hot; when it is lukewarm give him a hornful, and let him fast an hour.

For the Stoppage of Urine, when a Horse cannot stale.

Pound half a pound of aniseeds, and a handful of parsley-roots; or if you have not them, half an ounce of parsley-seeds, pound them, and boil them in a quart of strong white-wine, or for want of that, as much old strong beer; then strain it off, and add a dram of oyster-shells finely powdered, give it the horse milk-warm.

URITH, etherings, or windings of hedges.

URIVES, nets to catch hawks with.

URRY, a sort of blue or black clay, lying near a vein of coal.

USTILAGO, the same with burnt grain. See the article **BURNT-GRAIN.**

UTENSIL, a domestic moveable of any kind.

W.

WAD, black lead.

WAGGON, a vehicle or carriage, of which there are various forms, accommodated to the different uses they are intended for.

WAIL, an estray, which, for want of the owner's appearance after it has been cried and published in the neighbouring markets, is forfeited to the lord of the manor.

WALK, among horsemen, is the slowest, and least raised of all horse's goings. It is performed by a horse's lifting

up his two legs on a side, the one after the other, beginning with the hind leg first. Thus, if he leads with the legs of the right side, then the first foot he lifts is the far hind-foot, and in the time he is setting it down, (which in a step is always short of the tread of his fore-foot on the same side) he lifts his far fore-foot, and sets it down before his near fore-foot. Again, just as he is setting down his far fore-foot, he lifts up his near fore-foot, and sets it down again just short of his near fore-foot; and just as he is setting it down

he lifts his near fore-foot, and sets it down beyond his far fore-foot.

WALL, the principal part of a building, as serving both to inclose it, and support the roof, floors, &c.

Walls are distinguished into various kinds, from the matter whereof they consist, as plastered or mud-walls, brick-walls, stone-walls, flint or boulder-walls, and boarded-walls. In all which these general rules are to be regarded: 1. That the right angle therein depending is the true cause of all stability, both in artificial and natural position. 2. That the massiest and heaviest materials be the lowest, as fitter to bear than be borne. 3. That the walls, as they rise, diminish proportionably in thickness, for ease both of weight and expence. 4. That certain courses or ledges, of more strength than the rest, be interlaid, like bones, to strengthen the whole fabric.

Brick-walls are the most important and usual amongst us. In these, particular care is to be taken about laying of the bricks; that in summer they be laid as wet, and in winter as dry, as possible, to make them bind the better with the mortar: that in summer, as fast as they are laid, they be covered up to prevent the mortar, &c. from drying too fast: that in winter they be covered well to protect them from rain, snow, and frost, which are all enemies to mortar: that they be laid joint on joint in the middle of the walls as seldom as may be: but that good bond be made there as well as on the outside. Care is to be taken that the angles be firmly bound, which are the nerves of the whole edifice. In order to which, in working up the walls of a building, it is not advisable to raise any wall above eight feet high, before the next adjoining wall be brought up to it, that so good bond may be made in the progress of the work; it may be worth notice, that a wall, a brick and a half thick, with the joint, will be in thickness fourteen inches or very near; whereas one hundred and fifty or one hundred and sixty bricks will lay a yard square measure upon the face of the building; and to the square of ten feet are usually allowed seventeen hundred or eighteen hundred bricks. Flints, or boulder walls, are much used in some parts of Sussex and Kent, for fence-walls, round courts, gardens, &c. A right and left-handed man fits well for this work, as they have a hod of mortar poured down upon the work, which they part between them, each spreading it towards himself, and so they lay in the flints. The mortar for this work must be very stiff. See FENCE.

WALLNUT-TREE, the name of a well known tree, formerly held in great esteem in this country, for its wood, which is, in fact, often very finely veined; but, on account of its aptness to be worm-eaten, it has of late given place to the beautiful and much sounder mahogany, with which our cabinet-makers have been pretty plentifully supplied from the British settlements in the West Indies.

As an useful fruit tree, independent of its timber, which is, however, still of good value, it merits the husbandman's attention; nor can the gentleman easily find a more stately one to adorn his park with, or to form a noble avenue to his mansion.

These trees are raised from their nuts, which it is best to keep in dry sand, with their outer covers on, till February; that being the right time for planting them. If they are intended for timber trees, they should be sown in the places where they are to remain, in order that the breaking or otherwise shortening of their roots, and especially those of the tap kind, may not stint their growth, and make them run out in branches: but if they are designed for fruit, their fertility will be increased by transplanting them, because their downright roots, which are those that chiefly encourage the luxuriant growth of wood in all sorts of trees, will be thereby checked, and they will be made, in lieu of them, to strike out numbers of lateral roots, which as experience has proved, always conduce greatly to the production of the largest and fairest fruit. The most proper season for transplanting them is when their leaves begin to decay; and the best age, when they have had three or four years growth in the nursery. Mr. Miller says he has frequently experienced that there is little danger of their succeeding, although they be eight or ten years old when they are transplanted: but, however that may be, it is certain that they will root best, grow largest, and last longest, if they are removed young. The less their branches are cut at the time of transplanting, or indeed at any time after, the better they will prosper; for much lopping often causes them to decay: but if there be a necessity for taking off any of their boughs, it should be done early in September, that the wound may have

time to heal before the cold and wet come on. It is likewise essential to cut the branch off quite close to the trunk, lest the stump which is left, should decay, and rot the body of the tree; to prevent which, especially if the wound be large, it will be right to smooth it well with a chissel, and then to cover it over carefully with a cement of clay or wax, as in the case of grafting, with a piece of tarpawling, or of sheet lead, over that.

These trees should not be planted nearer together than forty feet, and more may yet be better, if they are designed for fruit. They delight in a firm, rich, loamy soil, or such as is inclinable to chalk or marle; and they will thrive very well in stony ground, or on chalk hills, as is evident from those large plantations near Leatherhead, Godstone, and Carshalton in Surry, where great number of these trees planted upon the downs produce annually large quantities of fruit, to the no small advantage of their owners.

In order to preserve this fruit, it should be left upon the tree till it is thoroughly ripe, and then, as it would be exceedingly troublesome to gather it by hand, it may be beaten off, but not with such violence as is commonly used, from a mistaken notion that the tree is improved thereby; for most certainly it cannot be benefited by that rough way of forcing off the young wood upon which this fruit grows. The nut thus obtained should be laid in heaps for two or three days, after which they should be spread out, and when they have parted from their husks, which they will then soon do, and have afterwards been well dried in the sun, to remove the moisture of their shells, which would otherwise make them mould, they should be laid up in a very dry place, where neither mice nor other vermin can get at them. In this manner they will remain good for four or five months: or, which is a yet better way, and will keep them still longer, let them, when their outward moisture has been dried by the sun, be put up in jars, or other close vessels, with dry sand between their interstices. The laying of them for four or five hours in an oven gently heated, as is the practice of some, will indeed dry the germ, and prevent their sprouting: but if the oven is too hot, it will make the kernel shrink, and prevent their being peeled with any tolerable ease.

Were it only for the oil that these nuts afford, the trees which produce them would be worth some care. Mr. Evelyn says that one bushel of them will yield fifteen pounds of peeled kernels, and that these will yield half that weight of oil, which the sooner it is drawn, is the more in quantity, though the drier the nut, the better in quality. He adds, that the lee, or marc of the pressing, is excellent to fatten hogs with. Certainly it would be good manure for land; as are the cakes of linseed, rape, &c. after the oil has been squeezed out of them. The green husks boiled, without any mixture, make a good colour to dye a dark yellow. The kernel being rubbed upon any crack or chink of a leaking vessel, stops it better than either clay, pitch, or wax.

The French are very fond of the kernels of these nuts scooped out of the shells before they are hardened, with a short broad brass knife; because iron rusts, and communicates a disagreeable taste to the kernels. When scooped out, they are steeped in salt and water for a few hours before they are set upon the table, as well to take off all taste of bitterness, as to make them peel with the utmost ease.

WANG-TOOTH, a jaw tooth.

WANT, a mole. See the article MOLE.

WANTY, a broad girth of leather, by which the load is bound upon a horse.

WAPENTAKE, the same with what is commonly called a hundred, and generally used in the northern counties beyond the Trent.

WARBLES, small hard tumours on the saddle part of a horse's back, occasioned by the heat of the saddle in travelling, or its uneasy situation.

A hot greasy dishcloth at first frequently applied, will sometimes remove them. Camphorated spirits of wine are also very effectual for this purpose to disperse them, especially if a little spirit of sal ammoniac be added to the camphorated spirit. If there be a necessity for working the horse, care should be taken to have the saddle nicely chambered.

WARP, or miscarry, sink her calf.

WARREN, a franchise, or place privileged, either by prescription or grant from the king, to keep beasts and fowl of warren in; as rabbits, hares, partridges, pheasants, &c.

By statute 21 Edw. III. a warren may lie open, and there is no need of closing it in, as there is a park.

In the setting up a warren, great caution is to be used for the fixing upon a proper place, and a right situation. It should always be upon a small ascent, and exposed to the east or the south. The soil that is most suitable, is that which is sandy; for when the soil is clayey or tough, the rabbits find greater difficulty in making their burrows, and never do it so well; and if the soil be boggy or moorish, there would be very little advantage from the warren, for wet is very destructive to these animals.

All due precautions must be taken, that the warren be so contrived, that the rabbits may habituate themselves to it with ease. Many would have it, that warrens should be inclosed with walls; but this is a very expensive method, and seems not necessary nor advisable; for we find but very few that are so, and those do not succeed at all the better for it. See RABBIT WARREN.

WART, a spongy excrescence near the eye of a horse.

This imperfection proceeds from congealed phlegm lodged there, which in time causes the eye to waste, or to grow little, if it be not remedied.

For the cure:

Put three ounces of powder of copperas into a crucible, on a charcoal fire, keeping the matter stirring from time to time; but take care to avoid the steams; continue a pretty smart heat till the matter grows somewhat reddish; then take it off the fire, and when it is cooled, break it, and beat the matter to a very fine powder; then incorporate four ounces of this powder with five ounces of album rasis, and make an ointment to be applied cold to the warts; anoint them lightly every day, and they will fall off like kernels of nuts, without causing any swelling in the least.

But you must take care to anoint nothing but the warts, nor must you work or ride the horse during the application of the ointment.

As soon as the warts are fallen off, which will be in a month's time, dress the sores with the Countess's ointment, and it will compleat the cure in a month more; for the sores are usually very deep where the warts are large.

WASPS may be destroyed by smoking the thatch or hollow tree with any stinking combustible article, or by scalding them with boiling water. By putting cyder, verjuice, wine, or any four or sweet liquor into a short-necked phial, you may catch them in it. Lay sweet apples, the entrails of beasts or fish, or treacle, in an earthen dish, mixed with a little water, or any liquid they like, and by that means you may destroy great numbers of them.

Thrusting pieces of lighted brimstone-rags into the nests of wasps, and immediately covering their holes with earth, will destroy them.

A copper coin of any kind held for a short time to the part wounded by a wasp, is an excellent remedy.

WASTE, a name given to such lands as are in no man's possession, but lie common.

WATER, a simple fluid, and liquid body, reputed the third of the four vulgar elements. Sir Isaac Newton defines water to be a fluid salt, volatile, and void of taste: but this definition Boerhaave sets aside, inasmuch as water is a menstruum, or dissolvent of salts and saline bodies, which does not agree with the notion of its being a salt itself; for we do not know of any salt that dissolves another. This last-mentioned philosopher, therefore, defines water, a very fluid, scentless, tasteless, transparent, colourless liquor, which turns to ice with a certain degree of cold.

Though water be defined a fluid, it is a point controverted among philosophers, whether fluidity be its natural state or the effect of violence. We sometimes find it appear in a fluid, and sometimes in a solid form; and as the former, in our warmer climate, is the more usual, we conclude it the proper one, and ascribe the other to the extraneous action of cold.

Boerhaave, however, asserts the contrary, and maintains water to be naturally of the crystalline kind; since, wherever a certain degree of fire is wanting to keep it in fusion, it readily grows into a hard globe, under the denomination of ice. Mr. Boyle is of the same opinion. Ice, he observes, is usually said to be water brought into a preternatural state by cold; but with regard to the nature of things, and setting aside our arbitrary ideas, it might as justly be said, that water is ice preternaturally thawed by heat.

If it be urged, that ice, left to itself, will, upon the removal of the freezing agents, return to water; it may be answered, that (not to mention the snow and ice which lie all the summer on the Alps, and other high mountains, even in the torrid zone) we have been assured, that in some parts of Siberia, the surface of the ground continues more months in the year frozen by the natural temperature of the climate, than thawed by the heat of the sun; and a little below the surface of the ground, the water which chances to be lodged in the cavities there, continues in a state of ice all the year round, so that when, in the heat of the summer, the fields are covered with corn, if you dig a foot or two deep, you shall find ice and a frozen soil.

Water is generally divided into salt and fresh, with regard to the ocean and rivers. But, according to Dr. Shaw, it seems divisible into as many different species, as the earth is into beds. Thus there are mineral waters of various kinds, according to the mineral substance they run over, and become impregnated with; though this impregnation sometimes happens in the way of vapour and exhalation. Water, therefore, in general, may be as mixed a body as earth, and perhaps neither of them naturally exists in any considerable purity.

In a general analysis of water, the Doctor found, 1. That common warm water throws up numerous little bubbles, and explodes, in the exhausted receiver of the air-pump; for which reason, water contains what may by way of distinction, be called æther or spirit.

2. It contains a merely aqueous part, distinct from æther and the sediment, as appears from distilled common water.

3. It contains a dry solid matter, which is either earthy or saline, as appears upon a full evaporation, and from the insides of tea-kettles, which, after long use, are lined with a stony matter, that beats off in flakes or crusty pieces.

Water is not only contained in the earth as in a reservoir, but likewise floats in the atmosphere. In both cases, it is actuated, rarefied, and put in motion by heat, so as to prove instrumental in producing effects. Thus it produces clouds, rains, dews, springs, and rivers. It refreshes the earth, recruits vegetables, and is the support of fish and other animals by conveying nutriment to all their parts. It is also the first and immediate instrument of fermentation, putrefaction, corruption, and change in all vegetable and animal subjects.

But the nature and uses of water will best appear from the following experiments:

1. That water is contained in many solid bodies, and to appearance in dry bodies, was proved thus: a piece of the hardest and driest bone being procured, and distilled in an earthen retort, with degrees of fire, a very large proportion of water, along with much oil and volatile salt, was obtained: whence it appears, that animal matters are resolvable into the four chemical principles, water, oil, salt, and earth. This experiment holds true even of the oldest hartshorn, the driest and hardest woods, earths, and pulverized stones.

Whence it also appears, that water may be concealed in solid bodies, and make a constituent part thereof; for it is not meant that water insinuates itself into the superficial pores of bodies, such as wood, skins, &c. so as to swell them in moist weather, and leave them shrunk in dry; but that it remains permanently intermixed as an essential ingredient, or as a part of solid bodies.

2. That water may be collected from the driest air, or in the hottest climate, was proved by the following experiment:

Half a pint of common water was put into a cylindrical glass, wiped perfectly dry on the outside; then was added to the water, two ounces and three quarters of pulverized and dry sal ammoniac; these were stirred briskly together; whereupon the water floating in the external air, was, by the coldness thus produced, condensed on the outside of the glass as the salt dissolved within, and trickled down in small veins, into the shallow basin set underneath to receive it.

This experiment holds in all climates and places of different heights where it has been tried; whence, by the law of induction, we make it universal, till any contradictory instance appears. Thus, therefore, it may hold in the most parched countries and hottest seasons, so as to afford an agreeable method of cooling potable liquors, and render them more refreshing. For if the containing glass of the salt and water be set in any liquor, the liquor will be cooled

cooled thereby; and if any considerable improvement could be made in the contrivance, it is observed, that it might, in some measure, serve to supply the thirsty traveller in parched deserts, and the sailors with fresh water at sea.

3. To determine the proportion of water contained in an assigned portion of the atmosphere, we are directed by the following experiment:

Having by means of the air-pump, and an exact pair of scales, found the weight of a certain quantity of air, contained in a large glass vessel, there was included therein a certain known weight of well dried potential cautery, whose property it is powerfully to attract the moisture of the air. The vessel was kept close stopped for several hours; during which time, the potential cautery was grown wet, in which state being weighed again, it was found considerably to encrease; which must be either owing to the water attracted out of the air in the glass, or to a condensation of the air itself into an aqueous fluid; for such a fluid might now by distillation be obtained from the matter thus run per deliquium.

It is observed that there is room to suspect, that if this experiment were made in perfection, a weight of water almost equal to that of the air included in the vessel, might be thus obtained, which might prove an extraordinary discovery, and shew what some have endeavoured to prove, that the matter of common air is little more than water.

4. That an earthy substance is naturally contained in water, was proved as follows. Three several glasses were filled with pure rain-water, spring-water, and Thames-water, and suffered to stand, close covered, for some days before they were exhibited. There was an earthy sediment then deposited in all the three, but most in the Thames-water, the sediment whereof was not only larger, but also more foul and muddy than in the rain-water; though here, also, it was dirty, perhaps, because not carefully collected; whereas, in the pump-water, it was white, scaly, flaky, and shining, like fine spangles of talc. This experiment is also universal, so far as it has been tried with care, and holds true of the waters of all species, and all countries, particularly in those called mineral waters, from which an earthy substance may usually be precipitated by air in a considerable proportion.

Certain experiments carefully made, and repeated, shew that the terrestrial matter naturally contained in water, has a principal share in the growth and encrease of vegetables; all the plants thrive in water appearing to enlarge their bulk in proportion to the earthy matter they draw from the water. Whence pure elementary water seems but a kind of vehicle to convey this nutrimental or substantial part, and deposit it in the vessels through which the water moves, in order to its general exit at the surface of vegetables. But we are not here to exclude the instrumental efficacy of the two other elements, fire and air. And this appearing to be the general office of water, in the whole animal and vegetable kingdoms, the conveyance or distribution of the alimentary matter to all their parts, it may be proper to consider its physical properties, which would wonderfully fit it for this office.

This figure of its component parts appears to be smooth and spherical, like those of quicksilver; whence it becomes extremely moving and penetrating. Thus it readily enters the pores, leather, skins, chords, musical strings, &c. thus likewise it becomes capable of moving and agitating particles of matter less active than itself, and so proves the more immediate physical agent of fermentation, putrefaction, solution, &c. and thus it also conveys earthy and saline matters through our filters of paper, stone, &c. and even raises some proportion of them in distillations. Its particles likewise appear to be extremely minute, and so have a large share of surface.

Hence water is admirably fitted for a solvent, or for readily entering the pores of salts, and coming into full contact with all their particles; and thus it will pass when air cannot, on account of its moisture, or lubricating power, whereby it fastens mucilaginous matters, and will therefore soak through the close pores of a bladder.

The specific gravity of water, and consequently its goodness by its lightness, are to be directly judged of by the hydrostatical balance. This experiment is a good substitute for several other ways of examining the purity and goodness, of waters both common and mineral; for it appears by numerous instances, that light waters are, *ceteris paribus*, the best, purest, and wholesomest. That water is accounted

best and wholesomest, which is not only the lightest and freest from earthy sediment, but that which is most spirituous; and these properties are usually found in pure rain-water; that being naturally distilled from the ocean and rivers, or by the heat of the sun raised up into the atmosphere, from whence it is returned much after the manner of common distillation.

From the preceding, and other experiments of Dr. Shaw made upon water, he deduces the following axioms:

First, we have seen, That water is naturally contained in some of the driest and hardest bodies, and in the driest air. 2. That itself naturally contains an earthy substance. 3. That it is the proper menstruum of salts, dissolving more of one and less of another. 4. That one good sign of its purity and wholesomeness, is its levity. 5. That the ingredient of a mineral water may be discovered by chemical expedients: and, 6. That mineral waters are imitable by art, from such discovery.

Secondly, That water is of infinite use in all the works both of nature and art, as without it there could be no generation, nutrition, or accretion, performed in any of the animal, vegetable, mineral, marine, or atmospherical regions. The blood could not flow in the veins, the sap in the vessels of vegetables, nor the particles of minerals concrete and grow together without water. It is this that makes the largest part of our blood, our drink, and other aliments. There could be no corruption, fermentation, or dissolution, carried on without it; no brewing, no distilling, no wines, no vinegar, no spirits, made without it.

Thirdly, That we meet with water under an infinite variety of forms, and in an infinite variety of bodies, as that of air, vapour, clouds, snow, hail, ice, sap, wines, blood, flesh, bone, horn, stone, &c. through all which it seems to pass unaltered, as an agent or instrument that suffers no alteration by re-action, but remains capable of resuming the form of water again upon occasion.

Fourthly, That water, in its own common state, appears to be a combination of all the elements together, as containing a quantity of fire, which keeps it fluid: a quantity of air, and a quantity of earth; whence it can be no wonder that water alone, as it appears to the senses, should suffice for vegetation in some cases, where little earth is wanted, or for supporting animal and mineral life, where no great degree of nutriment is required; and hence it proves a gluten, or cement, to some bodies, and a solvent to others: thus it consolidates brick, plaster of Paris, stone, bone, &c. but dissolves salts, and subtile earths approaching to salts, and becomes the instrumental cause of their action.

Fifthly, That water conveys nourishment, or a more fixed and solid matter, to the parts of vegetables, where having deposited it, the finer fluid perspires into the atmosphere, which gives us the physical cause of the dampness and unwholesomeness of woody countries, as they remarkably find in America. For all large vegetables act after the manner of forcing-pumps, and continually draw in large quantities of water at their roots, and discharge it at their leaves, which intimates a method of collecting water in dry countries, and likewise of making salt-water fresh.

Sixthly, That the water in passing through plants, after having deposited its more terrestrial parts, does not always go off pure, but impregnated with the finer effluvia, or more subtile particles of the vegetable; thus making an atmosphere round every plant, according to its nature, odoriferous or otherwise, which supplies us with a rule for procuring the odoriferous waters of vegetables by distillation.

Seventhly, That the particles, not fine enough to go thus along with the water, are left behind upon the surface of the leaves and flowers of plants, being now thickened, or strained from the moister plants, and remaining in the form of honey, manna, gums, balsams, &c. according to the nature of the vegetable. And hence appears the physical cause of plants proving more odoriferous and sweet when the weather is both warm and moist, as immediately after a summer's shower.

Eighthly, That the chemical operator should form to himself an hygrometer, for the service of his laboratory, to determine the proportion of water at all times contained in the air, which continually mixes with his preparations, differently augments their weight, and promotes or hinders many of his operations.

Ninthly, That pure water makes the largest part of mineral-waters, where it is impregnated as a menstruum, with

Fig. 1.

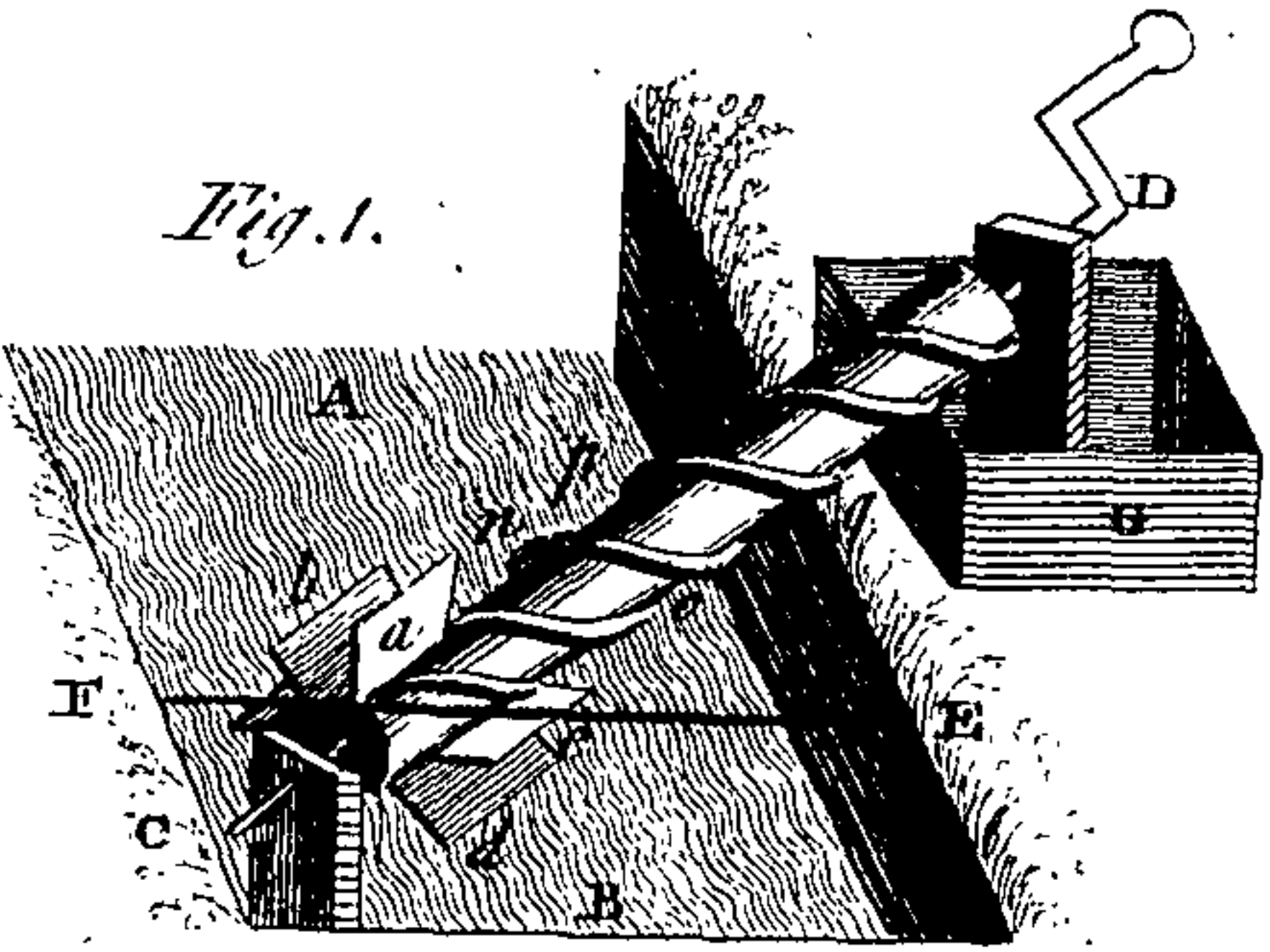


Fig. 3.



Fig. 4.

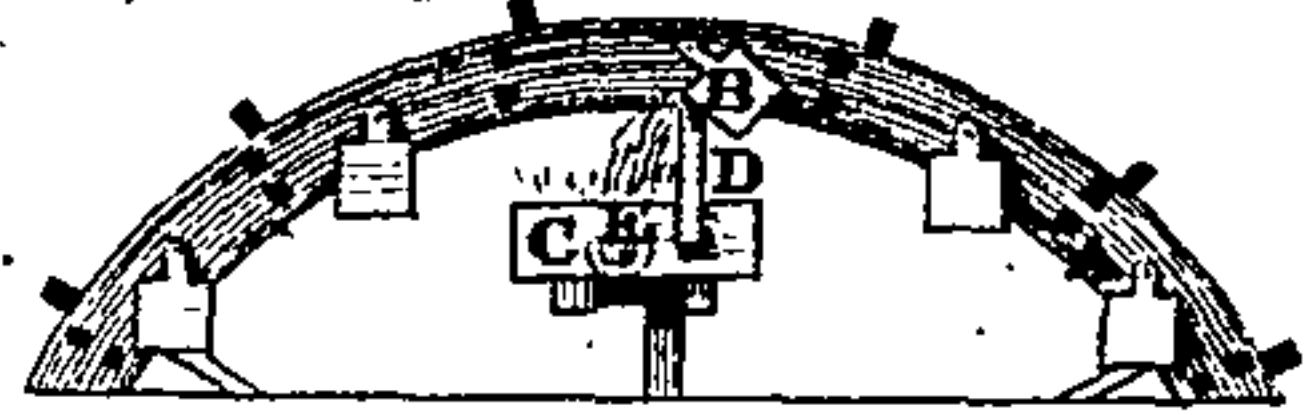


Fig. 2.

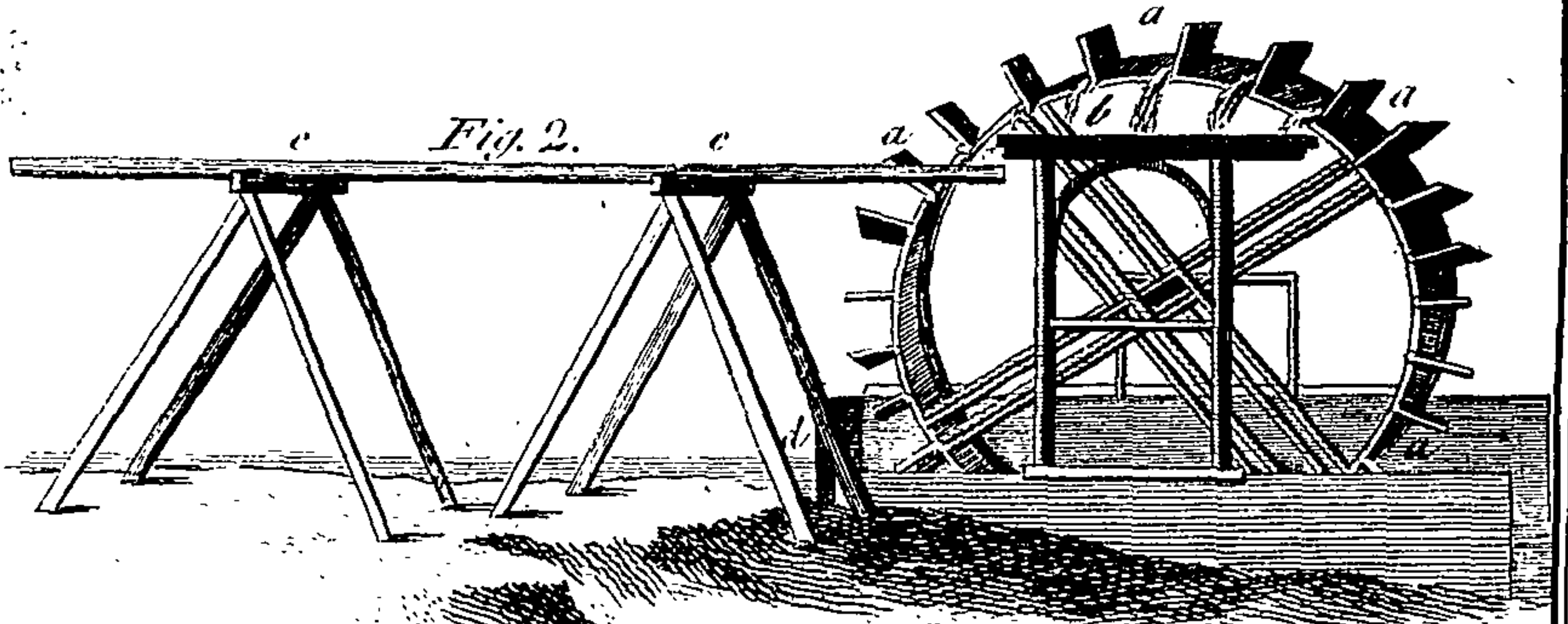


Fig. 5.

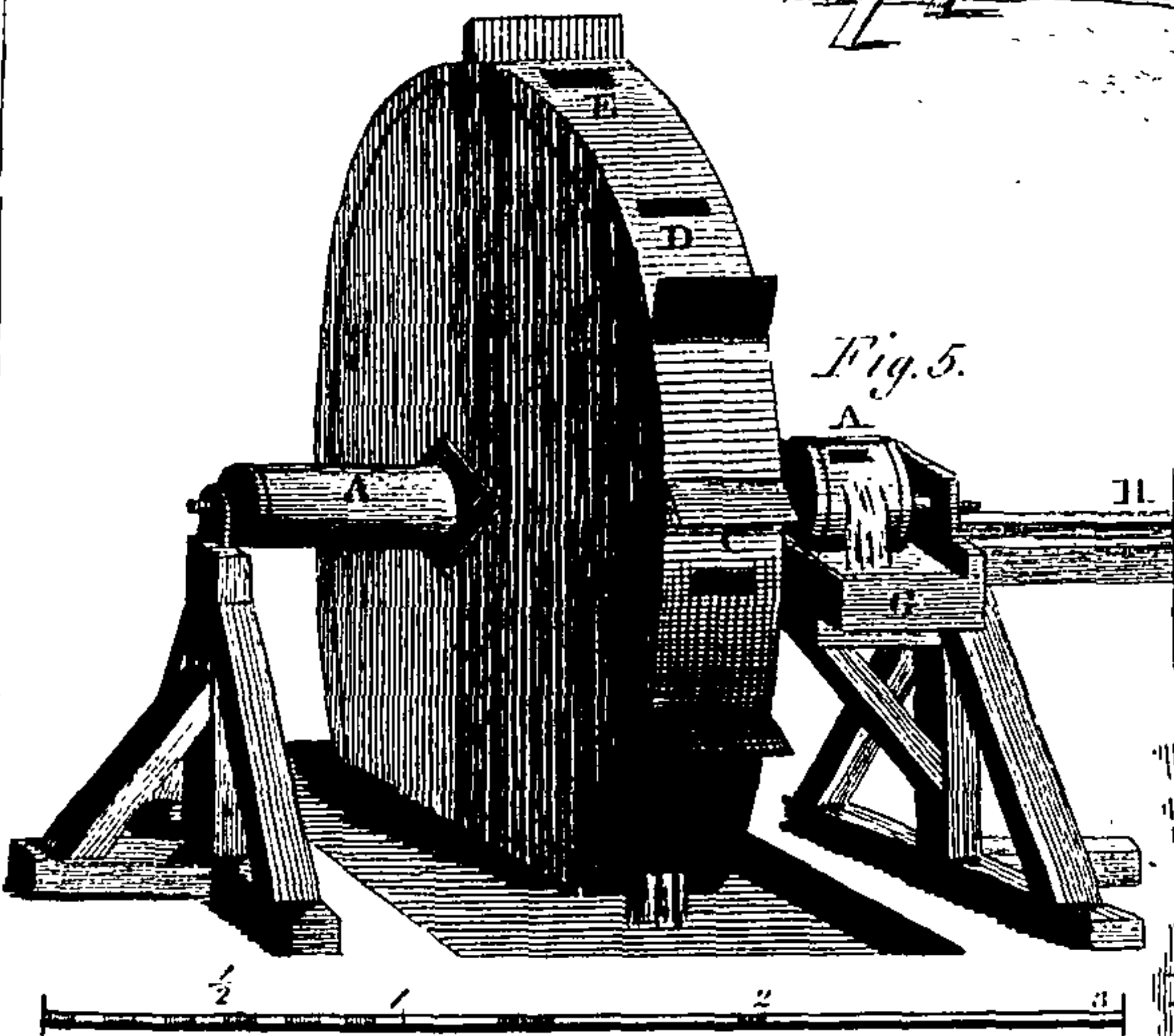


Fig. 6.

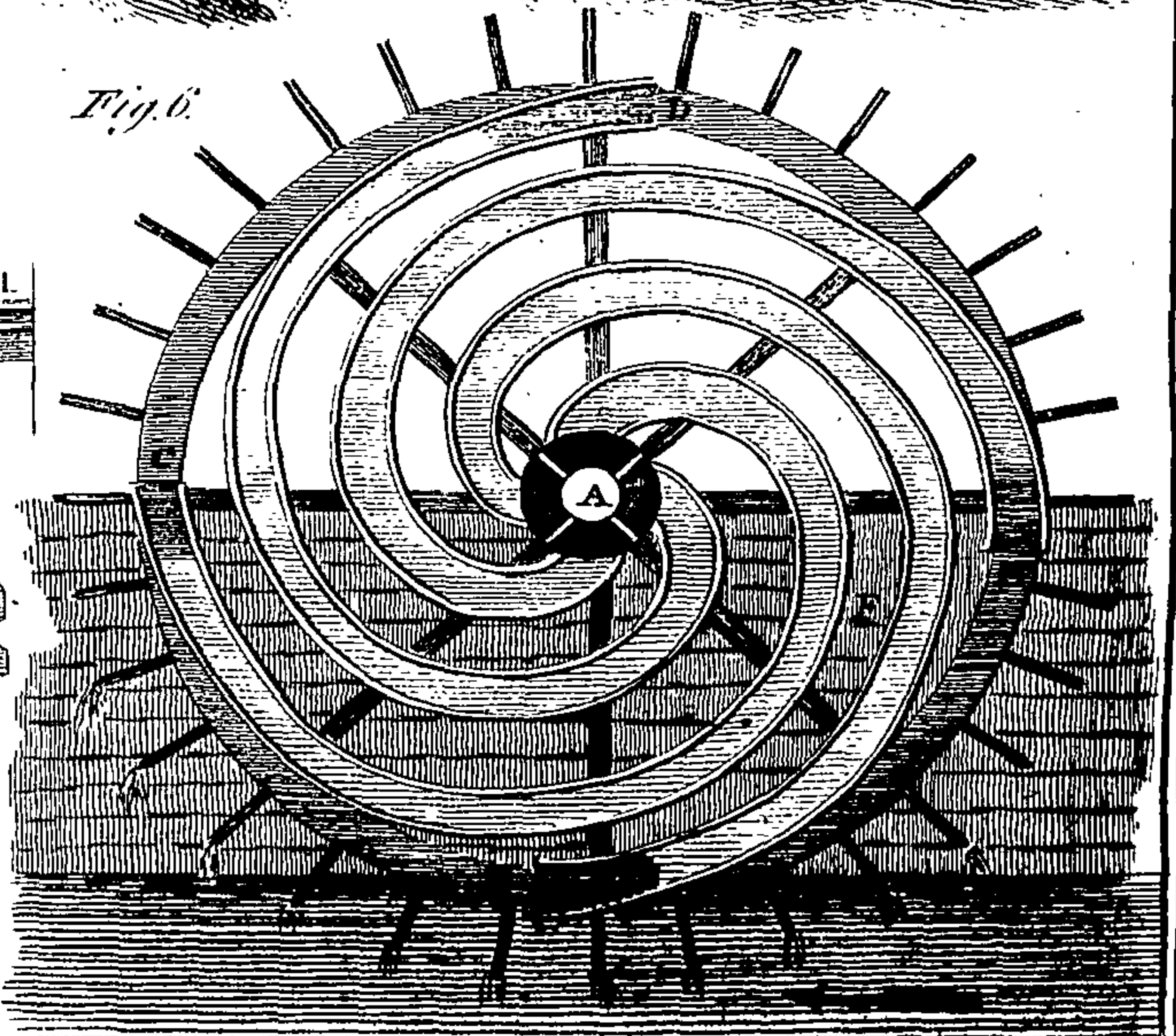


Fig. 7.

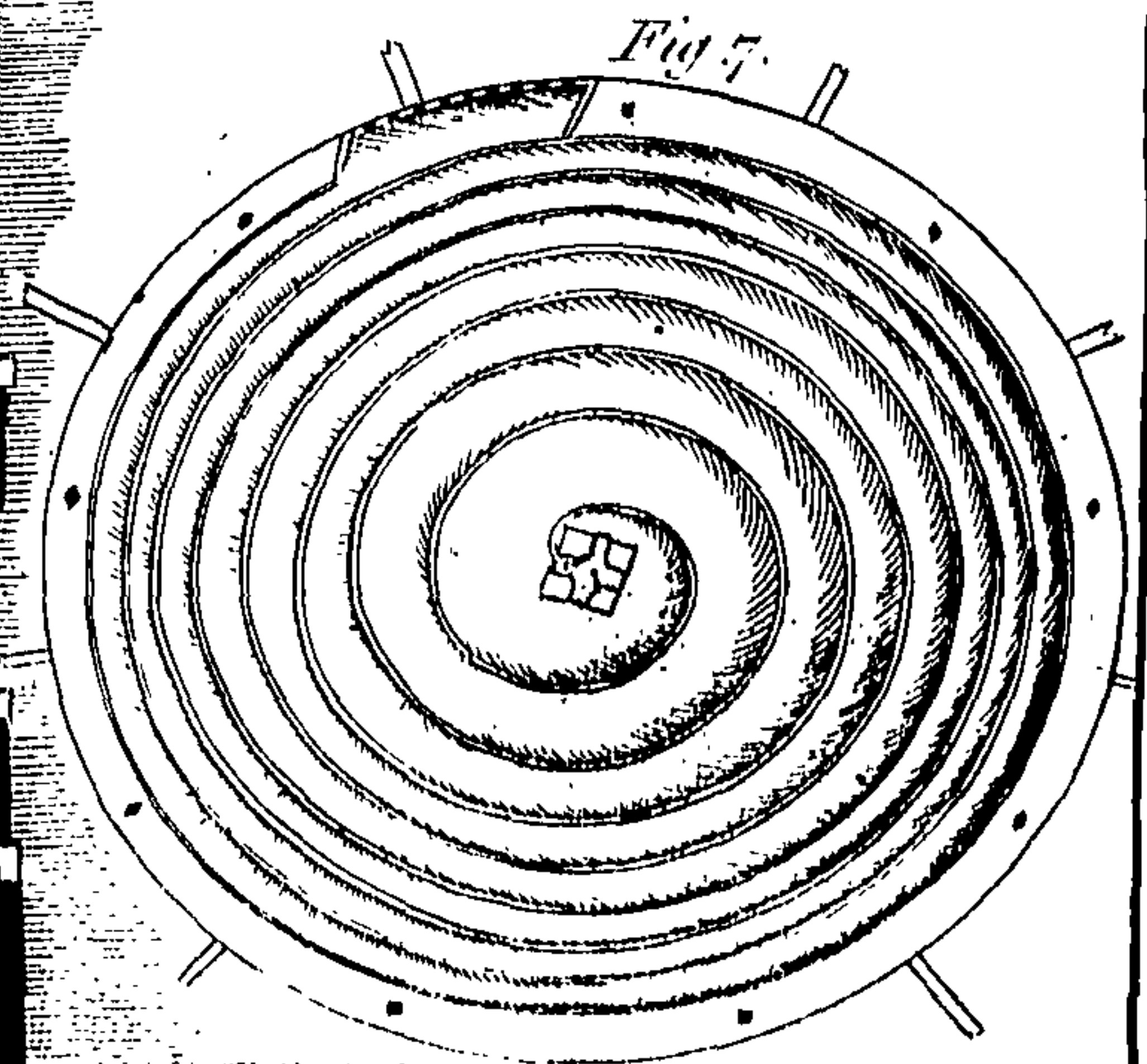


Fig. 8.

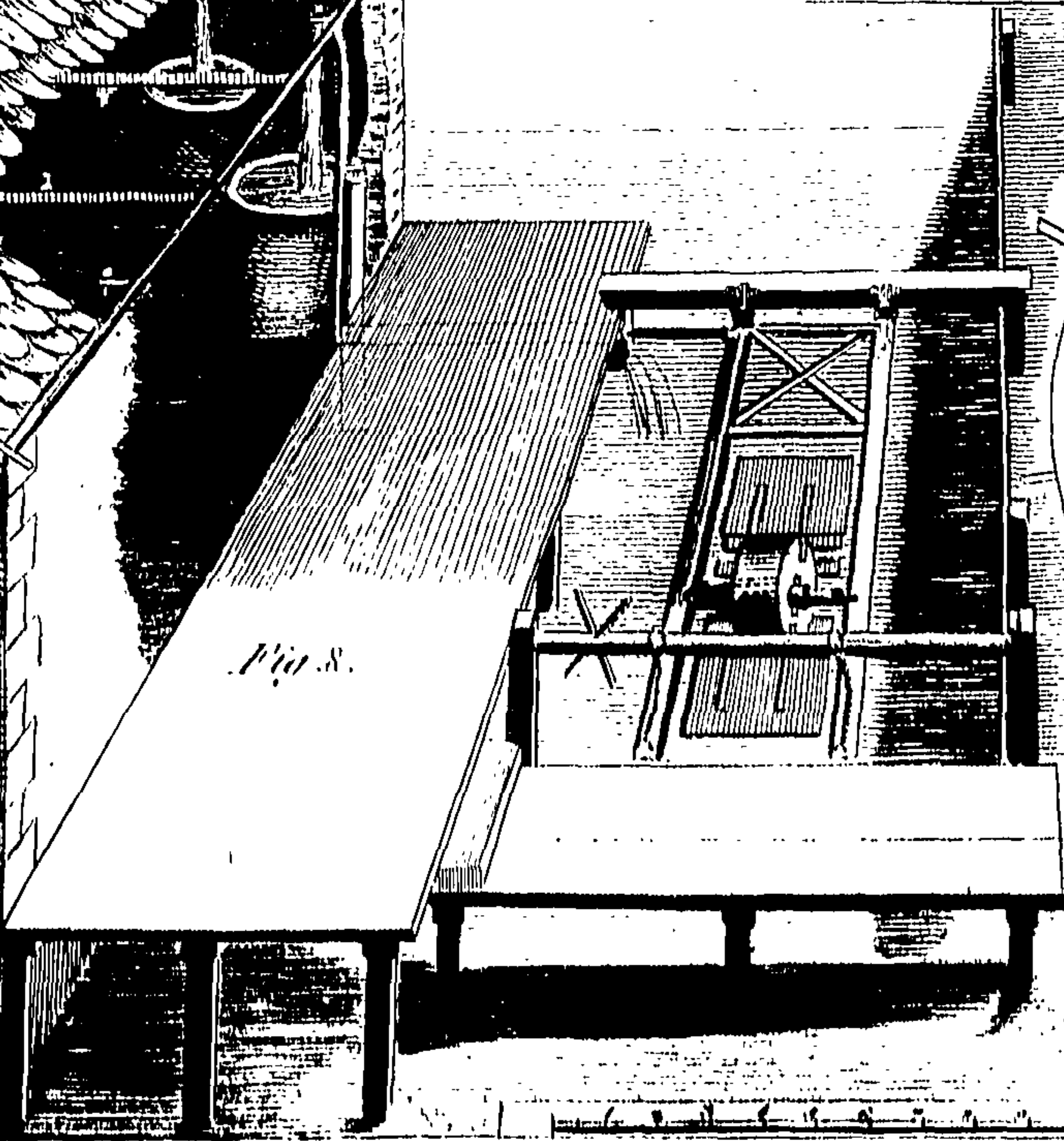
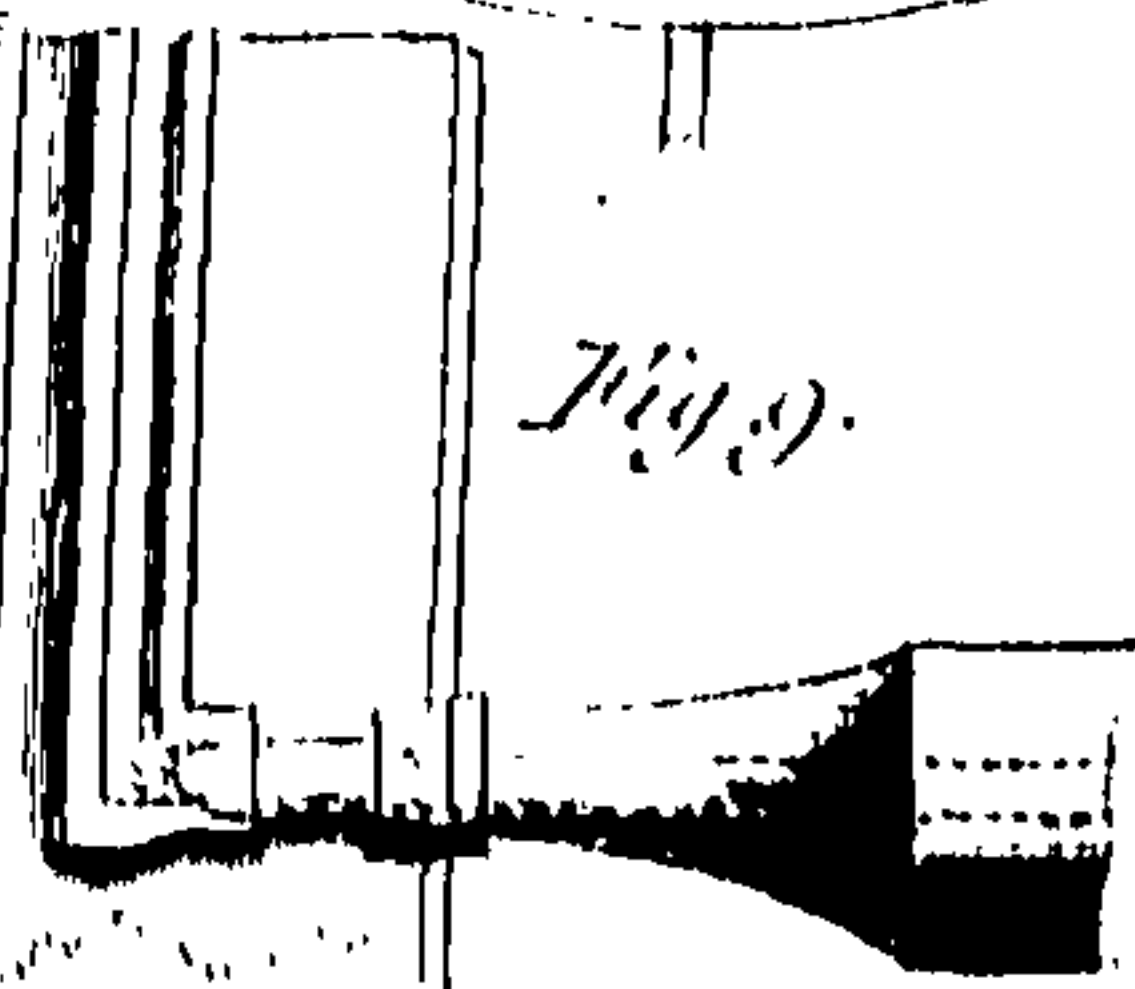


Fig. 9.



with several ingredients that it dissolves or drinks up in its passage through the earth.

Tenthly, and lastly, The preceding enquiry affords considerable light for discovering practicable ways of making sea-water fresh and potable, and of preparing waters by art, so as to render them fitter for the common oeconomic uses, and the service of many particular arts.

But though water is absolutely necessary to the growth of vegetables, and experience hath long evinced the great advantages arising from the overflowing of pastures, it is but of late years that this very profitable improvement is become pretty general in England; nor is it, as Mr. Worlidge observes, "yet carried to near the perfection it might be advanced unto, if the following obstructions were removed.

"1. The several interests that are in lands bordering on rivers, hinder very much this improvement, because the water cannot be brought over several quantities of land so circumstanced, but through the ground of ignorance and cross neighbours, who will not consent thereunto (though for their own advantage also) under unreasonable terms; and some will not at all. Others, again, are not by law capacitated for such consent.

"2. A great and pernicious impediment to this improvement is the mills that stand on many fruitful streams; prohibiting the laborious and ingenious husbandman to receive the benefit and advantage of such streams and rivers, which carry in their bowels much wealth into the ocean, while the mills themselves yield not a tenth of the profit to the owners, that they hinder to their neighbours, and their work may be as well performed by the wind, as by the water.

"3. Another grand impediment is the ignorance of the countrymen, who are commonly possessed with a foolish opinion, that the water leaves all its fatness on the ground it first flows over, and therefore will not benefit the next; which is most untrue; for I have seen meadows successively drowned with the same water, to almost an equal improvement for many miles together. It is true, the water leaves behind it a great part of the fatness which it hath washed from the hills and high-ways in the time of great rains: but we find by daily experience, that meadows are fertilized by overflowing, as well in clear and dry weather, as in rainy, and that to a very considerable degree. The clearest and most transparent streams will improve even ordinary lands, so much as to render them very fertile meadows.

"4. From a greedy and covetous principle, the grass is suffered to stand so on the watered meadows, that it becomes much discoloured, grows haulmy, and is neither so toothsome nor so wholesome, as that of unwatered meadows.

"5. The former of these impediments might easily be removed by a law, which would be of very great advantage to the kingdom in general. The latter can be remedied only by the example of such industrious and worthy persons as understand better things: the generality of the world being rather introduced to an ingenious and profitable enterprize by example, than by precept: although some are so sordid and self-willed, that neither apparent demonstration, nor any convincing argument whatsoever, can divert them from their bias of ill husbandry."

The industrious Swiss, sensibly attentive to every means of benefiting their deservedly cherished country, have thought this branch of husbandry of sufficient importance to propose it for the first premium offered by their truly laudable Society at Berne, for the year 1760: and I gratefully confess myself indebted to the dissertations produced thereby, for several of the following remarks:

Water not only acts as a vehicle to the nourishment of plants, but also carries with it many particles which enrich the soil; especially after heavy rains. It then deposits a fertilizing sediment, which turns the mould to a blackish colour. The common saying, that watering makes the stones disappear, is true; not so much from their sinking into the earth, as for their being covered by the new supply of mould brought by the slimy muddy water, particularly after great rains. Watering likewise promotes the putrefaction of every vegetable and animal substance found in the earth, and thereby contributes greatly to meliorate the soil underneath the sward.

Plants which grow on dry pastures contain richer and more nourishing juices, than those which grow in moist places. Care should therefore be taken, that the quantity of moisture brought upon the pasture, be only such as shall give vigour to the plants, without over-charging their

vessels. In order to do this, every part of the pasture should be watered equally; and as little water as possible should be suffered to go where the land is naturally moist.

Extreme heat should also be avoided in watering; because heat draws the moisture too hastily up into the plant, which is thereby filled with a watery juice, rendered of so tender a texture, as easily to be killed afterwards by drought or cold.

If the spring proves dry, pastures may be watered as soon as the frosty season is over; and this may be continued till the grass begins to shoot. But if the winter has been severe, and the earth remains moist, no current of water should be admitted, till the earth loosened by the frost is settled, and the surface become pretty dry: for even the gentlest stream would carry off the fine mould loosened by the frost. After that the grass has begun to shoot, and the weather is become mild, the water should be administered more sparingly; that is to say, in such proportion only, as just to push the grass gently on, till it has made such a covering as can shelter the earth from the too great power of drying winds, or of a scorching sun. Watering should afterwards be used with great caution, and only in case of extreme drought; nor even then, unless the water be perfectly clear and sweet, lest it should foul the grass, or give it a bad taste. If it be admitted sparingly before the hay is cut, it will make the grass stand the better to the scythe.

For a little time after the hay is made, the water should be admitted only in the night; because the weather then generally is very warm: for it is observed, that rain which falls with a hot sun, or a hot sun that comes on a heavy dew, is prejudicial to plants. Watering, under the same circumstances, will have the same effect; to prevent which, the prudent husbandman will let in his water only in the evening, and will withdraw it again before the sun gets up. It is continued at this season only till the grass begins to shoot vigorously; and in case of very great drought it may be repeated, but very sparingly.

If a second crop of hay is made, the water may be used more freely; as the weather is then become cooler, and the earth is generally very dry. This flooding will bring up a plentiful after-math. If the second crop of grass is fed off, the water should be renewed in the same manner: only care should be taken not to suffer cattle to feed on the ground while the water is upon it, because their poaching would destroy the roots of much of the grass, and leave the surface uneven; which should be avoided in the pasture.

The latter end of autumn is the season in which watering is the longest continued: and considering the dryness and parched state of the earth at that time, this practice seems rational: for the water then, not only supplies the moisture wanted in the earth, but it dissolves every substance soluble in water, and thereby converts to an additional manure, what might otherwise have remained long in its original state. Care should, however, be taken, to drain off the water before the season of strong frost is expected; because frost is observed to destroy all kind of vegetables much more when the plants are full of sap, than when they are in a dryer state. We may easily comprehend that it must have this effect, when we consider with what force it breaks every vessel containing water exposed so as to be frozen: for frost dilates all fluids to such a degree, that the vessels in which they are must be broken thereby. Hence it is that succulent plants soon become a putrid mass after a hard frost: and thus it is that the strongest trees are sometimes burst with a loud report.

When the water is brought to the desired height, the main channel should be cut, with such a descent as only just to keep the water in a gentle motion. The channel should be made in the highest part of the pasture, and proportional to the quantity of water necessary to be introduced. If a hollow intervenes between the place at which the water is brought into the field, and another rising ground in that field, it will be worth the farmer's while to convey it across that hollow, by pipes made of wood, or any substance, laid either horizontally over that hollow, or underneath it. The motion of the water in this horizontal channel should be different, according to the quality of the ground. If it is a strong earth, the channel may be cut nearly horizontally; but if it is a light loose soil, a quicker current should be given to the water, in proportion to the degree of lightness of the earth; or great part of the water will otherwise be lost, by sinking into it. In a light soil of this kind, it may be proper to line this main channel with brick or stone, well cemented with lime, to hinder the water from escaping through the

erevices; or at least to cover it with clay well rammed. As to the degree of descent most proper for the main channel, in order to give a current to the water, M. Bertrand, to whom we owe one of the ingenious dissertations on this subject in the memoirs of the Berne Society, observes, that Vitruvius required six inches in an hundred feet, which is a great deal too much: but that the moderns, who have made the most exact experiments in this respect, are satisfied with two inches in six hundred feet, when they cannot have more, and recommend particularly the avoiding all sharp angles in the winding of the channel, and the making of its bottom quite smooth and even. He adds, that this is nearly the declivity of the aqueduct of Rocquancourt, by which the water is conveyed to Versailles; the distance three thousand four hundred yards, and the slope, in all, only three feet.

The main channel should be of breadth, rather than depth, sufficient to receive all the water that is intended to be conveyed through it, and that breadth should lessen gradually as the water is carried off in lesser channels, in order that the water may press into those smaller ducts, which are to issue all along from the chief. The lesser channels should be as shallow, and as numerous, as can be: for the more equally the water is distributed over the grass, the greater will be the improvement. They should be made particularly wherever the water collects itself into a stream: for though cutting so much turf may seem to waste a great deal of land, yet it proves not so in the end; because the quicker the water runs over the grass, the more it benefits the pasture.

To keep the channels in repair, they should be frequently cleaned, especially after every cutting of the hay. The slime then taken out of them should be spread upon the pasture, and the next growth of the grass will be greatly improved thereby. Care should also be taken to have drains to carry off the water, so that none of it may stagnate upon the land.

The best way of watering a flat meadow, which is usually surrounded with a ditch, is to stop the out-let of the ditch, and, bringing in a quantity of water, to overflow the whole meadow, for such time as shall be judged necessary to moisten the earth sufficiently: but the water should not be continued upon it so long as to wither the grass. If this can be done in a rainy season, it will be so much the better; because the water will then be loaded with the enriching mud and slime washed down from the higher grounds.

The first heavy rains which fall in the latter end of the autumn, and which carry with them the rich particles of putrified animals and plants, are thought to be more fertilizing than at any other season of the year, and are therefore brought into the pasture, as often as the absence of the cattle fed on them will permit.

The next best to rain, is clear and sweet spring-water, flowing from a copious source. Here it is generally objected, that spring water is hard, and therefore not fit for the nourishment of plants. But Dr. Home, who judges otherwise, expresses himself thus on this very occasion. "Is not hard water more nourishing for vegetables than soft water? I imagine that the salt of vegetables enters their vessels in such a form as hath the salt which is found in hard waters. The salt of hard waters seems likewise to be of the nitrous kind, of which the nourishment of plants is all supposed to be. This query thwarts the general opinion; for no gardener will make use of hard water, if he can avoid it. I watered some plants with it, and thought that they grew better than those which were watered with soft water."

This is confirmed by an ingenious correspondent of the Berne Society, who made several experiments on the qualities of different waters, and found that their greater or less hardness made very little difference in their effects, when used for watering of pastures. The water of an excellent spring, which, upon trial, was found to be hard, fertilized greatly the pastures upon which it was let in.

Spring water may be used later in the winter, than any other, because, being warm, a mild frost will not freeze it, even when expanded on the pasture. It should however be turned off soon enough to let the earth become a little dry before severe frosts set in. It may be used earlier in the spring than other water, and to better advantage, by reason of the warmth which it communicates to the ground while it flows: and it becomes extremely proper in the summer, because it cools during the night (the only time for watering at that season) the heated soil, and grass scorched by the power of the sun.

The equal warmth of spring-water, is what renders it peculiarly useful for watering pastures. The last quoted

correspondent of the Berne Society tried its heat, in Switzerland, on the twenty-sixth of May, when the earth had been very little warmed by the sun, after a long winter's cold. He then found M. de Reaumur's thermometer, placed in the spring of water, stand at eight degrees and a half (equal to forty-seven and a half of Fahrenheit's) above the freezing point. On the fifth of July, in the evening, when the heat of the air was very great, Reaumur's thermometer, again placed in the spring, stood at nine degrees and a quarter (equal to forty-nine of Fahrenheit). He afterwards tried whether the warmth of the spring was considerably increased towards the end of the summer, when the earth was extremely heated: but even then, Reaumur's thermometer scarcely reached ten degrees (equal to about fifty of Fahrenheit's). By this we see, that springs which yield a full and constant stream vary very little in their degrees of warmth.

For the same reason it also is, that a perpetual verdure reigns around such springs, even during the hardest frost; and if their water could be preserved from freezing when spread over a field during the winter, it would be right to let them in upon pastures in that season: but as they soon lose their heat when dispersed over the grass, this is by no means advisable.

Experience has taught the inhabitants of the Alps (and the same will hold equally true in all mountainous countries), that it is not advisable to water pastures with floods which arise from melted snow, or with the water of rivers fed thereby. One reason which seems to render the water that descends from mountains perpetually covered with snow the less useful for watering pastures, is, that as all vegetation is at a stand in such places, no vegetable matter can be mixed with this water; and it therefore cannot communicate the fertility which arises from water fraught with those rich substances.

We are frequently told of correcting the crudity of water, by making it turn a wheel, or putting it otherwise into violent motion: but I know not what good effect this can have.

What are commonly called barren springs, are sometimes corrected by mixing dung with their water in ponds made higher than the pasture intended to be watered. Yet this, though an old custom, is liable to some objections; one of which, in particular, is, the water will deposit its richness on the first part of the pasture over which it flows, and therefore improve the grass very unequally. But if dung hath this effect, it will answer equally well, if it be spread upon the land. Care should indeed be taken that the current of the water be very slow over a pasture newly dunged; because the fertilizing particles of the dung may otherwise be carried off by the stream, before they can have had time to penetrate into the earth.

When dung, marle, or lime, is laid on a pasture which has a considerable descent, the best way is to lay a larger proportion on the higher parts; because the common rain-water will wash some of their richer particles down to the lower.

As clayey soils retain water, and by that means chill the plants growing on them, they are the least fit for watering of any. If the water abides on them, they become poachy; and when dried again, they gape, and become so hard that no plant can pierce them. Some sensible farmers have likewise observed, that their clayey lands have always yielded less grass in wet years, than when the season has been dry; which is a manifest proof that a soil of this kind does not admit of watering, unless it be a little, in case its surface has become hard after the hay has been taken off, or when the grass is short. Such land are fitter for arable, if their situation permits it.

Hazel earth, which is a loam mixed with gravel, and of a clayey nature, is the strongest soil that can be watered with propriety; and that this has been surprisingly benefited thereby, is evident from several instances given in the Memoirs of the Berne Society, even of large tracts of such ground that have been vastly improved by this means: but I shall mention here only the following.

"In the summer of 1758, part of the pasture ground belonging to a farmer in Switzerland was so entirely covered with stones and gravel, by the sudden overflowing of a stream, that it looked like a bank of sand. As the removing of this quantity of stones and gravel would have cost a great deal of labour and expence, the owner of the land carried off only the largest stones, and threw over the gravel a reddish earth taken from a neighbouring hill; but so thinly,

thinly spread, as only to fill the interstices between the pebbles, without entirely covering them. He then sowed this spot with hay seeds, and let in upon it the waters of an adjacent spring and a neighbouring rivulet. These waters were let in sparingly at first, till the grass began to appear, and after that they were flowed more abundantly. The consequence of this prudent conduct was, that the grass thus raised, bore cutting once the first year, and after having been mowed twice in the second, promised an excellent after-math at the time when this account was written, which was in the beginning of the autumn of that second year. The very first year's crop grew so prodigiously, that the grass was lodged, even though the pebbles were then felt under foot, if one trod upon it." — See the article MEADOW.

When the land is above the level of the adjacent water, recourse must be had to some engine to raise it to a proper height, in order to overflow it; though this will be attended with a very considerable expence, especially at first.

The oldest instrument used for this purpose is known by the name of Archimedes's water screw, and is thus described by Mr. Emerson :

C p D (Plate XXVII. fig. 1.) is a cylinder which turns upon the axis C D. About this cylinder there is twisted a pipe, or rather several pipes, *n o, p q*, running spiral-wise from end to end. This cylinder is placed higher at one end, D, than at the other; and its use is to screw up the water from the lower end to the higher. A B is a river running in the direction A B, *a, b, c, d*, are several floats fixed to the cylinder. E F is the surface of the water. As the cylinder stands in an inclined position, the upper floats *a, b*, are set out of the water, and the under ones *c, d* within it: so that the water acts only upon the under ones *c, d*, and turns about the cylinder, in the order *a, b, c, d*. By this motion, the water taken into the spiral tubes at the low end is, by the revolution of the cylinder, conveyed through these pipes, and discharged at the top into the vessel G. If A B is a standing water, there is no occasion for the floats *a, b, c, d*; and then the cylinder is to be turned by the handle at D. Instead of the pipe, a spiral channel may be cut round the cylinder, and covered close with plates of lead. The closer these spiral tubes are, the more water is raised: but it requires more force. Also the more the cylinder leans, the more water it carries; but to a less height.

Where a considerable quantity of water is to be raised, a greater force is requisite, that can be applied to such a handle. Her royal highness the princess dowager of Wales caused an instrument of this kind to be erected at Kew, by the ingenious Mr. Smeaton, and by means thereof a sufficient quantity of water was supplied, for all the ponds, and other uses, in that elegant and extensive garden: but it is there worked by horses.

The most common engine for raising water is the Persian wheel, of which Mr. Worlidge gives the following description :

"This wheel is made much after the manner of that of an under-shot mill, viz. with a double ring, into which are let two pins, on which the floats are fastened. These floats are made hollow; the half that is the most remote from the wheel, holds the water which is taken in at the open place, above the middle of the back of the float, and as the wheel goes round, and the float laden with water rises, so the water, by degrees, tends towards that part of the float which is next the wheel; and as the float surmounts the cistern or receiver, the water empties itself into it, every float succeeding the one the other, emptying itself into the receiver: so that if one float contains a gallon of water, and there be thirty floats on the wheel, at one motion round, it delivers thirty gallons of water into the cistern. Such a wheel will be about fifteen feet diameter, the floats are eighteen inches distance, and will deliver the water at eleven or twelve feet above the level of your stream, and will go four times round in one minute, and carry up about one hundred and twenty hogsheads of water in an hour, with twelve or eighteen inches penning or stopping of but an ordinary current of water, which will water very well thirty or forty acres of land; for if your land be cold and clayey, too much water does it hurt; and if it be light, warm, or sandy, a little water does it much good. It is also to be observed, that this motion is constant, and will last many years without repair, so that it stands not still, for one side to dry and grow lighter than the other: also

observe, that the slower it moves, the better it delivers the water.

"The view of this wheel we have in Plate XXVII. fig. 2. *a a a a* signify the wheel; *b* the cistern that receives the water; *c c*, the trough standing on trestles, that conveys the water from the cistern to the place you desire; *d*, the hatch, or pen-stock that bays up the water to a reasonable height, under which the water drives the wheel; *e*, (fig. 3.) one of the floats presented open to your eye, apart from the wheel; *f*, the place that is to receive the water; *g*, the open place out of which the water issues; *h h*, the two pins or ledges rivetted on to the fore-side of the float, and where-with you are to fix the float to the two rings of the wheel. These, or such like wheels, are much used in Spain, Italy, and France, and are esteemed the most easy and advantageous way of raising water in great quantity, to any height within the diameter of the wheel, where there is any current of water, to continue it in motion, which a stream will do.

"How many acres of land lie on the declining side of hills, by the sides of rivers, in many places where the water cannot be brought unto it by any ordinary way! yet by this wheel placed in the river, may the land be continually watered, so far as is under the level of the water when raised."

Instead of raising the water by means of the hollow floats placed around the outer circumference of the rim of the wheel, as here described; M. Belidor proposes, for wheels of this kind, to raise it in buckets placed at equal distances upon the side of the rim of the wheel, and suspended by a pin, upon which they play, as at A fig. 4. When by the rotation of the wheel, one of these buckets comes to B, which is the summit of the wheel, the upright piece D, which is fastened to the sides of the trough C, turns that bucket upon its side, and thereby makes it empty itself into the trough C, from whence the water is discharged into a receiver at E.—As these buckets keep full of water till they are carried up to the top of the wheel, where they are turned over, a much greater quantity of water may, undoubtedly, be raised by them, than can be by the floats of the Persian wheel, from which much must be spilled as it is carrying up. The size of these buckets should be adapted to the force of the current of water they are to take up.

Another wheel for raising water, though not so great a height, is represented in fig. 4. This engine was first invented by M. de la Baye, of the Royal Academy of Sciences at Paris, and was used with great success by the honourable Mr. Hamilton, at his seat at Pain's-hill in Surry, where that gentleman has shewn how far a barren spot may not only be rendered useful but even an ornament to the adjacent country.

This machine consists of a wheel whose size is adapted to the height to which it is intended to raise the water. A perspective view of this machine is represented fig. 5. and its internal parts fig. 6. The wheel turns upon its axis at A, and has several curved pipes, B, C, D, E, fixed to it, as represented in the figures. The mouth of each pipe ascends as the wheel is turned round by the stream, in the direction indicated by an arrow, and the water descends from C towards F, till it reaches the hollow axis, A A, from the opening, at the end of which it is discharged into the trough G, and thence conducted by troughs, as H, or other channels, to whatever place it may be wanted.

But if there be a necessity to raise the water higher than the axis of the wheel, we would recommend an ingenious machine, used for above twenty years at Zurich, for supplying a large dye-house there with water from the Limmat, and of which a description in the German language appeared in the third volume of the Zurich Acts, from whence the following account is translated.

The wheel itself differs little in appearance from other water-wheels. Its diameter exclusive of the ladle-boards, is not quite three feet. It is coated all over with tin plates, and forms a short cylinder, or rather drum, of the above diameter, and one foot thick. On its periphery the ladle-boards are fixed, as in other under-shot water-wheels, and by means of which it is put in motion by the stream. It turns on a hollow axis (like the last machine) of proportional thickness and length, and has one of its flat sides applied against a projection, or ledge, made round the axis, to which it is pressed close, and held fast by a wedge driven through the axis at the other side. That part of the axis, which passes through the wheel is square, that the wheel may

may not slip, or be able to turn, without turning the axis with it: the remaining part of it is round. The wheel is hung in the water to about one third of its height, and supported in a moveable frame, so that it can be lowered, raised, or even taken out of the water at pleasure. In the periphery of the wheel are holes, by which the water enters. The axis turns as usual, on two pivots, one of which is of brass, considerably larger than the other, and hollow from end to end, communicating with the canal in the axis. The hollow pivot, which may be considered as a brass pipe, has its end fitted close to a leaden pipe, in which it turns. The leaden pipe by a double bending is confined to the wall of the dye-house, where it is bent perpendicularly upwards, and rises along the wall to the height of ten feet above the axis; it is there bent again under the eaves, and continued into the dye-house itself.

The singular and remarkable operation of this little wheel depends solely on its internal structure. The water entering at the circumference of the wheel, runs in a square spiral canal, which passes round the wheel, and consists of a number of circumvolutions, within one another, like the spring of a watch, till at length it comes into the axis. A necessary condition here is, that each of the inner circumvolutions be of the same magnitude with regard to their content, as the outer one; or that the width of the spiral canal be gradually enlarged in each circumvolution, in proportion as the diameter diminishes, that is, the bore of each of the inner spirals must be to the bore of the outer one, as the diameter of the latter is to the diameter of the former.

The wheel thus furnished with its spiral canal, is to be hung so deep in the river, that half a spiral, at least, may, in each revolution, be filled with water. To keep it in this state it would be necessary to immerse it to the axis, or further: but as its motion, at such a depth, would be extremely slow, a kind of scoop is made at the outer opening of the spiral pipe, which takes up so much water at once, as is sufficient to fill the due proportion of the outermost spiral in one revolution. One half of the outer spiral being thus filled with water, the other half remains filled with air: as the wheel turns, the water and air pass into the second spiral, then into the third, fourth, and so on, till a sufficient number of turns bring the water and air to the axis, from whence they pass into the upright pipe, as already mentioned: thus the entrance and discharge of water continue without intermission, so long as the wheel is kept in motion. When the wheel scoops up just the proper quantity of water, and turns with due velocity, the water may be forced up in the perpendicular pipe to a height equal to the sum of the diameters of all the circumvolutions of the spiral canal.

If we consider the operation of this machine, we shall easily see the necessity of the inner circumvolutions being made to widen in the proportion above-mentioned; and that, without this condition, the water passing from the large outer spiral, would be crowded and retarded in the inner, and in great part forced back.

It is also obvious that just half of one of the spirals must be filled with water at each revolution, for if less be taken in, there will be a diminution in a quantity delivered; and if more, it will be pressed too much together, and its quantity also diminished.

The velocity with which the wheel moves, or the number of revolutions it makes in a given time, is another essential point in regard to the quantity of water, and may considerably influence the quantity of water necessary to be raised. When this is known, and the height determined, it will be easy to construct a wheel in such a manner, as to answer the purpose intended.

We shall conclude our account of this ingenious contrivance, with the following directions for constructing it. The two flat sides of the wheel should be made of two strong circular pieces of good oak, the inner sides of which must be planed as smooth as possible, and fitted to one another; and to keep them from bending or warping, secured by pieces on the outside. The plan of the spiral lines is represented in fig. 7. Plate XXVIII. These spiral lines being marked out on the wood, a groove must be cut about a quarter of an inch deep, in order to make a channel for the partition, which must be formed of a thin piece of copper. The channel being filled somewhat more than half with good cement that will bear water, the piece of copper must be set in regularly, care being taken to

keep the cement warm, or previously to heat the metal. The scoop also, which at every revolution of the wheel takes up a proper quantity of water from the river, may be made of the same metalline plate. The piece of copper for forming the partition must be cut at first exactly straight, and of an equal breadth throughout. This work being finished, the wheel must be put on the axis as far the ledge made for it to rest against, and cemented. The second piece of wood requires little preparation: some cement must be spread all over it, and the whole surface covered with a thick piece of woollen cloth, which must also be done over with cement on both sides: while the whole continues warm, it must be put on the axis, and pressed close to the other part of the wheel, so as to cover the as yet open side of the spirals. The two parts are held firm together, by means of a wedge or key passing through the axis, and a proper number of screws, placed round the circumference: these screws are strong iron pins, somewhat longer than the wheel is thick, and a nut, when they are placed through the wheel is screwed on the other. Thus the inside of the wheel or drum is finished. The disposition of the ladle-boards, the shape of the axis, and the structure of the frame by which the machine is supported, will be partly understood from what has been already said, and more fully from fig. 8. Plate XXVII.

It has been already observed, that the wheel in the limmat is covered with tin plates; but this is of little or no consequence. It is however advisable not to have one large opening, for the entrance of the water, but either a perforated plate, or a wire-grating nailed before it, in order to prevent weeds, or any other filth from passing into the spiral tube, and preventing, if not wholly stopping, the course of the water.

The frame or scaffold which the wheel hangs, and the means of raising or lowering it in the river, without disturbing the course of the water in the machine, deserves particular notice. It is plain from fig. 8. that the wheel rests on two arms, which, for the greater security, are bound together by cross-pieces. At the fore-end they are both suspended by iron chains, which pass over a roller so as to be wound off or on: on the other end they move on two strong joints or hinges. The communication of the leaden pipe, with the brass one, or hollow pivot, at the end of the axis, is drawn on a larger scale, in fig. 9. This pipe is bent close by the pin, to a right angle, and goes horizontally along one of the arms of the frame as far as the hinge, (see fig. 8). where it is again bent to a right angle, opposite to the dye-house, and communicates in the same manner as the hollow pivot of the axis, with another horizontal pipe, in which it moves round freely, without any impediment to the passage of the water, in raising or lowering the wheel. This large pipe passes under a stage built along the wall of the dye-house, and thence up the wall, where it distributes the water in the manner represented in the figure.

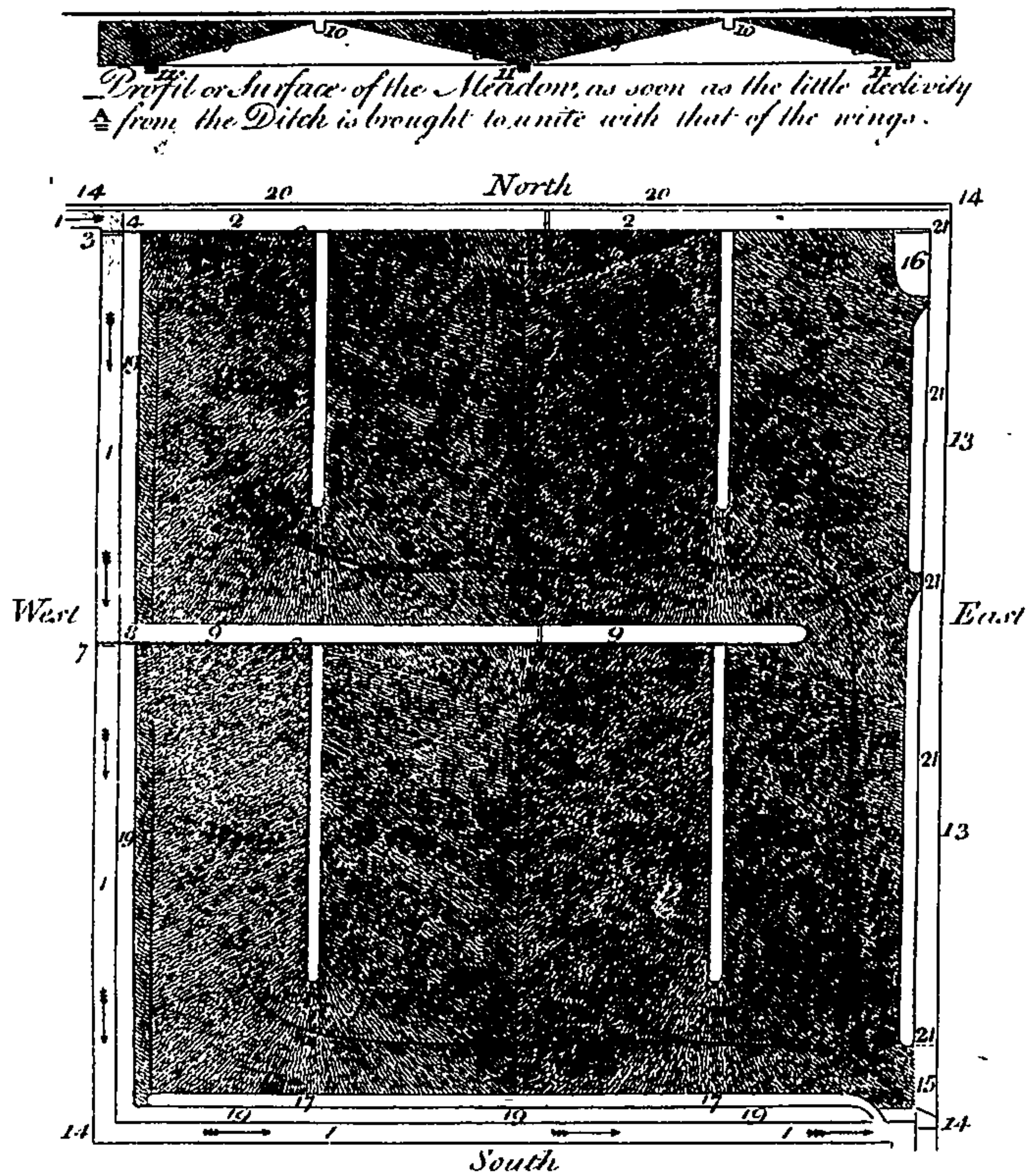
But though water is so necessary to the growth of plants, yet in lands that abound with it, there is a necessity for conveying it away, the best methods for doing which the reader will find under the articles BOG, DRAINING, MOOR, &c.

WATER-FARCY, a disease incident to horses, and is of two kinds; one the product of a feverish disposition, terminating on the skin, as often happens in epidemical colds; the other is dropical, where the water is not confined to the belly and limbs, but shews itself in several parts of the body, by soft swellings yielding to the pressure of the finger. This last kind usually proceeds from foul feeding, or from the latter grass and fog, that often come up in great plenty with continued cold rains, and breeds a sluggish viscid blood. In the former case, I have seen the limbs and whole body enormously swelled, and very hard, the belly and sheath greatly distended; which were as surprizingly reduced in four and twenty hours, by slight scarifications within-side the leg and thigh, with a sharp pen-knife, and three or four strokes on the skin of the belly on each side the sheath; from these scarifications there was a constant and surprizing large dripping of water, which soon relieved the horse; when a few purges completed his recovery.

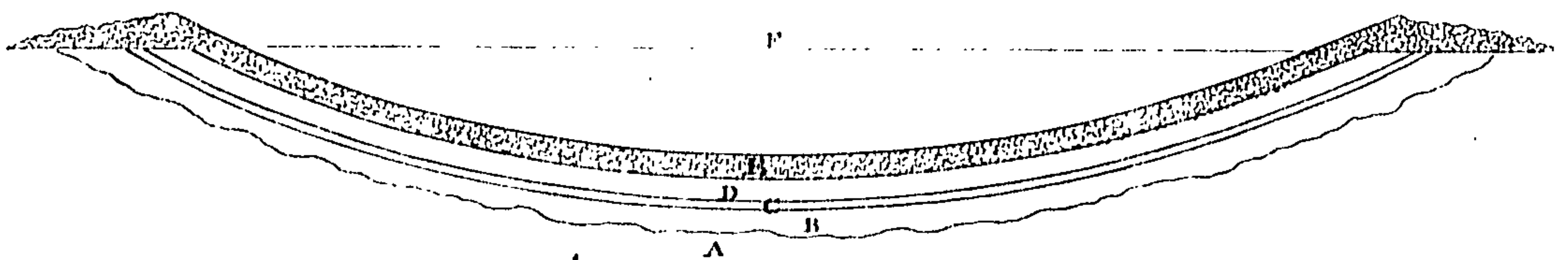
In the other species of dropy the curative intentions are to discharge the water, recover the crisis or strength of the blood, and brace up the relaxed fibres throughout the whole body. To this end, purge once a week or ten days: and give intermediately either of the following drinks, or balls:

Take

WATERING MEADOWS



ARTIFICIAL PONDS



Take black hellebore fresh gathered, two pounds ; wash, bruise, and boil in six quarts of water, to four ; then strain out the liquor, and put two quarts of white wine on the remaining hellebore, and let it infuse warm forty-eight hours ; then strain off, mix both together, and give the horse a pint night and morning.

Take nitre two ounces, squills powdered three drachms, or half an ounce ; camphor one drachm ; honey enough to form into a ball ; to be given once a day alone, or washed down with a horn or two of the above drink.

Take of the leaves and bark of elder, of each a large handful ; chamomile flowers half a handful ; juniper berries bruised, two ounces ; boil in a quart of water to a pint and a half, to which add honey and nitre, of each one ounce.

Give this drink every night, or night and morning ; and to complete the cure, and strengthen the whole body, give a pint of the subsequent infusion every night and morning, for a fortnight, fasting two hours after it.

Take gentian root and zedoary, of each four ounces ; chamomile flowers and the tops of centaury, of each two handfuls ; Jesuits bark powdered two ounces ; juniper berries four ounces ; filings of iron, half a pound : infuse in two gallons of ale for a week, shaking now and then the vessel.

Before we close this article, we think proper to lay down the symptoms of an incurable farcy, that the owners of such horses may save themselves unnecessary expence and trouble in their endeavours to obtain a cure.

When a farcy by improper applications, or by neglect, has spread or increased ; or after long continuance resisted the medicines above mentioned ; if fresh buds are continually sprouting forth, while the old ones remain foul and ill-conditioned ; if they rise on the spines of the back and loins ; if the horse grows hide-bound, and runs at the nose ; if abscesses are formed in the fleshy parts between the interstices of the large muscles ; if his eyes look dead and lifeless ; if he forsakes his food and scours often, and his excrements appear thin, and of a blackish colour ; if the plate, or thigh vein continue large after firing, and other proper applications : these symptoms denote the distemper to have penetrated internally, and that it will degenerate into an incurable consumption : it is also most probable, that the whole mass of fluids are tainted, and become incurable by art. *Bartlett's Farriery, p. 193.*

WATERING MEADOWS. Anth. Songa, esq. in vol. II. of Mr. Young's Annals of Agriculture, says, "Iowards the expence of making a field, I may tell you, that I have expended about 30 per cent. of the whole value of the ground ; and I think about 10 per cent. more was wanting to finish it entirely and properly, before it could be perfect for rendering a great crop of hay ; which on only a moderate reckoning would give a revenue, according to what is esteemed, of about four times as much as when it was a corn-field watered occasionally.

"I call, finishing work, the making it perfect in the surface and regular declivity after subsiding of the earth, by correcting what is subsided by time, and cutting down every small protuberance ; the dunging it well ; the keeping in the greatest perfection of levelness and regularity, the borders of the ditches, from which the water issues upon the wings, as earth removed is apt to break down at the beginning, and till the roots of the grass have strongly fastened it. The dunging it properly wants attention to do it always more at the upper part of the wings, and where the surface shews itself poor, which is the case in many places, by such a great removal of earth to form the declivity of the wings ; and particularly towards the lower part of the wings, where almost only dead soil remained, notwithstanding the attention used to remove first the surface of cultivated earth to where the upper part of the wings were to be, and spreading it mixed afterwards on the lower part, when the wings were completed.

"That dead soil, deprived of the cultivated surface, was ploughed very deep twice, distant about two weeks one ploughing from the other, before the work of making its surface was begun. Every stone as big as a pigeon's egg

was taken away from the whole field, and put on the lane ; which lane, by it, was reduced as fine all the length of the field, as any body could wish for to pass on ; attention was used in doing it, that half the washing of the lane should run into the ditches of the meadow through the edge ; the other half runs into the ditch of the owners of land on the other side.

"Great care is given to this by every intelligent husbandman in that territory, as the washings of the roads and lanes are accounted a good helping manure, and every rain increases the rotten fattening earth in the ditches.

"The edges too are frequently hoed out, and the earth of their surface made use of for manure ; and by experience I know it is a good one : at the same time it is a cultivation of the edges.

"The only thing I would have done for the edges, was to plant them all with trees, as, by keeping them down properly for it, they make the best and strongest edges, and sooner than any thing else I know of.

"To spare the expence of doing by hand all the work of forming the wings of the meadow, the plough was used to form the first rough declivities, a very strong wheel-plough, drawn by four oxen, and a horse as a leader. If it had been clayey ground, or clay, six oxen would have been wanted for such a deep ploughing. *See Plate XXVIII.*

"After the meadow was made, it was sown with oats and clover, and a great deal of hay-loft sweepings and liftings of every sort of grass ; and for a foundation of a fine good meadow, with a quantity of seeds from the watery meadows about Milan, bought of a seedsman there. The oats and grasses were all cut for hay at the beginning of June ; another cut was to be made at the beginning of August when I came away, and my direction was to cut it no more that year, unless very luxuriant ; but in this case I recommended to do it soon, that much grass might remain on it before the frost.

"The growing of the oats did shew better than any thing else where the ground was richer or poorer. In some places they were above five feet high, and in others but a foot high. I have remarked to the farmer who was left in possession for two years, by dividing the hay in half the attention he was to use in dunging it more where the poor spots were, that it might be brought to an equality of product in all the surface, at least as far as it was possible.

"The harrow, the indented roller, and the plane, called there the spianatona, were not left idle in making the meadow, as all tend to spare the hand-work.

Explanation of the Plate.

1. Rivulet, about 3 feet wide, and 18 inches deep ; and carrying water about 6 or 8 inches deep.
2. Upper ditch, about 6 feet wide, and 5 feet deep.
3. Water gate, to stop the current of water in the rivulet, that it may run into that ditch.
4. Water-gate, to stop or let the water into the ditch.
5. Water, to hinder watering the easterly parts or divisions of the meadow when chosen.
6. Ditto, to hinder watering the westerly divisions of ditto.
7. Ditto, to stop the current of the rivulet, and throw the water into the lower ditch.

N. B. When the upper ditch has thrown water enough on the upper division of the meadow, the water begins to collect through the rills into the ditch of the lower division, but not enough to irrigate it. Then the gate, No. 3, is risen a little, that part of the water may run down the rivulet, and by stopping the gate, No. 7, and open the No. 8, it may run into the ditch, No. 9 ; by which, between the collecting water from above, and the supply from No. 8, the lower division begins to be irrigated. As soon as the upper division is well irrigated, which happens in two hours, more or less, according to the water the rivulet happens to carry at that time, the gate, No. 4, is shut down, and all the water is thrown, by opening entirely No. 3, into the ditch, No. 9, through its gate, the No. 8.

"3. Water, to hinder, to stop or let the water into the ditch of the lower division of the meadow.

"9. Ditch of the lower division, about 4 feet wide, and 4 feet deep.

"10. Small ditches, about 2½ feet wide, and 2 feet deep, that receiveth the water from the leading ditches, No. 2 and 9 ; and expend it very finely and regularly on the wings, with the greatest exactitude.

" 11. Rill, about one foot wide and one foot deep, at the bottom of the wings, to receive the waste water and carry it to the ditches below.

" 12. Ditches close to the edge towards the lane, like the rills, but made 3 or 4 feet wide and deep, to receive the waste water on that side, and on purpose to form rotten earth and mud.

" 13. Pasturano Lane, half of it belongs to the field, the whole length, and is comprehended in the measure for property and for land tax, except high roads; all the rest, either road or line, is in the same predicament.

" 14. Jermini's, half of the bed of the rivulet is measured with, and belongs to the field.

" 15. Passage or entry into the meadow for sledges to carry out the hay to be put on carts in the lane, and to carry the distribution of the manure, &c.

" 16. Heaps of manure thrown in from the lane Pasturano, on purpose that no carts may go into the meadow, to spoil the surface of it: to which heap is carried all the mud, and cleaning of the ditches and rills, and these are cleaned every year almost.

" 17. Ditch at the bottom of the meadow, to collect all the waste land; whose bed is about 4 feet wide, and 4 deep, and has only a small opening for discharge, on purpose that the water may remain the longer in it, and deposit therein all the richness possible before it runs into the rivulet again.

" 18. Rill about 1 foot wide, and 6 inches deep, for the discharge of the ditch into the rivulet at the bottom.

" 19. Bank close to the rivulet.

" 20. Ditto north of the upper ditch.

" 21. Edge on the border of the lane.

" All planted thick with forest trees, as oak, elm, poplars, &c. all polled, except from distance to distance, the best growing trees are left growing in the full natural way. The pollards are cut every 4 years for poles and faggots.

" 22. Two small rills, 6 inches deep, to discharge the water from No. 12, when superabundant.

" 23. Rills to carry irrigation to the little ground near the bank of the upper ditch, No. 2, till the declivity of the ground; these meet the declivity of the wings in the regularity of these. These rills are necessary if the southern bank is planted, because the trees make the border of the ditch irregular for the level.

" 24. Water-gates, that serve like No. 6, to hinder the water from the ditches, No. 2 and 9, to come in, and to keep the two ditches full of water always.

WATTLE, a kind of hurdle formed with split wood, and used for making folds for sheep.

WAX, or **BEES-WAX**, a substance formed by bees from the farina of flowers. See the article **BEE**.

WAY-BREAD, plantain.

WEANEL, an animal newly weaned.

WEED, any plant growing in a field different from what the farmer intended.

There is not a field where we do not find some of these; they grow in the greatest plenty on the richest soils.

Mr. Marshall, in his Minutes of Agriculture for the month of June, says, "weeds are now in their most succulent state; and in this state after they have lain a few hours to wither, hungry cattle will eat greedily of almost every species. There is scarce a hedge or nook, but what is at this season of the year valuable, and it certainly must be good management to embrace the transient opportunity; for in a very few days they will become real nuisances. The margin of every meadow is a fringe of weeds, which, if made into hay, not only spoil the stack, but fill the fields in summer, and the farm-yard in winter with weed-seeds; but by verdling with them while succulent, the cows which go to the common are benefited, and the fields, the stack, and the farm-yard left unencumbered; besides a fresh swath of fine grass, (if the weeds are cut early enough) ready to be mown with the rest of the field."

Weeds will appear impediments to vegetation, if we consider the following particulars.

They rob the plants we desire to cultivate of their food; they prevent these plants from branching out from the root, and they lessen the vegetable pasture in the land where they are suffered to grow.

Weeds are nourished by the same food that would nourish useful plants; and therefore, when allowed to grow along with them, must rob them of part of their food. Although it is allowed, that the food of all plants is not exactly of the same kind; yet as plants suck in whatever

juices or small particles of matter are touched by their roots, it may be justly said, that all kinds deprive the earth of that vegetable food which would nourish others.

Experience convinces the farmer of the truth of this: for he finds, that his crop is bad in proportion to the quantity and kinds of weeds with which his land is infested.

Weeds cover the surface of the land on which they grow, and thereby, confining the plants we desire to cultivate, prevent them from branching out from the root. For all plants, when confined by others at their sides, instead of branching out, as some of them are inclined to do, make vigorous efforts to get above those by whom they are confined.

Some persons have attempted to show, that corn never wants room to grow; and that it is the want of food alone which makes some plants decay, when they are set too thick. If this is true, weeds can do no harm to plants, by covering the surface, and confining them while they grow. But let a person cast his eyes upon a plantation of any kind, and he will immediately observe, that where the plants are placed very near to each other, they stretch out chiefly to the length; and where they are placed at a greater distance, they grow not so much to the length, but more to the thickness, and branch out on all sides. So that the proportion of nourishment which the plants receive, makes them grow either to the length principally, or to the thickness, and branch out, according as they are placed near, or at a distance from each other. The same thing happens, when there are many weeds growing amongst corn. Some fields are so much infested with weeds, that, though no grain is sown, the plants come up very thick. This obliges the farmer to give plenty of seed: in consequence of which the surface is quite covered; and the plants of corn being confined by the weeds, instead of branching out from the root, and producing two or more stalks, as they are naturally disposed to do, push up one stalk only, that so they may the more easily get above their rivals. The proportion of nourishment which they receive, makes them grow to the length, instead of branching out from the roots; makes them produce one stalk and ear only, instead of many. Experience confirms the truth of this. When land is rich, and at the same time much infested with weeds, the plants of corn grow tall enough; but seldom have more than one stalk.

Some kinds of weeds have great numbers of small roots, which they extend to a great distance. These roots bind the soil in such a manner, as to lessen the vegetable pasture; or rather make it very difficult to enlarge it by tillage. It may be observed, that when a field is much infested with quickening grass, the soil is so firmly bound together by the roots, that it is not possible to pulverize it. When ploughed, the earth of the furrow is turned over whole, and the harrows scarcely make any impression upon it.

It is of great importance, therefore, to know how to destroy these useless and noxious plants, that so all the vegetable food in the soil may be applied to the nourishment of the useful plants we desire to cultivate; that these useful plants may have room to extend themselves, and branch from the root on all sides; and that the vegetable pasture, which, by the rain that falls, and the natural weight of the soil, is always lessening, may be the more easily enlarged.

Different Kinds of Weeds.

Plants are commonly divided into two sorts; annuals, that is, such as in one year come to perfection, carry seed, and die; and perennial, that is, such as continue in life for more years than one. Annual plants are almost all propagated by the seed. Perennial are propagated, some by the seed, others by the root, and a third sort both by the seed and root.

Weeds may be divided in the same manner, into annuals and perennials. But, in treating of the methods of destroying them, we shall be better understood, if they are divided into these two sorts; weeds that are propagated by the seed, and weeds that are propagated by the root. It is needless to consider the weeds that are propagated both by the seed and the root, as a third sort. For when their seeds infest the land, they must be treated as weeds that are propagated by the seed; and, when their roots infest the land, they must be treated as weeds that are propagated by the root. It is necessary, however, to divide weeds into these

two sorts, into which we have divided them: for, in some cases, that kind of management proper for discouraging the one sort, tends to encourage the growth of the other.

But, besides these two sorts of weeds mentioned, it will not be improper that we likewise take notice of those shrubs by which some land is greatly infested. These, though they are not commonly reckoned in the class of weeds, and though some of them may have their particular uses; yet, as they are plants different from what the farmer desires to cultivate in his fields, they fall under the definition which we have given of weeds, and shall be reckoned by us a third class.

Methods of destroying Weeds.

The destroying of weeds is certainly one of the most important parts of agriculture. By allowing them to grow, dilloaw the land, as was formerly observed, to be robbed of its vegetable food, and its vegetable pasture to be greatly lessened.

It may be inquired, what becomes of this vegetable food of which they rob the land? It is either conveyed to the air, and sent to enrich other land, or it is turned into a form that renders it destructive.

When weeds wither and putrefy above ground, the salts and oils which they contain, and of which they deprived the land on which they grew, become volatile, and fly off into the air, and leave little more than their earth remaining.

When weeds carry seed, and shed it upon the land, and when the roots, by the nourishment they receive, are enlarged and extended; the vegetable food, of which they have deprived the land, is turned into a form that renders it destructive, into seeds and roots, by which the land is further exhausted.

The seeds and roots of weeds, though destructive to useful plants, by robbing them of their food, yet they contain vegetable food in themselves: and, when the seeds are picked up by birds, and the roots eaten by animals, the vegetable food is carried off. But, if these weeds are destroyed, and reduced to a state of corruption, the vegetable food, which they have taken from the land, and rendered destructive, is restored to it, and becomes beneficial: so that land that is poor, and unfit for carrying crops of useful plants, by being full of weeds, may be made rich and fertile, by destroying them.

From these things it appears, that the destroying of weeds is one of the most important parts of agriculture. As it is important, so likewise it is difficult.

There is scarcely a field, in which we may not observe weeds of the two first kinds mentioned; of the kind that is propagated by the seed, and the kind that is propagated by the root. Some of these, perhaps, it may be easy to destroy, as they are foreigners, and not adapted to the soil; but others of them being natural to the soil, in that kind of it that is most proper for them, it may be expected, not only that it will be very difficult to destroy them, but also, that, by the culture given to the land, they will thrive wonderfully, carry great crops of seed, multiply, and extend their roots. As the destruction of weeds is then so important and difficult, it is a work that must be particularly attended to.

Weeds have been divided into three sorts. To destroy these different sorts, different management is required. It is necessary therefore to treat of them separately.

Methods of destroying Weeds that are propagated by the Seed.

Weeds are very different in their natures. The seeds of some of them will putrefy in a few years, if they lie moist in the earth, and are prevented from vegetating. But the seeds of others will lie many years in this situation, without having their vegetative power destroyed. This we know from experience. Land infested with different kinds of weeds, has been frequently thrown out into grass, and allowed to lie only a few years; some kinds of weeds are found to be destroyed, when the land is broke up again; but, though it lie twenty years, some other kinds are found in as great plenty as before.

The first sort may be destroyed by turning the land infested with them, from tillage into grass, and allowing it to remain in that situation for five or six years.

Both sorts may be destroyed by bringing the seeds to ve-

getate, and then tearing up the young plants. Seeds will not vegetate without air. Some require a greater proportion, and some a smaller. The small seeds will not vegetate without a very great proportion of it. It may be observed, in fallowing land which is full of weeds, that great numbers of them appear after every ploughing. This shows, that some of the seeds had not a sufficient quantity of air, in their former situation, to make them vegetate. Now, to give these small seeds the proportion of air necessary for them, they must be brought near the surface, and the earth about them rendered free and open. If the land is frequently stirred and turned over, both these will be done. For every time the land is stirred and turned over, some seeds, that before lay deep, are brought near the surface, and the earth about them also rendered free and open: and, besides, the plants that have appeared are thereby torn up and destroyed.

Every farmer that practises summer-fallowing, is now fully convinced of the truth of this. For he observes, when the season is favourable, and his fallow is well and frequently ploughed and harrowed, and time allowed betwixt every ploughing and harrowing for the weeds to vegetate, that his land, for several years, is not so much infested with weeds as before.

It has been observed, that seeds will not vegetate without air, and that to give the smaller kinds the quantity which they require, they must be brought near the surface, and the earth around them rendered free and open. It is necessary likewise to observe, that water is as requisite to promote vegetation as air; and that the bringing seeds near the surface, and rendering the earth free and open around them, as it supplies them with air, tends to deprive them of water. In the performance, therefore, of those operations, by which the land is stirred and turned over, to promote the vegetation of the small seeds, great care must be taken to preserve the sap, as much as possible. This will be done, if, in stirring the land, the surface is made smooth and plain. It is obvious, that when the surface is rough and uneven, the drought has easy access; but, when it is smooth and plain, the winds have less influence, and the sap is better preserved. Every farmer will observe, that in dry weather, when land is allowed to lie some time after it has been ploughed, without being harrowed, the drought has easy access, the sap is exhaled, and the seeds in it, though near the surface, and the earth around them free and open; yet, being deprived of water, are prevented from vegetating: whereas, when the land is harrowed immediately after it is ploughed, the sap is preserved, and the seeds spring up. Hence the custom of sowing barley immediately after the plough. Barley is commonly sown in a dry season; and therefore the land is not allowed to lie long after it is ploughed, lest the sap should be exhaled; but is immediately sown and harrowed, by which the sap is preserved.

The vegetation of seeds in land is promoted, not only by stirring and turning over the land, but also by the application of dung and some other manures. Dung raises a fermentation; this opens the pores of the soil, allows the air to reach the seeds, and gives them liberty to put forth their roots. If dung, therefore, is laid upon land infested with weeds, and the land carefully stirred and turned over several times, all the seeds in it, by degrees, will be brought to vegetate; and thus the weeds will be destroyed.

It must be owned, that this practice, though proper for destroying weeds, may, in some cases, destroy some of the virtues of the dung, before it is applied to promote the vegetation of the useful plants we design to cultivate. Dung promotes vegetation, by producing a fermentation in the soil upon which it is laid; and, by this fermentation, separating its particles. If this fermentation is, in a great measure, over before seed is sown, the natural weight of the soil, making it subside, will render the vegetable pasture, while the plants are growing, much less than it would have been, if the dung had not been so soon laid on; and more harm may be done by this, than advantage gained by destroying the weeds. But, though it may be improper to follow this method, when seed cannot be sown for a considerable time after the dung is laid on, as is the case sometimes when summer barley is sown on fallow, yet it may answer very well, when seed is to be sown soon after, as is the case when wheat is sown. The advantages arising from the destruction of the weeds, though not in the first case, yet in the last, may probably do more than overbalance the loss arising from

from some part of the strength of the dung being exhausted before seed is sown.

It may, perhaps, be thought a little surprising, that dung should be proposed as a means of destroying weeds, when it is universally considered as a great encourager of them. It is certain, that the laying dung upon land makes more weeds appear than otherwise would do. If the seeds of these weeds are in the dung, it must be owned, that it increases, and not diminishes their number. But, if the seeds are in the land, and the dung only makes them vegetate, it becomes a proper means of destroying them.

It seems to be the general opinion, that the great plenty of weeds that appear on land after it is dunged, are produced from seeds mixed with the dung. But there are some reasons to believe that this is a mistake.

It is to be observed, that dung produces weeds, when it is taken from a dung-hill, so much heated as to destroy the vegetative power of any seed.

It is observed likewise, that the same dung produces weeds, according to the nature of the land on which it is laid. It often happens, that dung carried from a town is laid upon different soils; and it is certain that this dung does not produce the same kind of weeds on all soils, which it would do, if the weeds arose from seeds, mixed with it: but always produces the weeds, with which the soil upon which it is laid is naturally infested.

These observations make it very probable, that the great quantity of weeds produced by dung, is entirely owing to the fermentation occasioned by the dung; by which almost all the seeds near the surface, receiving a proper quantity of air, are thereby brought to vegetate.

To this it may be objected, that such numbers of weeds do not appear upon land that is new marled, as upon land that is dunged. But, in answer to this, let it be observed, that a great quantity of marle is laid on, and in large pieces, and that it is ploughed in with a shallow furrow: and therefore, though a fermentation may be raised, yet the undissolved marle prevents a great part of the soil from being exposed to the air, in such a manner as to make the seeds in it vegetate; and also occasions such a hollowness, that, after the seeds begin to vegetate, such of the plants as are tender (and several sorts of them are not so hardy as corn) are easily destroyed by drought or frost.

Before we leave this article, it is necessary to observe, that the seeds of some weeds, particularly the different species of the thistle, are carried to a considerable distance by the wind; and where any earth is thrown up in such a manner as to intangle them, as at the root of a hedge, or side of a ditch, there they appear in great plenty. It is surprising, that many farmers allow them to grow there undisturbed: the consequence of which is, that their seeds are carried in great plenty into the adjacent fields, and thereby great damage is done; which might have been prevented by cutting them down, at a small expence, before their seeds were ripened, which will prevent their ripening, and being blown into the adjoining fields, therefore if they are cut down green, and carried into the yard, they will raise manure, where they will ferment, by being left in heaps.

Methods of destroying Weeds that are propagated by the Root.

There are many different kinds of weeds propagated by the root, and these of very different natures. Some of them infest the land that is in tillage, and others the land that is in grass. Any person may satisfy himself of this, by inspecting our fields. The farmer is very sensible of it: he knows that some kinds of weeds flourish and increase in his land, while in tillage, if he does not take all pains to discourage them: and when he lays down his land in grass, other kinds that do not appear before, soon discover themselves; and if undisturbed, continue to increase while, the land remains in that situation.

The first sort, it seems, have such a tender blade, and such tender roots, that they cannot pierce earth that is hard; but are of a kind that increase very fast, when the soil is free and open.

The second sort have the blade and roots so strong, that there is scarcely any soil that, of itself, will become so hard and stiff, as to prevent them from making their way through it; but are of such a nature, as to be easily torn up, when the land is free and open; and do not easily strike root again when torn up.

The natures of these weeds point out methods of destroying them.

The first sort, as they chiefly infest land in tillage, may be destroyed by turning the land from tillage into grass, and allowing it to remain for some years in that situation. This is confirmed by experience. Land over-run with quickening-grass, and other root-weeds of the same kind, is frequently laid down in grass, and allowed to continue for some years without being ploughed. This land, when broke up again, if allowed to lie in grass for six or seven years, is found to be clean, and the roots of the weeds destroyed.

The number of years necessary for destroying the roots, depends upon the nature of the soil. If the soil is naturally hard and stiff, it is the sooner brought to such a situation, as to prevent the roots and blades of the weeds from piercing it. But, if it is naturally soft and spongy, it takes a longer time before it is brought to that situation. For while the blade, or roots of the weed, can pierce the soil, their vegetation is not prevented. In some soils it is six or seven years before the roots of the quickening-grass are destroyed.

The number of years found necessary for destroying these root-weeds, has, no doubt, been partly the occasion of establishing the practice commonly observed. Three crops of corn are taken, and then the land is allowed to lie six years in grass, or lea. At the end of these, the farmer supposes that the lea is come to maturity, and fit again for being ploughed. When it is only two or three years old, it is called, in some parts of the country, calf-lea; and, if ploughed at that age, is commonly very full of roots.

The sowing land with grass-seeds, instead of turning it out into lea, destroys the roots of these weeds some years sooner. For thereby a sward being brought immediately upon the surface, the land becomes firm, the blades of the weeds are unable to pierce it, and the roots are deprived of air. Ryegrass-seed, or the common hay-seed, is the most proper for this. For the plants arising from these, soon cover the surface, and, by the number and smallness of their roots, bind the soil. Clover, particularly the broad clover, is improper; for the roots of it being large, they open the soil in growing and extending themselves, and thereby prevent it from arriving at that degree of firmness, necessary for destroying the weeds so soon, as if no grass-seeds are sown, but the land immediately turned into lea.

The second sort may be destroyed by turning the land infested with them, from grass into tillage; and it is not necessary to continue it long in this situation, for the weeds commonly disappear after the first ploughing.

But as it may be inconvenient to turn a field infested with weeds, from grass into tillage, or from tillage into grass; it is necessary to consider, if there are any methods of destroying these weeds, without altering the situation of the land.

When land in tillage is infested with weeds, they may be destroyed by frequently stirring and turning it over in dry weather. For the weeds being removed out of their place, the drought prevents them from striking root again. The stirring the land in wet weather is rather hurtful than beneficial: for though the roots of the weeds are removed from their place, yet the weeds themselves are only transplanted. If the land is wet, they soon strike root again; and the quickening-grass in particular, having its pasture enlarged, makes quicker progress than ever. But, if the land is dry, the weeds do not so easily strike root again: or, if some of them should strike root, they continue for some time in a languishing condition, and if removed out of their place, while in the condition, are easily destroyed by the drought. If land then is frequently stirred and turned over, by degrees all the weeds will be destroyed: for, by every stirring or ploughing, such of them as are in a languishing condition are destroyed, while those that are strong and vigorous are weakened.

When land is to be free from seed-weeds, it cannot be made too fine, nor the surface too smooth; for the more perfectly these are done, the greater number of seeds are brought to vegetate. But, when land is to be freed from root-weeds, it cannot be turned up in too large pieces, nor the surface left too rough: for the larger the pieces, and the rougher the surface, the drought has the easier access, and the roots are the more effectually destroyed.

When

When land in grass is infested with weeds, and it is inconvenient to turn it into tillage, the weeds themselves must be pulled up by the root, or frequently cut : which are the only ways of destroying them.

Some persons assert, that sheep are very fond of the yellow rag-weed, by which light land, when laid out in grass, is very much infested. If this is true, the putting sheep to pasture upon this grass, for a season or two, will effectually destroy this weed. This may be the more safely recommended, as the trial, though it does not succeed, cannot be attended with any danger or loss.

Some land, after being a few years in grass, is liable to be over-run with fog. This, it is supposed, is owing to the soil becoming soft and spongy near the surface. If this is the case, rolling, which makes the surface firm, will be of some use to destroy this pernicious weed. It may be observed, that, when there is a foot path through a grass-field over-run with fog, not so much frequented as to break the turf, the grass upon the path is clean, without any mixture of fog.

There is a third sort of weeds found to infest both the land that is in tillage, and the land that is in grass. This sort has not only the blade and roots very strong, so as to be able to pierce the soil, though hard, but also are of such a nature, as makes it difficult to tear them up ; or have their roots of such a kind, that they may be divided into a great number of plants.

These weeds cannot be destroyed, either by turning the land infested with them, from tillage into grass, or from grass into tillage : but they may be destroyed by the methods mentioned, when the situation of the land is not changed. If the land is in grass, they may be destroyed by digging them out, or by frequently cutting them. And, if the land is in tillage, they may be destroyed by frequently stirring and turning it over in dry weather. This work must be performed with ploughs properly made for cutting their roots. This kind of weeds push their roots very far down, and their roots are so tough and hard, that our common ploughs seldom break them. If there are any stones in the land, they push their roots among the stones ; and, in such places, the plough not having freedom to act, they continue undisturbed. In this land too the plough, most proper for cutting these roots, cannot go with safety. But if the stones are dug out, and the land ploughed with a broad pointed share, the roots, by degrees, will be cut, and the weeds destroyed.

Besides these three sorts of weeds mentioned, there is a fourth that chiefly infests land that is wet. Frequent cutting, and even digging out by the root, have been tried to destroy them, but to no purpose. They are not to be seen on dry land, and, when on land only inclining to be wet, appear very weak. This points out draining to be the proper method of destroying them, which indeed does it effectually.

We shall now conclude this article with observing, that all kinds of root-weeds, and many kinds of the seeds of weeds, may be destroyed by depriving them of air. For air is necessary not only to the vegetation, but also to the life of every plant.

When land is in tillage, the weeds may be deprived of air, either by burying them deep in the earth, or covering the surface. Trenching does the one, and a good crop of peas, potatoes, or any other plants that lie thick on the surface, does the other.

Fog, by which some lands in grass are much infested, may be destroyed in the same manner. The method proposed is this : the grass must be kept from the month of March to the month of December, for winter-pasturing, and the next season preserved for a crop of hay. The fog being by this management covered for two seasons by the grass, is thereby destroyed.

As different methods are necessary in the extirpation of different weeds, and it is of some importance to know which of them are perennial, and which only annual, we have added a list of the most remarkable weeds which infest the arable and grass lands in England, ranged according to their duration. A pomp of names is carefully avoided, and those which Mr. Hudson has given in his *Flora Anglica* are chosen : it is a misfortune that many farmers will not know what plants are meant by some of these names ; but it is a misfortune scarcely to be avoided, since the English names of vulgar plants are so various, altering not only with the county, but with the place, and

even sometimes depending on the whim of a common labourer.

By far the greater number of annual weeds infest the arable lands : in grass lands the perennials chiefly flourish. The reason is obvious ; in the former the roots are continually destroyed by cutting ; in the latter they are made to spread by cutting or eating down the stems : perennials usually require more than a year to come to perfection ; and the seeds by which annuals are propagated, are not so readily received into the more compact turf, as into land whose parts are constantly undergoing a separation.

The annual Weeds which infest arable Lands and Gardens are chiefly these :

- Ivy leaved speedwell, or small henbit. April.
- Annual dandel-grass.
- Bearded oat-grass, bearded wild oats, or haver.
- Little field-madder. May.
- Cleavers, or goose-grass. May.
- Parsley-piert. May.
- Pearl-wort, or chickweed breakstone. This small weed is very apt to infest gravel-walks ; and if it be suffered to feed, will increase prodigiously, and grow very troublesome. June.
- Bastard alkanet. May.
- Small wild bugloss. June.
- Male pimpernel. May.
- Venus's looking-glass, or coddled corn-violet. June.
- Dodder, hell-weed, devil's-guts, or scald. July.
- This is found chiefly on beans ; it strangles the crop, and draws its nourishment from the plants about which it entwines itself. It infests also hops and flax.
- Small corn-parsley. August.
- Goosefoot of several kinds flourishes on dunghills, and is often suffered by the farmers to grow there unmolested by which the dung is much exhausted. August.
- Fool's parsley. This is generally allowed to be a strong poison, and is very common in gardens.
- Shepherd's needle, or Venus's comb. June.
- Common chickweed. The pest of gardens.
- Knot-grass. This plant is remarkably full of seed, and propagates itself surprisingly : it will grow any where, particularly in places that are much trodden. The sparrows, and other small birds, are very fond of its seeds. June.
- Black bindweed. June.
- German knot-grass, or annual knawel. August.
- Purple-flowered chickweed, or spurry ; on sandy lands. June.
- Cockle. June.
- Corn spurrey. August.
- Petty-spurge. July.
- Sun-spurge, or wart-wort. These are both very common in gardens. July.
- Red-poppy, or corn-poppy. June.
- Wild larkspur. This has increased so much of late years in Cambridgeshire, as to become one of the common weeds among the corn.
- Adonis flower, pheasant's eye, red maithes, red Morocco. Frequent in the corn-fields of Kent.
- Corn crowfoot. The seeds of this do not come forth till the second year after sowing. June.
- Upright ground-ivy.
- Red archangel, or dead-nettle. Common in gardens.
- Great henbit.
- Narrow-leaved all-heal.
- Nettle-hemp, or hemp-leaved dead nettle.
- Red eye-bright.
- Fluellin ; sharp-pointed, and round-pointed.
- Gold of pleasure ; among the flax. June.
- Shepherd's purse.
- White-flowered charlock, with a jointed cod. June.
- Yellow-flowered ditto.
- Wild mustard, or charlock. May.
- These three, particularly the last, are the *opprobrium* of the farmers : they who will not be at the pains to extirpate them by hand, might do well at least to run a scythe over the crops, while the weed is in flower, and before their spring corn (for it is that which is chiefly troubled with it) is got up too high.
- Pumitory. April.
- Yellow vetchling ; very common in the corn-fields about Cambridge.
- Common sow-thistle. June.
- Common groundsel.

Corn-marigold ; the pest of light lands ; it is not fond of dung. In Denmark there are laws for the extirpation of this weed. June.

Common chamomile, or corn-feverfew. June.

Stinking May-weed. June ; somewhat earlier than last.

Blue-bottles. July.

Pansies, or heart's-ease.

Lesser nettle. August.

Orace, of several kinds ; along with the goosefoot, on dunghills, and the gardens. August.

Annual Weeds in Pasture Grounds are only the following :

Purging-flax. May.

Knot-grass. This spreads chiefly by the path sides, and where dung or rubbish has lain.

Yellow rattle or cock's-comb, vulgarly penny-grass ; in moist meadows. This keeps its ground, for the seeds are ripe at the time of cutting hay. June.

Eye-bright ; in dry pastures.

Red eye-bright.

Heart-trefoil, or clover. This is alway mixed with clover, and particularly with the hop-trefoil, or non-such. It is a harsher plant, full of hard, prickly seed-vessels, and therefore not a good food for cattle : it is easily known from other clovers, by its seed-vessels, and the spots upon its leaves.

Common creeping mouse-ear. May.

Smooth succory hawk-weed. June.

Star-thistle ; in dry barren pastures, and by way sides. July.

Hairy sheep's scabious ; on high pasture.

Biennial Weeds in Corn.

Viper's bugloss, called in Cambridgeshire, &c. cat's tail. It infests the corn very much every third year. July.

Mithridate-mustard, or bastard cress.

Common melilot. The seeds of this ground along with wheat are known to give bread a very strong taste. June.

Spear-thistle. July. This with many other kinds of thistles and other weeds, with downy seeds, are suffered to stand on banks, way-sides, and fallow lands, in order to serve for a constant supply of weeds. If the waste places were run over with an old scythe, this evil would soon be prevented.

Biennial Weeds in Pastures.

Wild-carrot, or bird's nest. June.

Cow-parship. July.

Common-mallow. May.

Rough-succory hawk-weed. July.

Stinking hawk-weed. June.

Musk-thistle. July.

Wild carline-thistle. June.

Perennial Weeds in Corn.

Field fox tail, or mouse-tail grass.

Common wheat grass, dog's-grass, quick-grass, or couch-grass. As every piece of this most detestable creeping-weed will grow, there is no way of destroying it, but by ploughing up the ground thoroughly, picking it out, and burning it.

Common field-scabious. August.

Small bind-weed. This spreads its roots deep and wide ; and as every piece of them will grow, it is no easy matter to eradicate this pernicious plant.

Bladder-campion, white corn-campion, spatling-poppy. July.

White-campion. May.

Small-bramble, or dewberry-bush. June.

Corn-mint. August.

White-archangel, or dead-nettle ; chiefly in gardens and under hedges.

Corn rest-harrow, or cammock. The roots of this mat together with great strength, and are therefore very troublesome, where land is to be ploughed for corn. This property, however, makes it an excellent plant to set on sea and fen banks, to keep them firm and compact. July.

Tree sow-thistle. August.

Way-thistle. The fallows are usually well overspread with this weed, whose downy seeds are easily spread by the wind. July.

Great knap-weed, or matfellow. Its roots are very stubborn and hard. July.

Corn horse-tail.

Perennial Weeds in Pastures.

Devil's-bit. June.

Great-plantain, or waybread. June.

Ribwort, or ribwort-plantain. June.

Yellow ladies bed-straw, or cheese-renning. It is a vulgar notion, but a false one, that this herb will turn milk. The good women are fond of putting some favourite plant into their rennet, and thus attribute to it a quality which it has no right to claim. July.

Cowslips, or pagils. April.

Round-leaved bell flower. August.

Lesser throat-wort, or Canterbury-bells. July.

Meadow-saxifrage. August.

Burnet-saxifrage. August.

Cow-garlic. This gives milk and butter an insufferable strong taste. June.

Broad-leaved dock. July.

Common-forrel. May.

Sheep's forrel.

White saxifrage, or fengreen. May.

Agrimony. June.

Drop-wort. Hogs are fond of the roots. July.

Meadow-sweet. June. Only in very moist meadows. Goats are very greedy of this plant, which neither horses nor kine will touch.

Tormentil, or septfoil. June.

Creeping-crow-foot, or butter-cups. May.

Bulbose-crowfoot, or butter-cups. May.

Upright meadow-crowfoot. June.

The three last, which occupy so much room in almost all meadows, are not eaten by any sort of cattle, being of a very hot and acrid nature, so that the notion of their giving butter a yellow tincture, is as false as it is vulgar.

Pilewort, or lesser celandine. April.

Meadow-rue. June.

Bugle. May.

Self-heal. August.

Common yellow toad-flax. July.

Common ladies-smock, or cuckow-flower. April.

Crowfoot cranebill. June.

Common broom ; in dry pastures. May.

Rest-harrow, or cammock ; in barren grounds.

Dandelion. April.

Rough dandelion. May.

Yellow devil's bit. August.

Long-rooted hawk-weed. May.

Dwarf carline-thistle. July.

Common coltsfoot ; in watery days. March.

Common butter-bur ; in moist meadows. March.

Ragwort, or seagrim. Nothing touches this plant ; though a perennial, it comes up easily by hand, when young, or when the ground is moist. July.

Fleabane ; in moist places. August.

Common daisie. We do not find that any cattle willingly eat of this plant, which occupies so large a part of our pastures.

Greater daisie, or ox-eye. May.

Common yarrow, or milfoil. The roots of this creep abominably, especially where rubbish, or dung has been laid. May.

Common knap-weed, or matfellow. July.

Orchises of various sorts ; as,

Butterfly orchis. May.

Male fool-stones. May.

Female fool-stones. May.

Male-handed orchis. May.

Female-handed orchis. June.

Red-handed orchis. June.

Purple late-flowering orchis. June.

Little purple-flowered orchis. May.

Man orchis. June.

Frog satyrion. May.

Triple ladies traces. August.

Bee orchis. June.

Carexes of various sorts ; in low meadows and fenny grounds.

} In moist meadows.

} In dry pastures, chiefly in chalk.

grounds. These are all very harsh: they are, however, mowed to fodder cows with in winter.

Common nettle.

Adder's tongue; in moist meadows.

Female fern, or brakes; on dry barren land. It strikes its roots far and wide, and is difficult to eradicate even with the plough.

Mosses of various sorts. Old pastures are most infested with these. Ploughing is the only effectual way of destroying them.

We have added the time in which most of the foregoing plants begin to flower; because about that time it is proper they should be destroyed.

Though the reader will find an account of many of the weeds enumerated in the above catalogue, under their proper articles, yet we were persuaded that a general description of the perennial weeds would not be unacceptable here, as too much cannot be said to enable the husbandman to know these pernicious plants, and exterminate them as soon as possible.

Annual dandel-grass is called white dandel by Gerard, and in the southern counties crap; though, in Worcestershire, they call the buck-wheat by this name. It was a ridiculous old notion, that this weed, which has ever been stigmatized as one of the greatest pests of corn, is produced from bad seed of wheat. The French call it *yvraine*; because put into bread, or beer, it is supposed to cause drunkenness. It has always been reckoned bad for the eyes, and to occasion vertigoes. This plant is very like the red dandel-grass, which has been so much cultivated, under the name of ray-grass, or vulgarly rye-grass: but the spike is much larger and paler; and has beards, which the ray-grass is entirely without. It is likewise annual: whereas the ray grass has an abiding root. Its seeds ripen with the corn.

Bearded oat-grass, or wild oats, is very like the common oat in appearance, but generally over-tops it. The seeds are also of a dusky reddish colour, and hairy towards the bottom. The beards or awns are very long, stiff, and bent. As it ripens with the corn, or but little before it, the extirpation of it is not very easy.

Bastard alkanet is called, also, bastard gromill, or gromwell, and falfern. Nothing is more common among the corn, especially among rye, than this weed. It may easily be known, by its red roots, which yield a red tincture, and are used by the country girls in Sweden, to smear their faces with. From the root usually rises a single stem, about a foot high, rough, and branching out at the top. The flowers are small and white, surrounded with five long, narrow, hairy leaves, and succeeded by four white rough seeds.

The dodder is so remarkable a plant, that it cannot be mistaken by those who know the name. It is entirely without leaves, and does not depend upon the ground for nourishment; but when it is grown up, rots at the bottom, and lives upon the juices of other plants, about which it entwines itself by means of small threads of a red colour which it throws out. The flowers are small, and come out in roundish heads, or bunches, many of them together, here and there, from the stem.

Small corn parsley, though it is very common among corn, does not seem to be much known. It is a low branching plant. The branches grow thick together, and are knotted and crooked. The flowers grow thick together after the manner of parsley, &c. and are of a white colour inclining to yellow. The seeds are large in proportion to the plant, and are set about with little crooked bristles, which makes them adhere to the stockings in great plenty when the seeds are ripe, which is about, or a little after, harvest.

The lesser hemlock, called by Gerard, thin-leaved wild hemlock, is so well known under the name of fools parsley, as scarce to need a description. However, as it is a matter of consequence to distinguish poisonous plants from those which they resemble, we may observe, that though the leaves resemble parsley, yet they are much darker on their upper surface, but pale and shining underneath. The divisions of the leaves are much sharper, and they have no smell, nor scarcely any taste. When the plant is in flower, it is easily known by the three long narrow green leaves, which hang down from the little stem that immediately support the flowers.

Shepherd's needle or Venus's comb, has its name from the remarkable shape of the seeds with their appendage, re-

sembling in this respect the cranes bills: these would be alone sufficient to distinguish the plant. They succeed small white flowers, and come out in a bunch like needles, or the teeth of a comb set close together. The leaves are very finely cut.

Knot-grass is so called from its knots or joints, of which its slender creeping branches are full. After harvest, the lands, in many places, seem all coloured with the little red flowers of this plant. It is called also, swine's grass; and, in the north, bird's tongue.

Black bindweed has a stem that lays hold on any neighbouring plants, and twines about them from right to left. Its leaves are smooth, and shaped pretty much like those of the buck-wheat, which its seeds also resembles; being triangular, but smaller. It frequently ramps up in hedges, and gardens, and is also very common among corn.

Corn crow-foot has an upright stalk. The leaves are of a pale green, and cut into long, narrow, acute segments. The flowers are much smaller, and paler than in the crow-foots of the pastures; but the seed-vessels are the most remarkable, for they are covered all over with prickles. This is extremely common among corn.

Charlock, called also chadlock, catlock, carlock, and wild rape, is, I suppose, too generally known to need a description. The white and the yellow-flowered charlock, or wild radish, which are the only varieties of each other, and not so common as the former, may easily be distinguished from it, by the paleness of their flowers, and the form of their seed-vessel, which is round, smooth, and jointed. Almost the whole plant is covered with bent pellucid hairs.

Yellow vetching, or small yellow fetch, has long slender divided stalks. The leaves are triangular, and grow by pairs close to the stalk. Out of these leaves comes a tendril, by which the plant supports itself; and, on a long stalk, one small pea flower, of a yellow colour, which is succeeded by a flat pod, about an inch in length, containing six or seven roundish seeds.

Corn-marigold, or golden corn-flower, is the buddle, or yellow buddle of Kent. Its leaves grow close to the stem, in an alternate order. They are of a blue-green colour, and are cut about the edges. The flowers are like those of the marigold, large, and a beautiful yellow.

Yellow rattle is known by its leaves being firmly indented about the edges, its flowers being yellow; and its seed-vessel swelling into a dry, large, compressed bladder divided into two cells, and containing several compressed seeds, surrounded with a membrane.

Red eye-bright, or eye-bright cow-wheat, has a stem rising not more than a foot high; long narrow leaves, indented about the edges, and purple flowers growing in spikes. It flowers in July and August.

Viper's bugloss. The stalks are rough, round, solid, erect, undivided, and marked with black spots; the leaves are very rough, long, narrowing to a point, and placed without any certain order. The large specious flowers, of a beautiful blue colour, grow in long bending spikes. They consist of one petal, divided into five roundish segments, of different sizes, and resemble a horn in their figure, expanding by degrees, from a narrow beginning. The flower-cup consists of five narrow segments, and contains four rough seeds.

Melilot is well known by its trefoil leaves, which are indented, and, as it were, eaten about the edges; and by its long, thin spikes of small, yellow flowers, which are succeeded by short rough pods, containing two seeds.

Wild carrot, bird's nest, or bees-nest, is very like the cultivated carrot, of which it is indeed supposed to be only a variety. The wild sort, however, differs in its roots being small and sticky. In both sorts, after they have done flowering, the umbels contract themselves into the shape of a bird's nest.

Cow parsnip, wild parsnip, meadow parsnip, or madnep. This grows three feet high. The stalk is round, furrowed, and hollow. The leaves proceed from a large membrane, or sheath. They grow on long hairy stalks, and are divided and downy. The flowers grow in large umbels, are white, and consist of five irregular petals. Two oval, streaked, compressed seeds, surrounded by a wing, succeed each flower.

Stinking hawkweed may be discovered by its very strong smell like castor. As it is not a common weed, it is not necessary to be particular in the description of it.

Musk-thistle is known by its handsome purple nodding heads

heads of flowers, which come out rather sooner than most sorts of thistle. The smell of them is agreeable.

Carline-thistles is very different from the other thistles. The hard, woody root, sends up one round purplish stalk, beset with prickly leaves in no order. This is terminated with several flowers, growing in a head. The small ones, composing the whole, are of a dusky purple, and contained in a swelling scaly cup; the inner scales of which are very long, shining, coloured, spreading, and placed in a ring round the flowers. The stalks and heads remain all the year, with very little variation, upon the dry pastures.

Perennial Weeds in Corn.

Field fox-tail, small bastard fox-tail, or mouse-tail grass, is known by its long, round, slender, smooth spike, of a dusky purple colour. The spikes are so very long and slender, that they usually bend a little. This grass is found in the moist furrows of arable land, and in any places where the water is suffered to stand.

Common wheat-grass, or couch-grass, is universally known, by its long white creeping roots. It grows very tall, especially in hedges. The spike resembles that of wheat in the manner in which the seeds are disposed.

Common field scabious is all over rough and hairy. The stalk is upright; a foot, or a foot and a half in height, spotted, and branching. The lower leaves are oval, and indented about the edge. Those which grow on the stalk are divided, and of that sort which botanists call pinnatifid. The flowers are blue, of the compound kind, consisting of a considerable number of small flowers, each divided into four parts, and having one seed under them.

The taste of the plant is a disagreeable bitter.

Small bind-weed, called, also, with-wind, and hedge-bells, though these names should seem rather to belong to the great bind-weed, which ramps in the hedges; whereas this overspreads the arable lands. The common people, in their wrath, have given this pernicious weed the same opprobrious names with the dodder, viz. hell-weed, and devil's guts.

The stalks of this plant are weak, and twine about any thing. They come near, from left to right; and when they find no support, they trail along the ground. The leaves come out single. They are three cornered, shaped somewhat like an arrow head, smooth, and placed on long foot-stalks. From the bosoms of the leaves comes out one flower on a very long foot-stalk. It is bell-shaped, of a beautiful colour, purple, red, white, or variegated; and is succeeded by a small, roundish seed vessel, containing four large angular seeds. The whole plant is full of a milky juice.

Bladder-campion, white corn-campion, spatling poppy, white bottle, white ben, or frothy poppy. The stalks grow a foot and a half, or two feet high, round, smooth, jointed, branched towards the top; and at every joint is a pair of leaves, perfectly smooth. The flowers are white, and consist of five bifid petals. The empalement, or outward covering, is puffed out into a roundish form; and is smooth, often varied with red, green, and white, and beautifully veined all over, like a fine net.

White campion, admitted into gardens, when it has a double flower, under the name of white batchelor's-buttons. It has a long and large root, of a sharp bitterish taste, sending forth several stalks about two feet high: round, hairy, jointed, branching, of a red colour near the ground: a pair of leaves comes out at every joint, hairy, and sharp-pointed. The flowers are like those of the last: but the empalement, which is not puffed out like that, is oblong, with purplish streaks down along it from top to bottom. The flowers of this are imperfect: the male or barren, and the female or fruitful, growing on distinct plants.

Small bramble, or dewberry-bush is distinguished from the common bramble of the hedges, by the place of its growth, the trailing of its round branches, the smallness of its prickles which are fewer in number, and chiefly on the stalks; the leaves growing only three together, being green underneath, and the side ones divided into two parts; and the blueness of its berries, which consist of a very few large divisions.

Corn-mint. We are told, on undoubted authority, that this herb will hinder milk from curdling; and that when hungry cows have been put after harvest into a field where

this plant abounded, it has been scarcely possible to turn their milk for cheese.

Corn rest-harrow, rest-plough, cammock, pretty whin, or ground furze. The hard, stubborn, creeping roots send forth many woody, round, slender, hairy branches, red towards the bottom. The leaves grow three together. The flowers of the pea kind, of a beautiful red colour, and are succeeded by a swelling, villous pod, containing a few roundish seeds.

Tree sow-thistles. The root is very creeping, full of milk, and with difficulty eradicated. The stalk is about two feet high, smooth at the bottom, but hairy where it begins to branch out. The leaves are like those of the dandelion, deeply cut, ending in sharp points, and having the edges set round with tender prickles. The flowers grow several together; and resemble those of the sow-thistle, but are much larger, of a deeper yellow, and surrounded by a very rough, hairy, dark-coloured empalement. They have the smell of bitter almonds, and are succeeded by downy seeds.

Great knapweed, matfellow, or bulweed. This plant is about two feet high. The stalks are round, streaked, and hoary. The bottom leaves are oblong and undivided; but those which grow on the stalk, are cut and divided. The flowers resemble those of the blue-bottle in shape, but are of a red colour. The seed is small, oblong, reddish, and hairy in the upper part.

Corn horse-tail grows in moist places. In April, naked stalks come up, which bear the flower and seed. These are but of short duration. In May, other stalks arise, hollow jointed about a foot high, and sending forth all round, hollow jointed leaves, six or eight inches in length, subdividing into others at the joints.

Perennial Weeds in Pasture.

Devil's-bit is a kind of scabious. It differs from the common field scabious, in having undivided leaves, set thicker on the stalk; in the flowers not spreading out into a flat surface, but growing in a round form; and the small flowers, which compose the whole, being all of a size and regular: and, lastly, in the root looking as if it were bit off at the end.

Great plantain, or way-dread, is easily known by its broad leaves, spreading on the ground, and marked on the under surface with seven strong nerves. From the centre of these arise several naked, round, hairy stalks, sustaining a long, cylindrical spike of small flowers, set thick together.

Rib-wort plantain has much longer leaves, marked only with five nerves. The stalks are higher, and not round, but cornered, and the spikes of the flowers are shorter.

Yellow ladies bedstraw, cheese-venning, maid's-hair, petty mugwet. Its slender stalks rise to about a foot. The leaves come out in whorls, eight or nine together. They are long and narrow, and of a deep green. Towards the top of the stalk, two little branches usually come out, sustaining a considerable number of small yellow flowers, consisting of one petal, divided into four parts, and succeeded by two smooth roundish seeds.

Round-leaved bell-flowers. The bottom leaves are roundish: those upon the stalk long and narrow. The flowers are blue, bell-shaped, with the edge divided into five parts, and hang down.

Lesser throatwort, or Canterbury bells. The stalk is cornered and undivided, about a foot high, and hairy. The flowers grow at the top of the stalk close to it, several together. They are erect, of a beautiful purple colour, and are divided to the middle into five acute segments.

Meadows saxifrage, English saxifrage, or stone-break. The root has a sharpish, aromatic taste. The stalks are round, streaked, and reddish towards the bottom. The leaves are smooth, of a dark green, and divided twice into long narrow, sharp segments. The foot-stalks membranaceous at the base. The flowers grow in loose umbels, and are of a pale yellow. The seeds are oval, streaked, and red at the top.

Burnet saxifrage is of two kinds. The large is found in woods, and the smaller in dry pastures. Of this last there is a variety, differing only in the leaves, which are cut even to the root. The stalks are streaked, and branched. The flowers grow in umbels close together. They are small, white, and consist of five entire petals. These are succeeded by two seeds of an oblong oval form. The root has a very hot taste.

Crow garlick, or wild garlick. The leaves are round and smooth, resembling much those of rushes. From the midst of these rises a stalk, a foot or more in height, naked, slender, round, smooth, and hard; sustaining many purple seeds, or little bulbs, about the size of grains of wheat, collected into a round head.

White saxifrage, fengreen, or stone-break, has kidney-shaped leaves spread upon the ground, and divided about the edges, not much unlike those of ground-ivy, but softer and smaller, and of a faint yellowish green. Among these rises a round, hairy, branching stalk, about six inches high, bearing spacious white flowers, consisting of five entire petals. This pretty little plant grows in dry pastures, and may readily be known by its roots, which are made up of little knobs.

From a want of sufficient distinction in names, a strange confusion has arisen between the meadow saxifrage, burnet saxifrage, burnet, and white saxifrage. It is hoped these descriptions will contribute something towards avoiding this confusion for the future.

Agrimony has generally a single, round, rough stalk, with leaves placed alternately upon it, which are winged with small leaves, placed between the larger pairs. The yellow flowers grow alternately along the stalk, in a long row, after the manner of a spike, and are succeeded by rough seeds.

Dropwort is known by its winged leaves, the divisions of which are all regular, and sharply indented about the edges, by its white flowers, growing in a bunch like an umbel; but principally by its roots, which consist of a bunch of knobs hanging upon threads, from whence it has the names of filipendula, and dropwort. The flowers smell agreeably.

Meadow-sweet, or queen of the meadows. The stalk is angular, smooth, strong, branching, and of a reddish colour. The leaves grow alternately, are winged, and consist of three or four pair of lobes, and a very large one at the end divided into three parts, like a raspberry-leaf. They are indented about the edges, white underneath, and wrinkled, like the leaf of the elm. The flowers are similar to those of the dropwort. The whole plant has an agreeable smell.

Tormentil, or septfoil. The root is large, of a reddish colour, and an astringent taste. The stalks are weak, and lie on the ground at first; but afterwards rise up. The leaves are hairy, grow close to the stalk, and are divided into seven parts. The flowers are yellow, and consist of four petals. There is another species, not so common, differing from this only in having its stalks laying entirely on the ground, and the leaves growing on foot-stalks.

The crowfoots are too common every where to need a description. They are known under the names of king-cob, king-cup, gold-cups, gold-knobs, butter-cups, and butter-flowers. The bulbous crow-foot is distinguished not only by its round root, but by the divisions of the flower-cups being bent back, the stalk being erect, and that which sustains the flowers being furrowed. The upright crow-foot has the divisions of the empalement spreading out, as in the creeping sort; but the flower-stalks are not furrowed, as in that and the bulbous one. The leaves are divided, first, into three parts; and each of those again into several. The upper leaves are long, narrow, and undivided. This plant grows much taller than the others. The flowers of all three are alike, and of a fine shining yellow.

Pilewort, figwort, or lesser celandine. The root consists of oblong knobs. The leaves are heart-shaped, cornered, and placed on foot-stalks. The flowers resemble in general those of the crow-foots, but differ somewhat from them in having the cup divided only into three parts, the petals being about eight in number, and narrower. This low plant runs very much at the root, and choaks all plants which are near it.

Bugle, middle confound, sicklewort, or herb carpenter. It rises about half a foot high, with a square stalk. The leaves come out by pairs, of a purplish colour, and indented about the edges. The flowers grow in a spike, are blue, and have a very small upper lip.

Self-heal, hooke-heal, sicklewort, carpenter's herb, or prunell. This differs from bugle, in the leaves being longer and narrower, and in the flowers growing in a thicker spike; their upper lip being larger, and their filaments being forked.

Common yellow toud-flax, or flax-weed. It creeps very much with its hard woody roots; which send up several smooth stalks, a foot, or a foot and a half high, covered

with long, narrow leaves, placed without order. The flowers grow in close spikes, on short foot-stalks, at the top of the stalks. They are of a light yellow, shaped like a calf's mouth, and end in the spur behind.

Ladies-smock, cuckow-flower; in Norfolk, Canterbury bells. The stalk is upright, round, and smooth. The leaves are winged, with the lobes of the lower ones roundish; and of those upon the stalk oblong. The flowers are large, handsome, and white, or purplish; consisting of four obtuse veined petals. The seeds are contained in erect compressed pods, an inch, or an inch and a half long; divided into two cells, with which, when ripe, burst with a touch, and throw out their seeds to a considerable distance.

Crow-foot crane's-bill, or blue crane's-bill. The leaves are divided, almost to the middle, usually into seven parts. The stalk commonly divided into two branches, and each of these into two more. From the corner of each division comes a flower stalk supporting two large blue flowers; consisting of five roundish, entire petals, succeeded by a long seed-vessel, resembling a crane's-bill. This bill-like seed vessel is thick and rough, but not so long as in some of the other sorts.

Rest-harrow, or cammock, of the pastures, differs very little from the corn rest-harrow described before. The branches of this are armed with long stiff prickles. The flowers are of a higher purple, and come out single: whereas, in the other, they come out together.

Dandelion, or piss-a-bed, is well known in all pastures, by its milkiness, and its naked hollow stalks, supporting one large, yellow, compound flower, which is succeeded by a round ball of downy seeds.

Rough dandelion, or dandelion hawkweed. The whole plant is rough, with forked hairs. The flower-cup does not bend back, as in the common dandelion: and this is a taller plant.

Yellow devil's-bit, so called, because the end of the root seems as if it were bit off, is also known by the name of small hare's hawkweed. The leaves are smooth, long, narrow, and cut into long sharp pointed segments. The stalks, are a foot and a half, or two feet high, and branching. On the tops of these, grow many flowers, smaller and paler than in the dandelion, supported on scaly flower-stalks.

Long-rooted hawkweed. This has a very long tap-root. The stalks are a foot and a half high, or more; cornered, naked, and divided. The bottom leaves spread in a circle on the ground, and are jagged and rough. The flower-stalks are scaly. The flowers and down of the seed resemble those of the dandelion.

Dwarf, or small purple carline thistle. This lowly plant spreads its prickly leaves a foot round, and suffers nothing to grow beneath them. Its purple flower comes out in the midst of these, without any stalks, close to the ground.

Colt's-foot, sole-foot, horse-hoof, or bull-foot. In February, the scaly stalks arise, bearing one yellow compound flower, which is succeeded by a hairy white down. The leaves come out later. They are shaped somewhat like a horse's hoof, and are downy underneath.

Butter-bur, or pestilent-wort, resembles colts-foot in many respects: but the flowers are purple, and grow in a thyrse. The leaves come out after the flowers decay; and are like those of the colt's-foot in shape; but are three or four times as big.

Ragwort, ragweed, stagger-wort, stancer-wort, St. James's-wort, seggrum, or seagrime. The stalk is usually single, round, streaked, solid, and of a purplish colour in some parts. The leaves are very much jagged, smooth, and of a dark green. The flowers are yellow, radiated, and grow many together. When we affirmed that this plant comes up easily by hand, when young, or the ground is moist, we spoke from experience. The fact, in few words, was this. Some closes were notoriously over-run with this weed. The owner, just before the time of flowering, and after some rain, turned in a man and woman upon them; ordering the woman to pull up all she could by hand, and the man to root out the rest, with his docking-iron. The rag-wort was not indeed left in a lane for the down seeds to ripen, and to be carried on again to the closes, by the wind: but the plant was thrown in heaps and burnt, and the ashes were spread upon the grass. It was not, indeed, all destroyed at this first attempt: but the few plants which came up the following year were soon pulled up by the woman; and scarce a plant has now appeared in these closes for several years past.

Fleabane, middle fleabane, or fleawort. The stalk is round, bending, solid, and hoary. The leaves are oblong, sharp-pointed, wrinkled, downy, and embrace the stalk, on which they grow very thick, without regularity. The flowers are yellow, radiated, and inclosed in a flower-cup, made up of narrow scales like bristles. Mr. Ray tells us that if the leaves or tops of fleabane be squeezed, they smell like soap. Gerard says, the herb-women call it herb Christopher.

Greater daisie, ox-eye, or maudlin-wort. The stalk is five cornered, solid, and branching. The leaves are jagged and embrace the stalk. The flowers are large, and radiated. The ray is white, and the disk yellow: the seeds have no down.

Common yarrow, milfoil, or nosebleed. The stalks are slender, round, streaked, stiff, and hairy. They are divided towards the top into several branches; and these again into flower-stalks, supporting small white or purplish flowers, growing thick together in a kind of umbel. The leaves are cut very fine, and divided twice.

Common, or black knapweed, or matfellow, black matfellow, or bullweed. The root is hard, thick and woody, and has a disagreeable astringency. The stalks are round, rough, streaked, strong and very tough. The leaves are irregularly placed, oblong, and of a dark green. From the wings of the leave arise stalks, supporting one, two, or three heads of flowers, which are purple, and inclosed in a scaly cup: the scales are black, and surrounded with fine hairs, like the eye-lashes.

The orchises may be known by their roots; which are either a double bulb, resembling a pair of testicles; or a bunch of long fleshy roots, like the fingers of the hand. The flowers, by growing in a spike, make a handsome appearance. The colour is red in most sorts.

Adder's tongue is hid among the grass in low meadows. From a very low stalk arises a single, thick, smooth, oblong leaf; from the bosom of which, issues a kind of tongue, ending in a point, and indented on each side like a file.

Mr. Marshall, in his Rural Economy of Norfolk, says, "Hand-weeding is carefully attended to by farmers in general; and is, generally, performed by the acre: a practice I have not met with elsewhere; though most eligible to be adopted in every district: a farmer has not a more disagreeable task than that of attending to weeders by the day. The price is, of course, proportioned to the foulness of the crop to be weeded:—from sixpence to five shillings an acre is given."

WEEVIL, an insect of the beetle kind, resembling a small May bug, with a long sharp pointed head, to the hinder part of which are fixed two antennæ. It is black, and therefore easily distinguished in any corn: but its principal and favourite food is wheat, of which, either old or new, it devours great quantities; without however communicating any bad smell to it, as the moth does. Some call it the corn-louse, because it bites animals more strongly than fleas do. This has made it to be looked upon as a carnivorous insect; and many have pretended that it devours both the worm and the chrysalis of the false moth: an opinion which M. Duhamel does not think improbable, because, in effect, very few of those moths are ever found in corn where there are many weevils.

Upon thrusting one's hand into a heap of corn, one may easily perceive by its heat, whether it contains many of these insects, which generally lie pretty much collected; and the particular places where they are most numerous, feel much warmer than the rest. This observation soon led M. Duhamel to think, that a considerable heat is probably necessary for the hatching of their eggs; and that in this case, even if they should live, they will not be able to breed, in his ventilating granaries.

To ascertain this fact, he put some weevils into wheat (not stove-dried) in one of those granaries, in May 1751. It was well ventilated from time to time, and opened in August 1752, when none of them were found. He did the same with wheat which had been stove dried: and when the granary was emptied, a year and a half or two years after, not a weevil could be seen.

He again put some weevils into a ventilating granary in which wheat of the year 1754 was laid up, without having been stove-dried. This corn was taken out in May 1756, and sifted over a fine screen; which gave him an opportunity to observe whether the weevils had increased. The number seemed to him nearly the same as that he

had put in: and a further reason which induced him to think they had not multiplied, was, that this grain, instead of being heated, as corn is well known to be whenever weevils breed in it, was so cool, that a country fellow employed for this work could hardly remain bare-footed among it.

In 1755, Dom Edward Provenchere, procurator of the Carthusians of Liget, near Loches, in the province of Touraine, intending to make some experiments on the preservation of corn, chose for that purpose a large cask, at one end of which, a little above the common bottom, he put a floor of lattice work, and over that a canvas. This cask was filled with wheat of the harvest of 1754, of which it contained 1080 pounds. He then fixed to it a pair of middle sized bellows, so situated that they might easily be worked; and nearly in the centre of this corn, he put as many weevils as weighed six drachms; which is pretty considerable for that quantity of grain.

The bellows were blown an hour every week. In the beginning of September 1756, when that operation had been neglected for some time, the corn began to heat: but it was soon cooled again by using the bellows. The 15th of October, on taking the corn out of this cask, in which it had kept perfectly well, not above twenty weevils were found in it. Dom Edward says, he saw that insect come out of the vent-holes every time the bellows were blown. He perceived in many places several grains of corn linked together by threads, certainly formed by moths that were in his wheat (which had not been stove-dried), and, not dying immediately, had had time to spin their web.

Dom Edward filled another cask with nine hundred pounds of barley, not stove-dried, and put into it six drachms of weevils. Though care was taken to ventilate this cask as much as the former, which was filled with wheat, that is to say, during an hour every week, yet this corn heated prodigiously: the bellows could not cool it, and the weevils multiplied in it exceedingly.

"This," says M. Duhamel, is the very thing that happened to me in my larger experiment on the same kind of grain. Barley probably contains a great deal of moisture; and the question is, whether stove-drying can be able to preserve it. The increase of the weevils here seems to prove that this insect cannot multiply in corn which retains a proper degree of coolness."

Though the above experiments seem to prove pretty clearly, at least that the weevil cannot breed in corn which is kept properly cool, and that if any sure way to destroy this insect be ever discovered, it will be most likely to succeed by means of the ventilating granary; yet M. Duhamel, with his constant candour and unvaried zeal for the welfare of mankind, exhorts the naturalists, the philosopher, the lover of the public good, not to rely too much on any thing that he has said in this respect; to look upon the trials which he has related, as steps only which may help to lead to that desired end; and to continue their endeavours to render to the world the important service of shewing how this creature may be effectually exterminated, by any safe and practicable method.

"I have tried," continues he, in his latest writings upon agriculture, many of the receipts most vaunted in books of husbandry, as remedies against the weevil, and have not found the least benefit from any one of them. All that they have taught me, is that this animal will endure a great deal before it can be killed. It will live a long time without eating; cold will benumb it so as to make it appear to be dead; but I have put some of them, in that state, into a warm place, and after keeping them there for some time, have found that they were perfectly alive: the great coolness of my granaries has seemed to prevent their increase: but it has not killed them. They bear easily a heat of from forty-five to fifty degrees of Reaumur's thermometer (from one hundred and fifteen to one hundred and twenty-four of Fahrenheit's). I kept corn in which there were many weevils, during half an hour, in a place heated to upwards of eighty degrees of Reaumur's thermometer (two hundred and ten of Fahrenheit's): some of them perished; but others remained alive. They, therefore, who would destroy them by such a degree of heat, must let their corn be exposed to it during seven or eight hours at least.

"I grant that the smoke of sulphur will kill any insect; but that method is not practicable in granaries: for this vapour, which is very light, ascends to the top of the granary, and scarcely acts at all upon the corn on the floor.

It is true, that the corn may be so disposed as to let this smoke pass through it, and all the insects in it will then be destroyed. But, at the same time, this smoke will give the corn a very disagreeable and lasting smell, which depreciates it entirely. Consequently this method will not do.

"It is confidently said, that the weevils may be driven away by turning the corn with shovels rubbed with essence of turpentine. To try whether this essence really displeases them, I ordered two large casks to be made: the inside of one of them was rubbed with essence of turpentine; both of them were filled with corn in which there were many weevils; and the insects remained as quiet in the one as in the other. It is true, that when corn infested with weevils is turned with a shovel, several of those insects quit the heap, and hasten towards the walls of the granary. This may have been imputed to the rubbing of the shovel with oil of spikenard or essence of turpentine: but the same thing happens when the shovel has not been rubbed with any drug whatever; and the fugitive weevils soon return to the heap of corn.

"When corn is sifted in a sieve (and the same is applicable to a screen) fine enough to retain the grain, the weevils then agitated, shrink up their legs, and are, in that posture, generally so much smaller than the good corn, that very many of them drop through the sieve. The greatest part of them may therefore be destroyed by this method, which is a very good one: but unfortunately, there will still remain enough of them among the corn, to do considerable damage. This sieve or screen should be of wire; and under it should be placed an earthen or copper vessel, pretty deep, to receive the insects, and smooth on its inside, to prevent their getting out easily.

"Of all the methods I have tried, that which has seemed to me to be the best, is to dry the corn in a stove, or oven, heated to eighty or ninety degrees of M. de Reaumur's thermometer (from two hundred and ten to two hundred and thirty of Fahrenheit's, and to let it remain there twelve hours. I exhort all those who wish the welfare of the public, to study the means of destroying the weevil, and, in consequence thereof, to make particular experiments: but I beseech them not to publish their discoveries till they have made repeated trials of them, and that in different granaries: for I have sometimes seen these insects forsake a granary, when no cause could possibly be assigned for so doing."

WELD, or DYERS WEED, the name of a plant much used by the dyers to give a yellow colour to woollens, silks, cotton, and thread.

Its root, which is composed of a few ligneous fibres, does not pierce deep; from this root it puts forth leaves about four inches long and half an inch broad, of a lively green, soft to the touch, and spread circularly near the ground, with some gentle wavings at their edges, but obtuse at their points. Its stem, which rises from amidst these leaves to the height of three feet, or even more, if the soil and culture be very good, often branches out, and is garnished with leaves like those below, though smaller in proportion as they approach the flowers, which grow in long loose spikes at the end of the branches or stem. These flowers, which appear at the latter end of June, are each of them composed of three small irregular petals of a greenish yellow, to which succeeds a globular berry of the same colour, terminated by three points, and in which are inclosed small brown spherical seeds. These seeds ripen in September, the plant becomes entirely yellow when it is dry, and the whole of it, but especially the berry, is used in dying. The slenderest weld, and particularly if it inclines to a russet colour, is accounted the best: that which is larger, and of a dull green, is much less esteemed.

This plant grows naturally along the sides of high ways, upon dry banks, and on old walls, in many parts of England, France, Spain, and other countries where the winters are not very severe: but the cultivated sort is far preferable to the wild, both for the quantity and the goodness of the colour which it yields. It will thrive tolerably on almost any soil, provided it be dry and warm: but the richer the land is upon which it is sown, the greater will be the produce; and in proportion to the care with which it is cultivated, the more vigorous and fit for dying will it be.

The ground for this, as for every other plant, should be in fine tilth at the time of sowing it; though here, un-

less it be very poor indeed; it will not require dung. The seed should be that of the preceding year; for if it be older, great part of it will not grow. Both Mr. Worlidge and M. Duhamel are of opinion that weld seed should, on account of its smallness, for it is but little bigger than that of purslane, be mixed with ashes, buckwheat, oats, or some other similar ingredient, in order the better to avoid sowing it too thick; for the plants of weld thrive best when they are about six inches asunder. For this reason, as was before observed in regard to all plants which require being hoed, it is best to sow weld in rows. Some sow it on barley, or oats after they have been sown and harrowed, this requiring only a bush to be drawn over it; for it should not be covered deep. A gallon of weld seed thus used in the broad-cast way will be sufficient to sow an acre of land. It will not grow much during the first summer, when it is thus sown; but it will thrive apace after the corn is taken off.

The beginning or middle of August is a proper season for sowing weld in this country. The only care that it requires whilst growing, is to keep it clear of weeds, which might choke it, or at least weaken its growth.

The French, in general, sow their weld in March, and pull it up in July or August of the ensuing year, when part of its seeds are ripe, and the plant is still of a greenish yellow: they then dry it and thresh it upon cloths, to get the ripest of the seed, and after this they tie their stalks up in bundles, and sell them to the dyers. But Mr. Miller rightly judges, that the best time to pull the weld for use is when it begins to flower, that is to say, about the latter end of June, because, like all other vegetables, it is then in its greatest vigour, and consequently best fitted to yield the greatest quantity of dye. For a produce of new seeds, it is much better to sow a small piece of land on purpose, or to set apart for this end a suitable portion of the field of which the plants are intended for use, rather than let the whole stand too long, that is to say, till part of the seeds are ripe; because, by letting the plants stand till then, their quality is injured far beyond the value of the seeds that are got from them (the berries being, as was observed before, the part which yields the finest dye); and besides, the seeds thus obtained will of course be a mixture of ripe and half-ripe ones, on the growing of which there cannot be a due reliance. The common way of drying these plants is to set them upright in small handfuls in the field, and when they are dry, to tie them up in bundles. They must also be housed dry; and care must be taken to stack them so loosely, that there may be room for the air to pass between them, to prevent their fermenting.

The plants which are intended for seed should be pulled as soon as their seeds are ripe, and then be dried and beaten out for use; for if this is deferred, or if they are let stand too long, the seeds will scatter.

The method of cultivating this plant at Oissel, in Normandy, where great quantities of it are raised for exportation to Holland, independent of the consumption in France, is thus related by M. Dambourney, in the Memoirs of the Royal Society of Agriculture at Rouen.

"In the month of July, just after the kidney beans then in bloom have been hoed for the second time, and earthed up, especially if there be an appearance of approaching rain, weld seed is sown among them, very thin, as equally as possible. Careful husbandmen bury this seed by dragging over it a small bush of thorns. Whilst the weld rises, the beans ripen and are gathered; after which the ground remains, of course, planted with weld only. This is hoed about Michaelmas, then left in that condition during the winter, and in the ensuing month of March, when the danger of frosts is judged to be over, it is hoed again, to extirpate such weeds as may have come up in the mean time. Towards the end of June in this second year, when the weld has done blossoming, when its berries form, and when the plant begins to turn yellow, advantage is taken of the first fair day after a rainy one, to pull it up. Two men will then pull up as much of it in one day, as four men can when the ground is dry and hard. It is carried off in large bundles: but these are untied before the weld is laid up for keeing, and the plants are spread out and set upright against walls or hedges well exposed to the sun, the heat of which completes their drying in two days. They are then laid upon a cloth, to prevent the loss of the seed, which drops very easily out of the now open capsules; and finally, after being tied up again in bundles, weighing about thirty pounds apiece, they

they are piled up loosely in a barn or other well covered place where they complete their ripening, and generally shrink to less than half of their former weight.

"Weld raised on rich ground is apt to be greasy and too full of stalks: that which grows in sandy places is of a better quality, and has only one main stem: but, in return, the produce here is much less than in the former case.

"As soon as the weld has been pulled, sheep are turned in upon the land, to eat up the grass it may have produced: it is then ploughed once; and after another ploughing at the end of October, it is sowed with wheat, or great rye, without using any other compost or dung. If the land is light and destined for spring-corn, turneps may be sown upon the first ploughing after the weld; for they will have time to grow big enough to be pulled before the ploughing for oats or small rye; which last crops it will be proper to help with a little shavings or raspings of horn.

"If it be intended to raise weld after peas, the ground should be ploughed, and the seed sown very thin: to do which the more effectually, this seed, like that of turneps, should be taken up only in pinches between the middle finger and the thumb, and the fore-finger should remain extended, the better to help its spreading when it is dropped. This seed should be sown in rows sufficiently distant for the plants to have full room to grow; and the best way is to leave an alley after every third row. When sown, it is harrowed in, and the only farther care that the weld requires is to keep the plants free from weeds, by hoeing the ground at Michaelmas and in March, as before directed.

"The weld which is sown after peas does not injure the land it grows on; and therefore in this case, as after the kidney-beans before spoken of, wheat may be sown in October without any previous manure.

WELL. See DRAINING.

WHEAT, the name of a well-known plant, greatly cultivated in many parts of the world, especially in England.

As a crop of wheat, is, in general, the principal riches of farmers whose farms consist of arable land, we shall be very full in describing every method yet practised with success for cultivating this useful species of grain; and in order to this, shall begin with the method of preparing the soil by ploughing, harrowing and rolling.

Ploughing increases the food of plants, by opening the soil to receive the vegetable food from the air, and by enlarging the surface, and thereby exposing a greater quantity of the soil to its influence.

Ploughing enlarges the pasture of plants, by opening the soil if too solid, and making it firm, if too light.

Ploughing prepares the vegetable food for entering the roots of plants, by reducing vegetables to a state of corruption, and dissolving oils.

Ploughing destroys weeds, by making their seed vegetate, and then tearing up the young plants; and by exposing the roots to the drought.

Ploughing removes wetness, by laying up land in proper ridges.

It may be said, therefore, that ploughing is one of the most important operations in agriculture; and that the greatest care is to be taken in the performance of it.

Though ploughing in general serves all the purposes mentioned, yet commonly one of them only is chiefly in view; and according to the design in view the work is to be performed.

When the design of ploughing is to increase the food of plants, the surface cannot be made too uneven: for the more uneven that the surface is made, the greater quantity of the soil is exposed to the influence of the air, and the greater quantity of food procured.

When the design of ploughing is to enlarge the pasture of plants, that kind is best that goes deepest, (provided the soil allows) and most effectually breaks the mould; for the deeper that the plough goes, the greater quantity of soil is employed in vegetation; and the more effectually that the mould is broken, the larger is the pasture in the same quantity.

When the design of ploughing is to destroy root-weeds, the surface cannot be left too rough, nor the earth of the furrow raised in too large pieces; for the rougher that the surface is, and the larger the pieces of earth raised, the drought has the easier access, and more effectually operates in the destruction of the roots.

When the design of ploughing is to destroy seed-weeds, the surface cannot be made too smooth, nor the mould too much broken: for the smoother that the surface is made, and more effectually that the mould is broken, the seeds are the more exposed to the influence of the air, the sap better preserved, and their vegetation the more encouraged.

When the design of ploughing is to remove wetness, the land must be laid up in high and narrow ridges; for the greater number that there are of furrows, there are the greater number of drains; and the higher that the ridges are, the more easily the water finds its way to the furrows.

Thus we see how this operation of ploughing is to be performed, according to the chief design in view. It often happens, however, that land is in such a condition as to require more than one of these advantages which ploughing is intended to promote. These are sometimes consistent with each other, and the land may be ploughed in such a manner as best to promote all of them. Thus land is sometimes, at the same time, poor, and wet, and full of root-weeds: now it may be ploughed in such a manner as is most proper for increasing its food, removing its wetness, and destroying its weeds: for by one ploughing, its surface may be made uneven, which fits it for receiving an increase of food: it may be formed into narrow and steep ridges, which best remove its wetness; and the earth may be raised in large pieces, which best expose the roots of the weeds to be destroyed by drought.

At other times the land is in such a situation, that the advantage which it requires from ploughing are inconsistent with each other, and it cannot be ploughed in such a manner as is most proper for promoting all of them. Thus land at the same time may be full both of seed-weeds and of root-weeds: now, it cannot be ploughed in such a manner as is most proper to destroy both: for by one ploughing it cannot be raised in pieces and left rough, which is necessary to destroy root-weeds, and have the mould broke and be made smooth, which is necessary to destroy seed-weeds. This makes it necessary to have one of these things chiefly in view at first, and to consider which of the two it is proper to begin with, and how the work may be performed in such a manner, as the other may most easily succeed. Thus, in the present case, the land should be ploughed, so as to be raised in pieces, and to be left rough: and in that condition it should be allowed to lie, till the drought may be supposed to have destroyed the roots; and then it may be reduced, the pieces broke, and the surface made smooth, in order to destroy the seeds.

In ploughing there are some general rules to be observed, whatever is the design of it. Thus land is never to be ploughed when it is wet. When land is ploughed wet, the design of ploughing, whatever it may be, is frustrated; and this holds true in every kind of soil.

When stiff soil is ploughed wet, by drying too suddenly, it becomes so hard, that it can receive no benefit from the air, and the pasture in it is entirely shut up: root-weeds strike root again before the drought reaches them; and if there are any seed-weeds, the surface crusts so soon, that they are prevented from vegetating.

When light soil is ploughed wet, though it may receive some benefit by exposing a larger surface to the influence of the air, yet its pores, being full of water, will prevent its pasture from being enlarged: and the root-weeds that are in it will not be destroyed; they will rather flourish by being transplanted into a new pasture. In both kinds of soil the labour is very severe upon the cattle, and the land is greatly damaged by their going upon it, and treading it down with their feet.

Thus it is also to be observed, that whatever is the design of ploughing, the quantity of firm land taken off from the surface of the plough in going, ought not to exceed the wideness of the furrow which the plough makes below. If it does, the land is not clean ploughed; it is only scratched, and a quantity of the soil is left below untouched betwixt every furrow that the plough makes.

The quantity of firm land to be taken off by the plough, depends upon the design of ploughing, and the nature of the soil.

When the design of ploughing is to increase the food of plants, and destroy root-weeds, whether the soil is stiff or light, as great a quantity may be taken off as the plough can take conveniently; because the greater that the quantity is which the plough takes off, the rougher and more uneven

uneven the surface is made, the more food is procured, and the root-weeds more effectually destroyed.

When the design of ploughing is to enlarge the pasture of plants and destroy feed-weeds, though a large quantity may be taken off in a light soil, that naturally falls in pieces when turned over, yet a small quantity ought to be taken off in stiff land that is not so easily reduced; because the smaller that the quantity is which the plough takes off, the soil is the more effectually broken, and the surface made the smoother; and the more effectually that the mould is broken, and the smoother that the surface is made, the pasture is the more enlarged, and the weeds more effectually destroyed. This is agreeable to the ordinary practice, introduced no doubt from experience; for we find that a much less quantity is taken off when land gets the seed-furrow, the chief design of which is to enlarge the pasture, than at any other ploughing.

In the directions which we have given about ploughing, we have had chiefly in our view land employed in tillage; it is necessary to add something with respect to the ploughing lea, or opening up grass ground.

The English writers on agriculture, when giving directions about the opening of grass ground, always suppose that the land is to be summer fallowed; and they recommend to plough as deep at first as the nature of the soil will allow. They assign this reason, that it is not possible to plough deeper afterwards. They likewise direct to turn the earth upside down, or on its back, as we have called it. The reason they assign for this is, that the sward or turf may be the sooner rotten.

Some persons tried this method of breaking up grass-ground in Scotland, but they found great difficulty in reducing it; and we have reason to believe that many find it so likewise in England: for Mr. Tull, in his chapter upon ploughs, tells us, that if the turf lie long without being turned, the grass from the edges will spread and form a new turf, and that the roots often set up new heads, and the former heads are converted to roots. As Mr. Tull's design is to shew the necessity of the four-coultered plough, we need not doubt but he has a little exaggerated the matter; for, upon a narrow inspection, it will be found, that if turf is turned upon its back, the grass will grow only from the sides. However, we may conclude, from what he says, that the land in England is not so easily reduced in this manner, as some pretend.

On the rich lands in Scotland, they follow a method the very reverse of this which has been mentioned. They commonly sow after one ploughing of grass-ground, and plough, as shallow and narrow as possible; and also set the turf as exact as possible upon its edge. It is not our business in this place to consider the propriety of sowing after one furrow. We may only observe, that if the land is good, a good crop may be expected; and if there is a good crop, the turf will be completely rotten before next season. What we have to consider is, which is the most proper method to break and reduce the turf. It is certain that the thinner and narrower the turf is taken off, the more easily it is torn asunder, and the more that it stands on its edge, the harrows in going across take the firmer hold, and make the greater impression.

If this kind of grass-ground is ploughed before winter in the manner mentioned, shallow and narrow, and the turf set upon its edge, it may be expected, if we are favoured with a little frost, that in the spring the turf will be in such condition, as to be easily torn asunder by the harrows, and the land itself in a proper condition to be sown with oats, or to be summer fallowed, and sown with wheat.

Their barren lands they break up in the same manner as in England. They plough deep, and turn the turf over on its back. It seems that the plants which grow on these lands have tougher and stronger roots than those that grow on rich lands. This makes it more difficult to break the turf. If the earths of the furrows are set on their edge, the harrows turn them back, instead of tearing them asunder. This happens whether the land is ploughed deep or shallow. But when the earths are turned on their back, and the land ploughed deep, the harrows raise a kind of mould upon the back of the turf, by which the hollows betwixt the earths are filled up, and nourishment afforded for the seed, the greatest part of which falls into these hollows.

There is another method proposed for opening up grass-ground, and that is by trench-ploughing. This manner

of ploughing is performed by one plough following another in the same track. The plough that goes first, turns over the sward or turf; and the one that follows turns up some inches of soil upon it. By this method there is sufficient nourishment provided for the crop, and the sward is rotten before next season.

This kind of ploughing needs not be confined to the opening up of grass-ground; it may be used in any soil that is deep; for by it some new soil is turned up, and a greater quantity employed in vegetation.

It has already been observed, that ploughing in ridges is proper for removing wetness. Every furrow becomes a kind of drain: the rain that falls upon the ridge, makes its way to the furrows, and by means of them is conveyed away from the field.

Ploughing in ridges is also proper for enlarging the surface. It is certainly an advantage to have the surface enlarged. Thereby not only a greater quantity of soil is exposed to the influence of the air, but also a great quantity of it actually employed in vegetation. There is no more soil added to the field by enlarging the surface; but some of the soil that lies buried, while a field is in its natural state, is exposed to the air and brought within reach of the roots of plants, when it is laid up in ridges. Some of the plants which we cultivate in our fields, have what are called horizontal roots, that is, roots that creep along the surface, and go down but a short way. Now, it is obviously an advantage to these plants, to have a quantity of the soil below, to which their roots cannot extend, brought within their reach, which is done by enlarging the surface.

The tap-rooted plants, that is, such as push one principal root perpendicularly downwards, have also horizontal roots, by which they are nourished; and therefore it must likewise be an advantage to them to have the surface enlarged.

To illustrate this further, let us suppose, that the roots of plants upon a field extend themselves through the whole soil within four inches of the surface. Now, it is obvious, that there is more soil within four inches of the surface, when the surface is enlarged by ridges, than when the land is lying quite flat.

From these things then it appears, that a field contains more food, and has a larger pasture when in ridges, than when laid down level.

It must be acknowledged, that some considerable persons are of a different opinion; and as this is the case, it will not be improper to consider what is advanced by them.

There are some who mention the perpendicular growth of plants, as an evidence, that a surface, however much extended, can support no more plants than the horizontal base. Though the fact is allowed, that plants grow perpendicularly, and that it is impossible to place more of them upon the surface than when the base; yet it does not follow, that a field, when its surface is enlarged, can nourish no more of them; and it is to be remembered it is not more room which we contend for, but more nourishment. We may further observe, with respect to the growing of vegetables, that the enlarging the surface has this other advantage; it gives the plants more air, and thereby prevents them from falling down and lodging.

Mr. Du Hamel, to show that the enlarging the surface by ridges is a real disadvantage, observes, that supposing the slope in ridges is one foot in six, yet the surface will be to the horizontal base only as seventy-six to seventy-five, which he says, is but a small advantage, when compared to the loss by the furrows.

In answer to this, it needs only be said that there is no loss by the furrows, unless when they are a real advantage to the rest of the field. When land is dry, the corn is as good in the furrows as in any part of the ridge; and when the land is wet, the furrows serve for drains, and the loss by them is more than made up by the advantage which the rest of the field receives by being drained.

We may therefore conclude in the general, that the way of ploughing in ridges is preferable to the way of ploughing without ridges.

Having shown, that ridges are advantageous, as they remove wetness, and enlarge the surface, it is necessary now to consider what kind of ridges are most proper for answering the ends proposed.

As ridges remove wetness, when the soil is wet, the ridges ought to be narrow; for the greater number there are of ridges, there are the greater number of drains.

When the soil is wet, the ridges ought also to be steep. For the steeper that the ridges are, the water more easily finds its way to the furrows.

When the soil is very dry, it is submitted, if narrow ridges are not proper likewise. For by altering the ridges, and turning the furrows into the crowns, and the crowns into the furrow, a quantity of fresh soil is always employed in vegetation. When the crown of a ridge is turned into a furrow, it is obvious that some fresh soil is turned up, which was not employed in vegetation in its former situation; and the greater number there are of ridges, there is the greater quantity of fresh soil employed.

When the soil is just so wet as to occasion loss in the furrows, then the ridges should be somewhat broader. For, in this case, the fewer there are of furrows, there is the less loss.

It is proper to observe here, that a difference should be made betwixt the situation of land in the winter, and its situation in the summer. It may be convenient sometimes, when winter-grain is to be sown, or when the land is to get winter-fallowing, to make the ridges very narrow; and, when summer-grain is to be sown, to make them broader.

As it is an advantage to have the surface enlarged, the ridges ought to be made high in the middle, or crown. For the higher that the ridge is made, the more is the surface enlarged.

When the soil is shallow, the ridges, if broad, cannot be raised, without depriving the furrows of soil: and therefore, to enlarge the surface on such land, the ridges must be made narrow. For this both enlarges the surface, and prevents the furrows from going below the soil.

When the soil is deep, the ridges may be made broader: for though the ridges are raised in the crown, yet still there is soil left in the furrows. But then the ridges must not be made too broad: for it is evident that narrow ridges give more surface than broad ridges, of the same degree of steepness, and do not cover the lower parts of the ridges so much from the influence of the sun and winds.

It is necessary to observe, that though, in the general, it is recommended to raise the ridges in the crown, to enlarge the surface, and to allow the water more easily to find its way to the furrows; yet, in some low flat-lying land, it is proper to make the ridges as flat as possible, in order to raise the furrows. For the higher that the furrows are raised, there is, in some cases, the greater command of the water, and it is the more easy to find a fall for conveying it away.

It is necessary to observe likewise, that flat ridges have this advantage over steep ridges; they can be sown with greater exactness. It is obvious from the method of sowing, that, in sowing steep ridges, it is not possible to prevent a great proportion of the seed from falling into the furrows. It is obvious likewise, that this proportion is increased by harrowing. Whereas, in sowing flat ridges, the seed is equally scattered, and the harrows do not remove it from its place.

From these observations, it is obvious, that soils in different situations require to be laid out in different kinds of ridges. It is absurd, therefore, to assert, that, in every case, one kind of ridges is preferable to another; that narrow ridges are better than broad ridges, and flat ridges better than steep ridges. In some situations, one kind of ridges is most proper; and, in other situations, another kind is most proper. Every person ought, therefore, to consider the nature of the soil he has to deal with, consider the advantages and disadvantages of each kind of ridges, and then determine which are most proper.

When there is nothing in the nature of the soil to determine what kind of ridges are most proper, then narrow ridges are to be preferred; for this reason, that a quantity of land in narrow ridges is sooner ploughed than when in broad. It is obvious, that the two first furrows which the plough takes off from the ridge, are wider than any taken off afterwards, especially if the plough begins in the furrow, as is frequently the case; so that the greater number there are of ridges, the field is the sooner ploughed. Besides, when ridges are broad, it is obvious that the plough has more work, and must take longer time in turning, than when they are narrow. But then it is supposed that the ridges are straight and equal. If they are not, the greater number there are of them, the greater is the trouble, and the more time is spent in ploughing. This, however, it must be owned, is of no great importance

because it seldom happens that the kind of soil does not determine what kind of ridges are most proper.

Having considered the kinds of ridges proper for land, according to its different situations; it is proper to inquire, whether there are any qualities which ridges ought to have, whatever is the situation of the land.

It will easily appear, that all ridges ought to be made straight. Crooked ridges, it is obvious, are attended with several inconveniencies. In ploughing them, the cattle are not always going exactly in the same direction with the plough; short turnings are often necessary, as fields are generally bounded by straight lines, or lines not crooked in the same manner with the ridges; and, when there is a small descent, the water, as it runs in the furrows, meets with resistance.

It is obvious, that when the plough goes in a curve, as it does in ploughing crooked ridges, the draught is not in the same direction with the beam, but is either to the right or left of it; and this gives the plough either too much or too little land.

It is obvious likewise, that, when ridges are crooked in a manner different from the lines by which a field is bounded, in ploughing the ridges upon the sides, one part of them must be finished before some other parts are near done; and thus short turnings are necessary, which hurt the land much by the treading of the horses.

It is obvious likewise, that as a crooked furrow is continually altering the direction of the water, and has a less descent than a straight furrow, the water, as it runs along it, must meet with greater resistance, and thus penetrates the soil, and makes it more difficult to convey it away.

These inconveniencies are removed by making the ridges straight. For, in ploughing straight ridges, the cattle are always going in the same direction with the plough; no short turnings are necessary, as fields can be made of an equal breadth in all places; and the furrows having a greater descent, the water meets with less resistance, and is more easily conveyed away.

Straight ridges not only removes the inconveniencies with which crooked ridges are attended, but it is found that they are to be attended with no inconveniencies themselves: they require indeed a little attention in the ploughman, which is itself an advantage; and therefore, upon all occasions are to be preferred.

As, in all kinds of soil, ridges ought to be straight, so likewise they ought to be equal, equal one to another, and the same ridges equally broad in all places. Unequal ridges are attended with inconveniencies, as well as crooked ridges. It is difficult to sow them with exactness; it is difficult to alter them, when necessary; and the plough must often turn in the middle of the ridge, which does great harm, by the treading of the horses, or it must be driven empty to the end.

These inconveniencies may be removed by making the ridges equal. Equal ridges may be sown with greater exactness, and consequently with less seed; it is easy to change them, one into two, or two into three, as occasion requires; and the same furrow that finishes the ploughing of the ridge in one place, finishes it in all places; so that there is no necessity to turn the plough in the middle of the ridge, or to drive it forward the shortest space, without turning up a furrow.

In many places of England and Scotland the ridges are still crooked and unequal; and, in many places, they are much broader, and much higher raised in the crown, than the nature of the soil allows. Were the ridges altered, and the fields laid down in a proper manner, as the soil requires, it would be a great advantage. At the same time, it may be observed, that much harm is done, by proceeding in this matter with too much precipitancy. It is necessary, therefore, that we consider it as an affair of some importance.

It is necessary to observe, in the first place, that ridges must not be rashly altered: on the contrary, great caution is to be used.

If the soil is very dry, ridges may be altered without great danger, though high; and they may be made straight without being levelled. For, though the old furrows are still lower than the rest of the field, yet this is attended with no bad consequences in dry land; and by degrees, they are filled up in ploughing. But then, it is to be observed, that there is not much land in Scotland, on which the ridges, at present, are high raised, in its nature so dry, as to allow this to be done.

If the soil is wet, the ridges cannot be made straight till the

the ground is level, without great danger. For the water will lodge in the hollows of the old furrows, from whence it will not be possible to force it. Some persons that make their ridges straight, before they are sufficiently levelled, draw water-furrows along the hollows of the old furrows, to carry off the water that is apt to lodge there. This is of some use, but does not fully answer the purpose. A quantity of loose earth, in ploughing, is thrown into the old furrows. The water, as it falls, penetrates this loose earth, and is retained by it, notwithstanding the water-furrows. Besides, these water-furrows must be neatly cleaned out with a spade, and made deeper in the places where they are intercepted by the crowns of the new ridges, otherwise they are of very little use.

Before ridges can be properly made straight, it is necessary therefore that the land be made as level as possible.

But it must be observed, that it is as dangerous to level ridges rashly as to alter them before they are levelled: for if ridges are levelled too fast, and thereby a great depth of loose earth thrown suddenly into the furrows, it will not be possible to convey away the water that falls upon them. The water as it falls will sink to the bottom, and there will lodge and chill the soil; and the earth thrown into the furrows being loose, the cattle in ploughing must sink to the bottom likewise, by which the land is very much poached.

It is recommended therefore to every person, seriously to consider the nature of the soil he has to deal with, before he proceeds to the altering old ridges; and if the soil is wet, to level the ridges very gradually. When the soil is deep, and inclining to be wet, and a sufficient slope for carrying off the water, it is probable, that the loss arising from the levelling steep and broad ridges suddenly, may exceed the profit of many years, arising from the ridges being properly laid down; and therefore, if a view to inclosing makes it necessary to straighten the ridges, the levelling them should be the work of several years. Even supposing that the soil is shallow, and the ridges raised so high, that there is nothing but grass left in the furrows, yet still it is improper to level the ridges too fast, though levelling in this case is necessary.

In levelling ridges a great hollow is made in the crowns. This is occasioned by frequent successive cleavings, which is the method commonly used for levelling ridges. It is obvious, that by the first cleaving a hollow is made in the crown of the ridge equal to the depth and breadth of the furrow which the plough makes; whereas the parts on each side of the ridge are but little levelled, and at each successive cleaving this hollow is made greater. Such a quantity of new earth immediately turned up, is not fit for vegetation. Besides, this hollow becomes so great, and the parts of the ridges on each side of it become so steep, that it is impossible to plough them in a proper manner.

In this case, when levelling is still thought proper, some furrows from each side must be thrown back by the plough into this hollow, by which a new small ridge is formed upon the crown of the old one, and then the remaining parts of the ridge may be levelled as before. Some persons, instead of this, plough across the ridges. This method serves the same purposes; it both throws some earth into the hollows, and levels the ridges; for the plough in going carries off some earth from every height, and leaves some in every hollow. But then land must not be left in this situation during the wet season, unless the water-furrows are drawn along the furrows, and also in some cases along the crowns; for unless this is done, the water that falls upon the field cannot be conveyed away. At the next ploughing, the whole old ridges may be levelled in the same manner as at the first ploughing; or, if thought more proper, may be divided into two equal ridges, ploughed in such a manner that the furrows betwixt them may be exactly in the crown of the old ridge, and the other furrows exactly in the furrows of the old ridge. By this operation the old ridge is raised from the furrows, and levelled from the crown.

When a person is upon a scheme of levelling, this method of dividing the ridges into two, will be found very proper, either when winter-grain is to be sown, or when the barley-land gets the winter-ploughing.

Though land may be in such a situation as to allow the ridges to be levelled with safety, yet unless it is remarkably dry, and in no case in danger of being damaged by too much water, the ridges should not be altered, excepting when the land is summer-fallowed; and in that case, besides the ploughing that alters the ridges, there ought to be another before the wet season comes on, that so the bottom may be sufficiently firm to resist the water.

We have observed, that ridges serve to remove wetness, and to expose the soil to the influence of the air, and we have shown what kind is most proper for these purposes. But this is not enough; it is necessary likewise to consider in what manner ridges ought to be placed. This is a matter of some consequence: for, according to the position of ridges, water may be either conveyed away or retained; and some assert likewise, that by this the soil may be better exposed to the influence of the sun and wind. These things therefore must be kept in view in the placing of ridges.

When the land is wet, as is often the case, it is certain that ridges ought to be placed with a view to the conveying away the water: but when land is dry, as is sometimes the case, then ridges should be placed with a view to the retaining the water.

The most common way of placing ridges where there is a slope, is along the declivity in a straight line from the top to the bottom; and land is commonly laid out with a view to this. Where the declivity is gentle, this is, no doubt, a very proper way of placing the ridges; but if the declivity is great, this way of placing the ridges allows the soil to be washed away by the rain. It is obvious, that water, in running off of the land, carries a part of the soil along with it, and the quantity is great, in proportion to the violence with which it runs. In climates where there are heavy showers of rain, the damage done by this is not inconsiderable. Therefore, in this case, placing ridges across the declivity is the most proper way; for when ridges are placed across, the water meets with many interruptions in its course, and does not run off with such violence as when placed along from top to bottom, and therefore does not carry off such a quantity of the soil along with it.

Instead of this some persons make the ridges very narrow. This serves the same purpose; for in proportion to the number of furrows, there is the less water in each furrow, and consequently it runs with less violence. However, placing the ridges in this manner is not so proper for this purpose as placing them across the declivity, and, besides, is not so proper for retaining the water in a dry season.

When land is very dry, and in no danger of being damaged by the stagnation of water, the ridges ought to be placed across the declivity, as near the level as possible; for this retains both the water and the soil. It is obvious, that when ridges are placed in this manner, the water cannot get off by running along the surface, by which the soil is in the greatest danger of being carried away. As the furrows stop it in its course down the hill, it can get off in no other way than by penetrating the soil. By this a part of it is retained; what of it gets off is clear, and carries no soil along with it.

When land is dry at the head of the ridges, and wet at the foot, and no proper fall for carrying off the water, as is frequently the case, the ridges should be placed in the same manner, directly across the declivity. For, in this case, every furrow in some measure retains the water that falls upon the ridge above, and thereby prevents it from sinking towards the bottom of the field, and lodging there. By this way of placing the ridges, the dry part of the field is rendered wetter, and the wet part of the field is rendered drier than otherwise they would be.

This is likewise a very proper way of placing the ridges, even when the declivity is but small, if the land is in the situation mentioned, dry at the head, and wet at the foot. It must be owned, however, that this will not entirely answer the end proposed; for the water will penetrate the soil; and when it is resisted by till or clay, will find its way along these to the bottom of the field. But this will not be so sudden as in the other way of placing the ridges: and the soil at the head, which is naturally dry, will receive more benefit from the rain as it falls.

When land is wet, and the water may be conveyed away from the bottom of the field, the ridges should be placed across likewise; not directly, but with a small slope to a drain or furrow on the side of the field from top to bottom, by which the whole water is conveyed away. In this case every furrow becomes a drain to the ridge below, and prevents the water from running over it.

When land is wet from the breaking out of small springs, this way of placing the ridges is also very proper. The furrows convey away the water as it rises, and prevent it from doing any damage.

It is necessary to observe, that ridges placed in this manner, to serve these purposes, should not be altered; for when the furrow

furrow is kept in one place, it is a more proper drain than when altered. When the furrows are kept in one place, the bottom is always firm, and the water runs easily along it; whereas, if changed, it may fall upon places of the field, where the surface, being raised by former ploughings, will prevent them from reaching the firm bottom. Besides, if the springs break out in the furrows, by changing their place, they may break out in other parts of the ridge.

It is necessary to observe likewise, that ridges placed in this manner should not be raised in the crown, but kept quite flat; that so, by the natural descent of the ground, the whole water that falls upon the ridge may be conveyed into the furrow below.

It was before observed, that some persons assert, that, by a proper position of ridges, the soil is better exposed to the influence of the sun and air. These persons recommend the paying a regard to this. But it cannot be done excepting when the land is quite flat, and when the placing of the ridges makes no difference as to its wetness. However, as this is represented by those persons as important, some attention shall be given to what they say.

Some advise the placing the ridges south and north; and the reason which they assign for this, is, that thereby the sun may have an equal influence upon all parts of the ridge.

Others, again, advise the placing the ridges east and west; and the reason which they assign, is, that they may shelter each other from the cold north wind.

Which of these advantages is the greatest, is uncertain. It is even uncertain whether they can be called advantages at all.

It may be disputed whether in the winter season, cold or heat is most beneficial to land. That heat is beneficial, and cold destructive to plants, is certain. But cold possibly may be as proper as heat for preparing land for the nourishment of plants. It is allowed, that the coldness of the north wind is, in some measure, owing to the quantity of salts that it carries along with it. These salts are beneficial to land; and therefore an exposure to the north seems to be rather a benefit than a disadvantage. This is confirmed from observation. The lands on the north side of rising grounds are, generally speaking, more fertile than those on the south-side. It is certain, that the richest lands in Scotland have this situation, and are exposed to the north.

It may be disputed likewise, whether the north or the south side of an east and west ridge has most benefit from the sun in summer. It is not to be denied, that the rays of the sun fall more directly on the south side of the ridge; but then let it be observed, that the north side has the benefit of the sun's rays in the mornings and evenings, when the sun is so low, that the south side is under the shade; which may possibly balance the loss sustained by the greater obliquity of the sun's rays about mid-day.

These things have been mentioned, to shew, that it is uncertain, which way of placing ridges exposes the land best to the influence of the sun and air: and therefore, that, in placing them, it is needless to have any view in this. When the placing of ridges makes no difference as to the wetness of land, then we are chiefly to have in view the conveniency of ploughing and laying out the land in proper breaks.

There are three different ways of ploughing ridges: gathering, casting, and cleaving.

Gathering keeps the crown and furrows of the ridge in the same place in which they were before. The plough begins in the crown, and ploughs out the ridge, turning the earth towards the crown, where it entered. Every ridge is ploughed by itself; or, instead of this, the halves of two contiguous ridges may be ploughed together. By this method of ploughing, the ridge is higher raised than before. It is obvious, that, as the earth on each side is turned upon the crown, and thrown up out of the furrows, the ridge is raised, both by making the crown higher, and the furrows lower.

Casting keeps the crowns and furrows likewise in the same place in which they were before. The ridges are ploughed in pairs. The plough may enter in the furrow betwixt the ridges, and plough out the ridges, turning the earth towards the furrow, where it entered. Or, the plough may enter in the furrow on the right side of the two ridges, then turn to the one on the left, and plough out the ridges, turning the earth to these furrows, and from the furrow that is betwixt them. By this method of ploughing, the ridges are kept of the same height in the crown,

and one of the furrows made a little higher, and the other a little lower than before. The earth is taken from one furrow, and thrown into the other; and this is done alternately through the field. If this is reversed at next ploughing, that is, the earth turned into the furrows from which it was taken at the former ploughing, thereby the ridges are preserved in the same situation.

Cleaving is the reverse of gathering. The plough enters in the furrow on the right side of the ridge, turns to the furrow on the left side, and ploughs out the ridge, turning the earth from the crown towards the furrows. Every ridge is ploughed by itself; or, instead of this, the halves of two contiguous ridges may be ploughed together. If the ridge is raised in the crown, by this method of ploughing it is made flatter. It is obvious, that, by this method of ploughing, earth is thrown into the furrows, by which they are made higher; and that earth is taken from the crowns, by which they are made lower. If the ridge is already flat, by this method it is changed, and the crown turned into the furrow.

When a field is laid out in the manner judged most proper with respect to the breadth and height of the ridges, it should be ploughed in one or other of these ways mentioned, according to its situation. If the ridges are broad and high, casting will be found to be the most proper method of ploughing. For this is the only way by which they can be ploughed, and yet kept in the same situation: cleaving will make them flatter; and gathering will raise them higher. If they are flat and narrow, cleaving will be found to be the best method. Cleaving flat ridges, and thereby turning the crowns into furrows, and the furrows into crowns, has these peculiar advantages: a field is much sooner ploughed in this way, than in any other; and a quantity of fresh earth, at every ploughing, is exposed to the air, and employed in vegetation; and the ridges being kept level, are sown with exactness. In no case gathering is proper, unless when the proper situation of the ridge renders it rather too wet for winter grain.

It may not be improper, in this place, to consider a method of ploughing, used in some places, called ribbing. This method of ploughing is performed by making furrows about two feet distant from each other: one half of the surface is untouched by the plough, and the other half, which the plough turns up in making the furrows, is thrown on the top of what remains fast. The land may be ploughed in this manner, either without regard to ridges; or the plough may be made to enter and turn, as it does in gathering, casting, or cleaving; that is, a ridge may be ribbed in the way of gathering or cleaving; and two ridges may be ribbed in the way of casting. This kind of ploughing is seldom practised, but in the beginning of winter, and upon land to be sown with barley, after two more clean ploughings. It does not prevail so much as formerly, and is very much condemned by our modern improvers. But, however much it may be condemned, it certainly has its uses. It keeps the land dry; the rain that falls is confined to the furrows, from whence the loose earth is taken, and easily finds its way off. It facilitates the rotting of the stubble, by covering it and keeping it dry; it makes the frost penetrate a greater quantity of the soil; and it also exposes a larger surface to the influence of the air. These things make this kind of ploughing, in some cases, preferable to a clean ploughing.

There is also another method of ploughing called bout-ing. It is performed by throwing the earths of two furrows towards each other upon some fast land. This is certainly an improvement upon ribbing, and better answers all the purposes of it.

By this method ribs are placed where furrows were before, and furrows where ribs were before; and the surface is entirely changed, what was above turned down, and what was below turned up. These two ploughings may be performed with the same strength, and in the same time with one clean ploughing; and, it is probable, that, upon trial, in some cases, will be found more beneficial.

As a further improvement of this method of ploughing, it is proposed to rib the land, and, at the same time, to plough it clean. This is done by throwing the earths of three or four furrows together in such a manner, as to leave no fast land below; and in the same thing with ploughing the land in ridges about three feet broad, from the middle of one furrow to the middle of the other. This serves all the purposes of the other kinds of ribbing, and, besides, has these further advantages; the land being clean ploughed,

ed, weeds are more effectually destroyed, and the soil is better opened for receiving benefit from the frost and air. This method may likewise be reversed by another ploughing. The surface may be entirely changed, and the ribs turned into furrows, and the furrows into ribs.

These different methods of ploughing, the last two excepted, are known to every common ploughman, and they should be attended to by every improver as of importance; without a proper knowledge of them he cannot give directions to his servants, nor prevent them from falling into blunders in the execution, which they are but too apt to do. The ignorance of a master in things which his servants are acquainted with, is attended with bad consequences; it gives them an indifferent opinion of his knowledge of farming, and makes them despise every new thing which he proposes, as absurd and whimsical.

It was observed, that ploughmen are apt to commit blunders in ploughing. Thus, in gathering ridges, if care is not taken in beginning the ploughing of the ridge, some firm land will be left in the crown, and the crown itself so much raised above the rest of the ridge, that no seed will lie upon it. It is sometimes observed, that just on the crown of a ridge, where the soil is deepest, there is less corn, and more root weeds, than in any other part of the ridge. This is certainly occasioned by allowing firm land to remain there in ploughing, and by raising the crown like a peak above the rest of the ridge. The ploughman, instead of turning back the earth of the first furrow, and the firm land below it, keeps at such a distance, as to lay the earth of the second furrow up to it, or on the top of it. This leaves firm land betwixt the furrows, and raises the crown of the ridges to a peak. But if he is directed to draw the furrows so near, as to turn back the earth of the first in making the second, no firm land will be left, and the earth, that by the other method is thrown upon the crown, will be scattered.

This blunder is oftener committed when flat ridges are cleaved. In cleaving, if the ridges are ploughed out turning the plough always to the left, it is impossible to prevent the two furrows, laid together in the crown of the new ridge, from being at too great a distance, and raised higher than the rest of the ridge. When ridges are cleaved in this manner, the earth of the first furrow that the plough makes, is turned over upon firm land, and backed by the earths of the other furrows in their course. This makes it impossible to get at this firm land in ploughing the next ridge, without turning up the firm land itself, and the earth of the furrow laid over it, upon the top of the earth of the second furrow, by which the crown of the ridge would be raised to a high sharp peak. Now, to prevent this, the ploughman, in ploughing the next ridge, keeps at a proper distance, and does not touch the firm land, over which the earth of the first furrow is laid. But it may be observed, that he must either keep at such a distance as to leave firm land in the crown of the new ridge equal to the breadth of two furrows, or he must turn the earth of his furrow upon the top of the earth of that first furrow. By this the crown of the ridge is still high raised, and some firm land still left.

But ridges of this kind may be cleaved without leaving any unploughed land, or without raising the crown much above the rest of the ridge. The method of doing it is this: after the plough has made the first furrow, instead of turning to the left, and making a furrow on the other side of the ridge, it turns to the right, and throws back the earth of its first furrow along with the firm land below it, and after going round again in the same course, turns to the other side of the ridge, and goes twice round in the same manner, after which the ridge betwixt the two firings, as they are called, is ploughed out, as it is first proposed. When the ploughing of the ridge is finished, a new firing is made in the next furrow, by the plough going twice round, as before directed, and then the ridge betwixt the last made firing and the ploughed land is ploughed out in the same manner as before; and in the same way the firings are made till the whole field is ploughed. By this method there is no firm land left below the earth of the furrow; and the earth that is turned towards the crown being scattered, and not laid all in one place, the crown itself is not much raised above the rest of the ridge.

It may be observed likewise, that in casting ridges, if care is not taken, the furrow towards which the earth is thrown will be so filled up as to be improper for a drain. The plough enters the ridge near the furrow, and throws

the earth towards it, turns to the right, and throws the earth from the opposite side towards it likewise; and then goes in the tract of the old furrow, betwixt the earths of the furrows made on each side. This furrow, towards which the earth is thrown, is sometimes so filled up as to render it improper for a drain. We have shown how the earth around it is ploughed. The furrow which the plough makes going in the track of the old furrow, betwixt the earths of the furrows on each side, is called a gore-furrow. On the left side, the plough having no mould-board, the loose earth falls back into the furrow behind the plough, and fills it up, or at least makes it unfit for a drain, which in wet land is a great disadvantage.

But this may be prevented by proper care; the furrow may be made clean, and fit for a drain. The method of doing it is this: the plough enters about two feet from the furrow, and instead of turning to the other side, returns on the same side, turning back the earth, and then goes round again in the same course; after this, turns to the other side of the furrow, and does the same, going twice round. By this the gore-furrow is made quite clean, and, like the crowns of ridges, formed at about two feet distance on each side.

Some other things of a like nature might be mentioned. These have been insisted upon, to show that it is necessary to attend every circumstance of ploughing, that so this important work may be performed in the most proper manner.

The chief design of harrowing land is, to smooth the surface. By this weeds are destroyed, and seed, if sown, is covered.

Root-weeds that are loosened by the plough, are sometimes torn up by the harrow, and thus are destroyed. When this is the design of harrowing, the harrows should go across the ridges, or rather across the way that the plough has gone. Because, by going across the earths of the furrows, the teeth of the harrow are apter to catch hold of the roots, than if it should go in the same way with the plough.

Though the harrow may bring some part of the roots above ground, yet commonly some other parts continue below, which will grow if undisturbed. This makes it necessary for persons to follow the harrows, and gather all the roots which they observe brought up, and carry them off the field, or burn them.

If harrowing does not actually tear up the roots, it encourages their vegetation, by filling up the hollows, and thereby defending them against their greatest enemy, the drought. On this account harrowing is improper for destroying root-weeds, excepting after a spring-ploughing, when the land is soon to be ploughed again for seed. For at this season the drought is seldom violent, and it has not time to operate in the destruction of the roots; and therefore whatever the harrows bring out is so much destroyed.

The same things that make harrowing improper for destroying root-weeds, also make it very proper for destroying feed-weeds. The smoother that the surface is made, and the more effectual that the mould is broke, the seeds near the surface are the more exposed to the air, and the sap, which is in the land, the more effectually retained. Both these are necessary to promote the vegetation of the seeds; and they must vegetate before they can be destroyed. But harrowing not only promotes the vegetation of the seeds of weeds, but also destroys the young plants when sprung up; so that one ploughing, if the season is favourable, and soil allows, may be attended with several harrowings, and thereby several crops of weeds destroyed.

If land rises in hard clods, the harrow makes but little impression; at least before the clods are broken, the land is made so firm by the treading of the horses, and the weight of the harrows, as to render the work useless, and sometimes destructive. Great care should therefore be taken to prevent land from being brought to this situation. If land once rises in hard clods, it is vain to expect to break them with the harrow, so as to cover the seed. Unless the season is very wet, it will remain in this situation through the summer, and afford but little nourishment for the crop. Sometimes it will remain in this situation after men have attempted to break the clods with malls.

If the soil is light and spongy, it can scarcely get too much harrowing; for the more that it is harrowed, it becomes the firmer. But if the soil is stiff, the less harrowing it gets the better, if the purposes proposed are answered. The ef-

fects of harrowing are in this case contrary to those of ploughing. Ploughing renders stiff soil more free and open, but harrowing renders it still more firm and solid.

The ordinary way of harrowing after seed is sown, is first along the ridges, then across, and then along again. If ridges are flat, they may be harrowed either along or across; and the work may be begun or ended either way. But if the ridges are steep, it is improper to begin by harrowing across, because thereby too much of the seed will be drawn into the furrows. If the ridges are very steep, for the same reason, it is improper to harrow across at all. For another reason it is thought improper to harrow across ridges when the land has been ploughed immediately out of lea or grass. In ploughing this kind of land, the sward is for the most part turned over whole; so that when the harrow goes across, instead of tearing the sward, it is apt to turn it back into the furrow from whence it was taken. When ridges are gathered or cast, this will probably happen. In casting, the earths of the furrows on one side of the ridge are turned towards the crown; and, in gathering, the earths of the furrows on both sides are turned the same way; and therefore the harrows, when drawn from the crown to the furrow, are apt to take hold of the unbroken sward, and turn it back. But this does not so readily happen when the ridge is cloven. Because in cleaving, the earths of the furrows on both sides of the ridge being turned from the crown, the harrows, in going up from the furrow, are not in such danger of turning them back. In ploughing lea, the earths of the furrows are sometimes placed as exactly as possible upon their edge, that so they may be the more easily torn by the harrows. When these are turned to the crown, they do not support each other; and are therefore easily turned back by the harrow, in going from the crowns to the furrows: but when the earths are turned to the furrows, so they support each other by their weight; and therefore are not so easily turned back by the harrows in going up from the furrows to the crowns.

Rolling of land is practised with success, both on land lying in grass and on land in tillage. It is of advantage to land in grass, by pressing down mole-hills and mole-runs. Some say, that it also destroys fog.

When land is laid down in grass for hay, rolling is of use in smoothing the surface; and, when laid down in grass for pasture, it makes the grass stool, or tiller, and grow thicker.

There is a kind of land, which, when clover is sown upon it, throws out the young plants after frost. Rolling, in the beginning of winter, and immediately after the frost is gone, it is said, will, in some measure, prevent this. The first rolling prevents the frost from penetrating so deep, as otherwise it would do; and the second makes the land firm, after having been loosened by the change from frost to open weather.

Rolling may also be used with advantage upon land in tillage. When the land is naturally stiff, and may be reduced by the harrow, rolling is very improper: for it makes this kind of land still firmer than the harrow does. But if the land rises in clods, which the harrow does not reduce, rolling is very proper; for it smooths the surface, and breaks the clods, more effectually than harrowing.

When the land is light and spongy, the roller should always be applied after seed is sown; for it is scarcely possible to make this land too firm.

It was observed, that, to destroy root-weeds, land should be made rough, and raised in as large pieces as possible; and that it should be allowed to lie for some time in that situation. Rolling, after this, is of great use, for without it, if the weather continues dry, it will not be possible to make the land fit for receiving another ploughing.

If the land is soft below, and some hard clods upon the surface, which the harrow does not break, rolling may be used with some advantage: for, besides smoothing the surface, it will break some of the clods; and such of them as are pressed down, will be dissolved by the natural fermentation of the soil, if in good heart.

Sometimes in stiff land, ploughed dry, after a former wet ploughing, or when, by any accident, it has been much trod upon, the whole rises in hard clods, which the harrows cannot break, so as to cover the seed. In this case rolling is of great use. It bruises some of the clods; and, when followed by the break-harrow, these clods are raised up and broken. Though rolling should do no service but smooth the surface, yet, on that account, it should be prac-

tised. For when the surface is smooth, the corn may be cut down more expeditiously than when it is rough and uneven. When grass-seeds are sown for hay, it is absolutely necessary to smooth the surface: the roller is most proper for this. Some use it before, and some after sowing. When it is used before sowing, the seed is more equally scattered.

Grass-seeds must be sown in such a manner as to lie near the surface; otherwise they will not vegetate. The making the land firm by rolling is therefore an advantage, as, by it, the sap is better preserved; and this does not so much damage to grass as to corn, for the several kinds of it are commonly better foragers.

But however all the operations of ploughing, harrowing, and rolling are performed, something will be still wanting to promote vegetation, and this want is effectually supplied by certain substances called manures. To apply these substances in such a manner, as most effectually to promote vegetation, it is of importance to know their natures, and the ways in which they operate. This is the more necessary, as, without it, we cannot know how to apply them in the most proper manner to the different soils.

Manures operate, by communicating to the soil with which they are mixed, the vegetable food which they contain; by communicating to it a power of attracting this food in greater plenty from the air: by enlarging the vegetable pasture which it contains; and by dissolving the vegetable food which it is already possessed of, and fitting it for entering the roots of plants.

Manures are very different in their natures. Some of them operate in all the ways mentioned; and there are none of them that do not operate in more ways than one.

Great mistakes have arisen from supposing that manures operate only in one way. None have been attended with greater loss, than supposing that they serve only to divide the soil, and that tillage may be substituted in their place. This is Mr. Tull's opinion, and is, indeed, the fundamental principle of his horse-hoeing husbandry.

Before one changes the ordinary practice of agriculture, in so important a point as banishing manures from his fields, the good effects of which are so obvious; he must be certain, that the principle which determine him to so important a change, is itself well founded.

Mr. Tull has endeavoured to prove, that earth is the food of plants; and hence infers, that to divide the earth into minute particles, by which it is fitted for entering their roots, is all that is necessary in agriculture: and this, he asserts, may be done by tillage, without manures.

When treating of the food of plants, we have attempted to shew, that other principles, besides earth, are in the composition of this food: and, if this is true, the want of manures, which provide these other principles, cannot be supplied by tillage.

But supposing we allow, with Mr. Tull, that earth is the food of plants, yet still it does not follow, that tillage may supply the place of manures. It is certain, that every particle of earth which we observe, is not of the kind that is the food of plants. Every soil is a composition of different earths; several of which, it is obvious, are not of this kind.

The great difference in soils equally pulverised, is a plain and convincing evidence of this. Now, let it be observed, that the earth contained in dung is of this kind; it has already been food to plants, and therefore, though all that is contained in the greatest quantity of dung laid on at one time, is but small in proportion to the quantity of soil employed in vegetation, as Mr. Tull justly observes; yet it may be considerable in proportion to the quantity that is really the food or pabulum of plants. If the quantity of earth contained in the quantity of dung commonly laid on at one time, is compared with the quantity of earth contained in the rich crop, it will be found several times larger; and therefore, by the laying on of this dung, food is provided for several good crops.

Besides, let it be observed, that the mechanical action of the plough cannot increase the number of the particles by which plants are nourished; they are so small as not to be observed in water. Mr. Tull supposes, that they are as small as those upon which the colour of bodies depends. Now, though pounding earth in a mortar may perhaps do something to increase them, yet the action of the plough can never be supposed to do it. The plough can do no more

more than open the soil, or enlarge the pasture of plants, and allow them to extend their roots in search of their food, but does not increase the quantity of it; and therefore tillage cannot supply the place of dung, which not only opens the soil by its fermentation, but also increases the vegetable food by the earth which it contains.

It may further be observed, that the fermentation raised by dung continues for a considerable time; so that though by ploughing, the soil may be as completely divided as by the fermentation of dung, yet it will not continue so: for after seed is sown, the artificial pasture raised by ploughing is continually decreasing while the crop is growing; whereas the artificial pasture, raised by the fermentation of dung, is continued by the continuance of this fermentation; and therefore, though in the horsehoeing husbandry the want of dung may be supplied by hoeing, yet, as Mr. Tull indeed observes, dung is still necessary in the old husbandry.

If persons attentively consider the effects of manures, it will appear that they operate in all the ways mentioned.

Manures are found to enrich the best pulverised soil, and to do this again and again, after it is exhausted by crops. It is also an universal practice in Scotland, to lay dung upon land that is kept constantly in tillage once in three, four, or five years. It is observed, that after the dung is laid on, the land becomes rich, and that the crops turn gradually worse and worse, till the whole virtues of the dung are exhausted; and it is also observed, that immediately upon the dung being again applied, the land becomes rich as before. It is natural to conclude from this, that dung promotes vegetation by increasing the quantity of the vegetable food.

It is found, that some manures lose part of their virtues by being long exposed to the air. After dung is sufficiently rotten, the longer that it lies it becomes of less value, and does not enrich so large a quantity of land as when used in proper time. The dung of cows dried upon their pasture, gathered and laid upon other land, is scarcely to be discerned in its effects on the crops produced: the same quantity applied, whether carried from the byre, or by folding the cattle, enriches the land. From this it is obvious, that this kind of manure contains the vegetable food in itself, and does not receive it from the air.

It is found, that some manures operate the sooner, and with the greater violence, the longer that they are exposed to the air before they are used. Lime and marles are of this kind; the longer they lie exposed, they operate the sooner; and it is observed, that they have a strong power of attracting the virtues of the atmosphere. From these things it is reasonable to infer, that these manures operate, by communicating to the soil with which they are mixed, a power of attracting the vegetable food from the air.

It is observed, that some manures exhaust land of its vegetable food, and do not restore it again when immediately applied. This is found to be the case with lime. Land thoroughly limed has been found to carry many very good crops: by degrees, however, the virtues of it have been exhausted, and the land reduced to a worse situation than before the lime was laid on. In this situation lime has been applied a second time, but its effects found to be far inferior to what they were when first applied. This is sufficient to convince us, that this manure operates by dissolving the vegetable food which it meets with in the soil, and fitting it for entering the roots of plants.

It is certain, that all kinds of manures open the soil. Any person will be convinced of the truth of this, who will take the trouble to compare a piece of land, on which dung, or any other manure has been laid, with a piece contiguous that has not been manured; he will find the one much softer, much more free and open than the other. It must be allowed, therefore, that all manures operate by enlarging the vegetable pasture.

Manures are commonly divided into classes. Some divide them into natural and artificial; others divide them into the fossil, the vegetable, and the animal; and treat of them in order, as belonging to each of these classes.

The manures belonging to some of these classes, differ both in the nature and operation from those in the other classes. Some of them likewise differ from others in the same class. The dividing them into classes, therefore, serves no purpose. All that is necessary is, to treat of the different particulars which the farmer can command, without considering to what class they belong.

The manures generally procured are dung, marles,

ashes, soot, sea-weed, shells, sown vegetables; and water.

There are several other things that are very rich manures, such as rags, leather, &c. But as these are to be procured only in small quantities, it is needless to treat of them separately.

Dung is commonly used to signify not only the excrement of animals, but also all rotten vegetables, when used as manures.

Dung is the food by which animals are nourished, reduced to a corrupted state. The stomach dissolves the food of the animal, and reduces it to a state of putrefaction much sooner than is done by the air. It is by being in this state of putrefaction that the juices fit for the nourishment of the body are conveyed by the guts into the blood. While bodies are in a sound state, their parts adhere firmly together, and they are incapable of being turned into the parts of other bodies. To render them capable of this, they must be reduced to their first principles. This is done by corruption. It is observed, that by corruption all the parts of bodies are relaxed, and the salts, oils, and other juices which they contain, from being fixed, are made volatile. It is by being reduced to this state in the stomach, that the things which the animal feeds upon become nourishment to it, and are turned into parts of its body.

All the juices contained by the things which animals feed upon, are not exhausted by the guts; many of them, along with the earthy part of the food, are thrown out. There is no doubt that some of the earthy part of the food goes also to the nourishment of the animal; but as the earth is rendered volatile by the salts and oils, there must be but a small quantity of it in proportion to the quantity of these exhausted by the animal; and therefore in the dung there must be a great quantity of each in proportion to the other principles. However, as the dung contains all the principles of the food, we may consider the dung of those animals that feed on vegetables, as vegetables in a putrified state.

Of the same nature is the dung of animals that feed upon other animals. Vegetables are the original food. All animals either feed on pure vegetables, or on other animals that feed on vegetables. Animals that feed on vegetables are made up of the same things with vegetables, only under a different form; and therefore the dung of animals that feed upon these, is still to be considered as vegetables in a putrified state.

Chemists inform us, that dung is compounded of the same principles of which vegetables are compounded, of water, air, oils, salts, and earth. The earth which it contains is of the absorbent kind, and attracts the other principles. They also inform us, that dung attracts and ferments with acids, and by this fermentation produces salts. A quality of salt, as was before observed, is to attract and dissolve oils, and make them capable of being mixed with water.

If these qualities of dung are considered, it will appear that it promotes vegetation in all the different methods before-mentioned.

It promotes vegetation by increasing the vegetable food. It is compounded of the same principles of which the vegetable food itself is compounded, as we endeavoured to shew, when treating of the food of plants. This is also confirmed by the experience of all places and of all ages; and it is what no person will doubt of, who considers that it has the same effect upon land of all kinds, and in all situations.

It promotes vegetation by enlarging the pasture of plants, it attracts acids from the air and soil; and by raising a fermentation with them, thereby separates the particles of the soil with which it is mixed. Every farmer knows the truth of this from experience. The land upon which dung is laid, though naturally stiff, becomes soft and mellow, and is more easily ploughed than before.

Dung, we have said, enlarges the pasture of plants, by attracting acids, and fermenting with them. These acids are in the soil and air. They are in the soil; for the soil produces acid plants. Chemists tell us, that the natural salt found in soil is compounded of an alkaline salt, such as is found in vegetables, and an acid spirit. All alkalis are strong attractors of acids, so that, in the process of an experiment upon soil, perhaps it may be difficult to keep them separate, though they may exist separate in it. The acid plants prevent these from mixing; or, perhaps, have a stronger power in their vessels to separate them, than other plants have. But

But though there may be no acids in soil, excepting in the compound of neutral salts, yet there is no doubt, but they are in the air. Chemists find this by innumerable experiments. Ashes, when exposed to the air, produce neutral salts; the application of acids has the same effects. Any person may observe a salt adhering to the lime of old walls; this salt is not in the lime, it is produced by the air. The same salt is produced by acids. Other experiments might be mentioned, but these are sufficient.

Dung promotes vegetation, by communicating to the soil a power of attracting the vegetable food from the air. The earth which it contains, is of the absorbent kinds, and attracts all the other principles of the vegetable food; and the salts which it contains and produces, attract oils.

It likewise promotes vegetation, by preparing the vegetable food for the nourishment of plants. By the salts which it contains and produces, it not only attracts oils, but also dissolves them, and makes them capable of being mixed with water. It is probable, that oil is a principal part of the food of every plant which we cultivate in our fields, at least is the ingredient of which it is easiest to exhaust the soil, and which it is most difficult to restore to it again. In proportion to the quantity of oil contained in any plant, in proportion it robs the soil by which it is nourished of its vegetable food. But the nature of oil must be changed before it can enter the roots of plants. This change is made by salts; they dissolve it, and make it to mix with water.

Though dung promotes vegetation in all these ways mentioned; yet, as there are other bodies, they are much stronger attractors of acids, by which many of its effects are produced; it is probable, that it principally operates by increasing the food of plants. Its effects in dissolving the vegetable food in the soil, must be very trifling. The salts which it contains and produces, having its own oils to work upon, and being along with them conveyed into the roots of plants, cannot operate with any violence upon the oils which the soil contains. This is confirmed by the experience. When the virtues of dung are exhausted, the soil is no poorer than before it was laid on.

Some new improvers are pleased to ridicule the old farmers, because they are so fond of dung; but none will do this who attentively consider the virtues of it. Such other manures as can be obtained, are to be used; and tillage is carefully to be attended to: but none of these are to supersede the use of dung, which can be employed to so great advantage.

Though dung in general has all the qualities mentioned, yet there are some kinds of it possessed of some of these qualities in a higher degree than others. There are as many kinds of dung as there are of animals, and in some respects they all differ one from another.

The difference betwixt one kind of dung and another is commonly supposed to arise from the different food of the animals. Green herbage, straw, or hay, do not contain so much vegetable food in the same quantity as grain does. Hence it is supposed, that the dung of cows is not so rich as that of horses, nor the dung of horses so rich as that of fowls.

But this difference must partly arise likewise from the nature of the animals, if it is true, that the dung of horses, cows, sheep, hogs, and geese, all differ one from another, though fed upon the same pasture. Some animals digest their food more quickly than others. This makes a difference in the dung produced by the same food. Some things are digested, and turned into a state of corruption by some animals, that pass through others sound and undissolved. The matter then in the stomach that digests the food, must be different in the different animals. The dung must partake something of the nature of this, which makes another difference in the dung produced by the same food.

Some writers in agriculture treat of the dung of the different animals separately. But it is needless to do this; for it requires more pains and expence to keep them separate, and use each of them by itself, than all the advantages arising from this way, above the ordinary way, can possibly amount to.

The dung of fowls, particularly of pigeons, is an exception to this. It is commonly used without any mixture, and it can be kept separate from other dung without any trouble or expence. It is observed, with respect to it, that the effects of it are more violent, and sooner over,

than the effects of common dung. The effects of some other kinds of dung would perhaps be the same, if they were used without any mixture. The pigeons dung being thoroughly corrupted, soon dissolves, and becomes vegetable food. But the straw, with which the other kinds of dung are commonly mixed, not being so thoroughly corrupted, prevents the effects of them from being so violent, and so soon over.

The way in which pigeons dung operates, points out the manner in which it should be applied. As it is very rich, and its qualities soon exhausted, a very small quantity should be applied in proportion to the quantity of other dung. If care is not taken of this, the crop will be destroyed by being too luxuriant. Perhaps, mixing it with some other things may have good effects. The strewing small chaff of any kind, from time to time, on the bottom of the pigeon house, is very proper. The chaff sucks up the moisture, and makes it easy to reduce the dung to powder, which is an advantage: for thereby the dung is scattered more equally, and manures a greater quantity of land.

It is a custom in some places, to fold sheep and cattle, for the sake of their dung, which, in this way, is used without any mixture. Some writers on husbandry give particular directions how to do this in the most advantageous manner. But it is needless to consider these. The farmer must consult the advantage of his sheep and cattle, and not to the advantage of the land by the dung; and therefore must fold them in the most convenient manner. A score of sheep, with the best management in folding, will not produce much more than ten shillings worth of dung, in the season, above the expence of folding; a sum soon lost by an injudicious management of them.

Dung is commonly mixed with vegetables, and allowed to lie for some time before it is used.

Straw is thrown below the cattle, and this is carried out along with the dung, and thrown upon the dunghill. On the dunghill is also thrown all the straw that is left after serving other purposes; and all the refuse of vegetables and animals used in the farmer's family.

In the management of dunghills, two things are always to be kept in view: the promoting putrefaction; and the preventing the vegetable food from flying off into the air, or being conveyed away by water. The straw and other parts of uncorrupted vegetables, of which the dunghill is compounded, make it necessary to keep the first in view; and the salts and oils, which by corruption are rendered volatile, and the water, which extracts the virtues of dung, make it necessary to keep the last in view.

To promote putrefaction, the situation of the dunghill should be dry, and the dung laid together as thick as is convenient. Putrefaction, indeed, cannot be promoted without water: but the quantity that falls in rain, with the natural sap of the dung, is sufficient for this purpose. Too much water prevents that fermentation, which carries on the process of putrefaction most quickly. This is confirmed by experience. If there is any part of a dunghill soaked with water, it is observed that the straw is quite sound, while, in other parts, that are dry, it is completely rotten.

To promote putrefaction, the dung should be laid thick together; thereby the heat is the sooner generated, that produces the putrefaction; and thereby the natural sap is the better preserved, which prevents the dung from being burned.

When the natural sap of the dung is exhaled, and the dung afterwards covered, the heat is in danger of rising to such a height as to burn the dung. This must be carefully guarded against: for when the dung is burned, its strength is exhausted, and it is rendered almost useless. Dung, in this situation, is dry and white; the ploughmen call it fire-fanged. When thus burnt, it is found, from experience, that it has lost almost all its virtues. To prevent the dung from being reduced to this situation, when it is carried out of the stable, or byre, particularly if there is much straw in it, it must not be laid in heaps, which makes it dry too fast, but carefully spread thick upon the top of the dunghill. This prevents the sap from being carried off by the wind, and thereby prevents the heat from being raised to such a height as to burn the dung.

It may be observed, that, when grass is cut green, and immediately thrown into a heap, it heats, and this heat soon reduces the grass to a state of putrefaction. But, if the grass is for some time exposed to the air, and then put together without being sufficiently dry, it heats also; but,

instead

Instead of being reduced to a state of putrefaction, is burned. So it is with dung: if, when carried out, it is laid in small heaps, being thereby too much exposed to the air, it loses its sap; and, being afterwards covered, the heat is raised to such a height as to burn it: but if it is spread thick upon the top of the dunghill, it retains the sap, and putrifies.

A distinction is here made betwixt dung putrified and burned; and this distinction is represented as important. We know not if the chemists make any such distinction. A late author says, that the greater part of what remains of dung, after the putrefaction is completed, seems to be earth, and a fixed alkali. These things, we apprehend, make up the greater part of what remains, when dung is what we have called burned; but when it is only putrified, it contains also salts and oils. But though chemists should make no such distinction, it is absolutely necessary that the farmer do it: for, when the dunghill is allowed to heat to such a degree, as to burn the dung, the value of it is thereby greatly lessened.

To prevent the vegetable food from being conveyed away, no foreign water, except what falls in rain, must be allowed to run into the dunghill; and the situation of the dunghill, if possible, should be high at the sides, and hollow in the middle. When foreign water is allowed to run into the dunghill, the fermentation is not only stopped, but, as it is often necessary to allow the water a passage from it, thereby much of the vegetable food is conveyed away. When the bottom of the dunghill is quite level, the rain, which sometimes falls in heavy showers, easily finds its way off; but this is prevented by making it high at the sides, and hollow in the middle.

The only way to prevent the vegetable food from being exhaled by the sun, or carried off by the wind, is to cover the dunghill. The covering the dung would certainly be an advantage, if it could be easily executed. If it was not for the additions that are daily made to it, earth would be very proper for this purpose. Some persons assert, that by covering the dunghill, it would lose the influence of the air; and it is the air alone, they say, that makes it fit nourishment for vegetables; and, therefore, recommend the exposing it, particularly to the north and north-east; because the wind from these points bring along with it more aerial nourishment than from the others. If the dunghill contained no vegetable food but what it received from the air, this direction would be very proper; but as the dunghill contains in itself all the ingredients of the vegetable food, and as its juices, the more it is putrified, become the more volatile, the vegetable food in it, by being exposed to the air, instead of being increased, would be diminished. The covering the dunghill, therefore, would be an advantage. But the difficulty lies in executing this.

Some propose to dig a large pit, lay the bottom with flags, build up the sides with stones, and cover it with a roof. This, it must be owned, will retain the juices, and promote corruption, as well as prevent the vegetable food from being exhaled. But then it must be so expensive, that few will be engaged to make trial, unless the benefits are more obvious than the assertions of the contrivers make them: and, besides the expence, it must likewise be attended with inconveniencies. In some situations, it will be very difficult to prevent too much water from getting into it, and as difficult to get the dung itself carried out.

The method which we proposed for preventing the dung from over-heating, will also, in a great measure, serve this purpose. The dung, when it comes from the stable or byre, is mixed with straw, which absorbs the juices, and prevents them from flying off, till the straw itself begins to putrify. When, in this situation, it is laid thick upon the top of the dunghill, a small surface only being exposed to the air, and being covered before the straw begins to putrify, the juices, in a great measure, are preserved. A person, by the smell, is sensible that the juices of the dung are not so volatile, when first laid upon the dunghill, as after they have been covered for some time, and then exposed to the air.

Dung, exposed to the sun and wind, or washed by rain, loses its vegetable food; it ought, therefore, to be ploughed in as soon as is possible, after it is laid upon land. Some persons assert, that they have found from experience, that dung is nothing worse, though it lie a considerable time spread upon land, in dry weather, before it is ploughed in. This, if true, is contrary to what has been supposed,

that the vegetable food is exhaled by the sun, and carried off by the wind. It is probable, that, after dung is spread upon land, its fermentation ceases, and the salts and oils remaining in it may become fixed, and may continue so till a new fermentation is raised by mixing the dung with the soil; and that, by attracting acids from the air, more salts may be formed. By these its effects will be more sudden and violent, but sooner over.

It may be proper also to observe, that as the juices contained in the dung are washed downwards by the rain, it should be ploughed in with a very shallow furrow; excepting when the dung is not sufficiently rotten. In this case it requires a deeper furrow to cover it.

The better that dung is mixed with soil, the purposes of vegetation are the better answered; all parts of the soil receive equal benefit, the vegetable food is equally distributed, and in all parts the fermentation equally promoted. When dung then is laid on land, it ought to be spread as equally as possible. This likewise prevents the breeding of vermin, which happens in some soils, when the dung is left in too large pieces.

Some are of opinion that lime is only a stimulus, that is, that it promotes vegetation, only by making the soil with which it is mixed, exert itself. Others, that it promotes vegetation by enriching the land, and adding to the quantity of vegetable food.

They first support their opinion by observing, that the crops which lime enables land to produce, exhaust it in a remarkable manner. It is a certain fact, that land thoroughly limed may be reduced to a much poorer condition by cropping than land can be reduced to, that is not limed. It is possible to reduce limed land almost to a *caput mortuum*; and the better and the oftener the land is ploughed, this is done the sooner.

The other opinion is supported by observing, that, in some places, lime is applied regularly once in four or five years: that the land seldom gets any other manure: that it is kept almost constantly in tillage; and with the assistance of fallowing, carries very good crops.

From these observations, one is led to conclude, that lime acts both ways; not only makes land exert itself in the nourishment of vegetables, but also enriches it, and adds to the vegetable food.

An inquiry into the qualities of lime will probably illustrate this.

Chemists tell us, that lime has the following qualities:

It is a great dissolver of all animal and vegetable substances: it is a very heavy body: it is an attracter of acids; with these it raises a fermentation, and produces salt; and it communicates its virtues to water.

When these things are considered, it will appear, that lime promotes vegetation in the ways following.

It communicates to the soil a power of attracting the vegetable food from the air. It attracts the acids from the air and soil; these it converts into a neutral salt, by which oils are attracted from the air. This operation of lime is confirmed by the experience of those who use it as a manure once in four or five years.

Lime enlarges the vegetable pasture. By its weight it penetrates the soil; and, by its fermentation with acids, it separates its particles.

This operation of lime is obvious to every person that views with attention any land that is thoroughly limed. It appears soft and mellow, and obviously in a state of fermentation.

Lime dissolves the vegetable food, and fits it for entering the roots of plants. It dissolves all the animal and vegetable substances which it meets within the soil, and converts them to vegetable food; and, by the salts which it produces, it dissolves all oily substances in the soil, and conveys them into the roots of plants. We find from experience, that lime clears land of root-weeds. This it does by its dissolving power. Root-weeds, when torn up by the plough, have their growth checked, and are for some time in a languishing condition: if lime is applied to their roots while in this situation, by its dissolving power, it is apt to destroy them.

That it is owing to the salt which lime produces by its attracting and fermenting with acids, that it chiefly owes its power of promoting vegetation, is confirmed by this observation. The lime of old walls which has been long exposed to the air, and where the salt is already formed, is much more sudden in its operations, when laid upon land, than quick lime.

It has been observed, that lime promotes vegetation by communicating to the soil a power of attracting the vegetable food from the air, by enlarging the vegetable pasture, and by dissolving the vegetable food, and fitting it for entering the roots of plants. It is probable, that the two last are the ways by which it chiefly operates.

By this it exhausts the land of its vegetable food. For it cannot be supposed to attract from the air a sufficient quantity of food for the nourishment of the crops which it enables the land on which it is laid to carry; and it contains none of this food in itself. This is confirmed by experience. If land upon which lime has been laid, is exhausted by crops, the application of lime a second time has not the same effect as before; unless the vegetable food is supplied by dung, or the land allowed to rest for some years, and have the vegetable food supplied by the air.

Thus it appears, that lime from its nature must act both as a stimulus and a manure; while it makes the earth exert itself in the nourishment of vegetables, in some measure also enriches it, and adds to the vegetable food.

In some lands, the dissolving the vegetable food, and fitting it for entering the roots of plants, may be most beneficial: in others, the communicating the power of attracting the vegetable food from the air, may be most beneficial. It will not be improper, therefore, to point out how lime is to be applied, so that it may chiefly answer the one or the other of these purposes.

In uncultivated land, in which there is a large quantity of vegetable substance, lime ought to be used chiefly as a stimulus: and when improved land needs a recruit of vegetable food, it ought chiefly to be used as a manure.

When lime is intended for a stimulus, a large quantity should be applied at once. For it takes a considerable quantity to dissolve roots, and the other vegetable substances in the land, and to produce a high degree of fermentation.

When lime is intended for a manure, a small quantity applied at a time is sufficient. It is probable, that it requires only a small quantity of lime to impregnate a large quantity of earth, and to communicate it to an absorbent quality, in as high a degree as it is capable of receiving: and it is certain, that it is in proportion to the absorbent quality which it communicates, that the soil is enriched by it. This is not a mere conjecture. It is certain that a small quantity of lime will impregnate a large quantity of water, and communicate to it all its virtues, and these in as high a degree too as it is capable of receiving: it is not improbable, that it may operate in the same manner upon earth. If a small quantity of lime communicates an absorbent quality to a large quantity of earth, but has not such influence in dissolving vegetable substances, or in producing fermentation, it follows, that the smaller the quantity is which is applied, it will operate the more as a manure; and the greater the quantity applied, it will operate the more as a stimulus.

It is proper to observe likewise, that when lime is applied in small quantities as a manure, it is necessary to repeat the application frequently; for it is probable, that the soil by action loses the absorbent quality which the lime communicates.

These things which we have observed, concerning the operation of lime in smaller and larger quantities, are, in some measure, confirmed by experience. They are agreeable to the practice in those parts where lime is most used. When barren land is to be improved, it is laid on in large quantities; and when it is applied to land already improved, it is laid on in small quantities, and frequently once in three or four years.

As lime operates by attracting acids from the air, the longer that it is exposed to the air before it is ploughed in, it will exert itself the more quickly, and with the greater violence. Some alledge, that this should not be done in summer. For they say, that the sun acts contrary to the air; as the air supplies the salt, the sun exhales it, and communicates it again to the air.

As lime, when laid on in large quantities, exhausts land of its vegetable food, it is necessary to supply this food by dung, or such other manures as have it in great plenty; or the land should be managed in such a manner, as to prevent, as much as possible, the vegetable food from being exhausted. Laying off land, after a very few crops of corn, into grass for pasture, is the most proper way of doing this. Land, when pastured, has not its vegetable food so much exhausted, as when it carries corn. The quantity

of vegetable food carried off in flesh, by the cattle, or conveyed to the air by their perspiration, bears but a small proportion to the quantity carried off by a crop of corn and straw.

It is necessary further to observe, that as lime communicates its virtues to water, land inclining to be wet, and from which the water has free access away, is not proper for it: for the water, in running off, carries along with it the virtues of the lime.

There are a variety of marles, which are commonly reduced to three sorts: the clay, the stone, and the shell.

The first has its name from its similitude, in appearance, to clay; the second from its hardness, and similitude to stone; and the third from the shells, with which it is mixed, or rather of which it is compounded.

The clay and stone marles are of the same nature; the shell marle is very different from both. This makes it necessary to treat of them separately.

Marle of the stone and clay kinds promotes vegetation in a surprising manner. It is probable, however, that it contains in itself few of the principles of which the vegetable food is compounded. Plants are not able to find their food in it. When in a bed below the surface, it resists the entrance of water, like till or clay. When near the surface, and turned up by the plough in great quantities, the soil is little better than till, almost quite barren. The method of its operation will be best known by inquiring into its qualities.

It is observed, that both the clay and stone marles have the following qualities.

When long exposed to the air, or put into water, they fall down into a powder: they are very heavy bodies: the earth of which they are compounded, is of the absorbent kind: they are attractors of acids; with them they raise a fermentation, and produce salts.

The only difference betwixt them is this: the clay marle is sooner dissolved than the stone marle; and commonly has a stronger power of destroying acids, and producing salts. Dr. Home says, that the clay marle, which he tried, destroyed a third more of acids than the stone marle.

These marles seem to have much the same qualities with lime; and, therefore, must operate in the same manner.

They communicate to the soil a power of attracting the vegetable food from the air, they enlarge the vegetable pasture; and they dissolve the vegetable food that is in the soil, and prepare it for entering the roots of plants.

These marles communicate to the soil a power of attracting the vegetable food from the air. The absorbent earth which they contain, and the salts which they produce, are strong attractors of oils.

It is observed, that they attract oils so strongly, that they are used by some to extract greasy spots from cloaths. When laid upon land, they will therefore attract oil from the air, which is the ingredient of the vegetable food most wanted.

These marles enlarge the pasture of plants. They ferment with acids, and fall down into powder, when exposed to the air, or put into water. These things make them operate in separating the particles of the soil with which they are mixed.

These marles also prepare the vegetable food for being nourishment to plants. The salts which they produce, not only attract oils from the air, but also from the soil, dissolve these oils, and render them capable of being mixed with water, and of being conveyed by it into the roots of plants.

According to some, these marles contain some oily matter. This, if true, would make them operate in a manner different from lime. But this is uncertain. The earth of which these marles are compounded, is of the absorbent kind; it cannot be long exposed to the air, without attracting oils; and therefore, though they contain none in their original composition, yet some marks of them may appear upon trial.

These marles are long in dissolving. Large pieces of the stone marle are seen sometimes undissolved, six or seven years after it has been laid upon land. This makes it necessary to apply a very large quantity of them, otherwise their effects will not be known.

As the quantity of marles applied is very great in proportion to the quantity of lime; land, when manured with marle, must have a stronger power of attracting the vegetable

table food from the air; and therefore the marle should be preferred, when it can be as easily obtained.

As the earth of these marles is of the absorbent kind, as a great quantity of it is applied at one time, and as it is long in dissolving, it must be many years before its operation ceases; and, if the land is barren, the nature of it will be changed, and ever after, by the same kind of dressings it received before, will continue to carry better crops. In this respect also it is preferable to lime. This advantage however, depends, in a great measure, upon the nature of the soil. If the soil is soft and spongy, and has not a firm bottom, the marle, by its weight, will, by degrees, penetrate, like lime, beyond the reach of the plough; and therefore must leave the soil no better than it found it.

Although, in some respects, these marles seem preferable to lime, yet we are to consider, that their principal operation is the same with that of lime; which is enlarging the pasture of plants, and fitting the vegetable food for entering their roots. When land, therefore, manured with them, is exhausted by crops, it cannot receive much benefit from them a second time, if immediately applied. This is confirmed, it is said, by experience. It is observed, that marle, when applied a second time to land exhausted by crops, has not the same effect as when first applied.

As marle operates in the same manner as lime, it follows likewise, that limed land exhausted by crops, can receive little benefit from the application of marle; and that marled land, exhausted by crops can receive little benefit from the application of lime, as it exhausts the vegetable food, the proper manure after it is dung, which contains this food in the greatest plenty.

It was observed, that marle operates chiefly by attracting oils and acids from the air; the longer, therefore, that it lies upon land, exposed to the influence of the air, the more quickly it will operate.

The difference betwixt the clay and stone marles was said to consist in this; that the clay marle dissolves sooner, and has a stronger power to destroy acids and produce salts. This kind is therefore preferable, as a less quantity will produce the same effects. If Dr. Home's experiments are to be depended upon, or rather, if all clay and stone marles have the same powers with those which he made his experiments with, then four cart-load of the clay marle is equal to five of the stone.

What was said of lime, with respect to the application of it in smaller and larger quantities, may likewise be said of marle. When barren land is to be improved, the marle should be laid on in large quantities: but when land is in good order, the applying a fifth or sixth part of the quantity commonly used, once in six or seven years, may have very good effects.

Shell marle is very different in its nature from the other two. It is commonly classed among the animal manures.

It does not dissolve with water, as the other marles do. It sucks it up, and swells with it, like a sponge. It is a much stronger attractor of acids than they. Dr. Home says, that it takes six times more of acids to saturate it than any of the other marles which he had met with. But the greatest difference betwixt the shell marle and the other marles consists in this; the shell marle contains oils. It is uncertain whether the other marles contain any oils; but this kind, it is said, contains them in great plenty.

This marle, it would seem, from the qualities which it possesses, promotes vegetation in all the different ways. It increases the food of plants; it communicates to the soil a power of attracting this food from the air; it enlarges the pasture of plants; and it prepares the vegetable food for entering their roots.

It increases the food of plants by the oils which it contains, and the salts which it produces: by these salts, and by the absorbent quality which it possesses, it communicates to the soil a power of attracting this food from the air. It enlarges the pasture of plants, by its swelling with water, and the fermentation which it occasions; and it prepares the vegetable food for entering the roots of plants, by the salts it produces in fermentation.

It will not be improper to attend the effects of these different operations. The communicating vegetable food immediately to the soil, and communicating to it a power of attracting this food from the air, have the same effects. By both these operations the vegetable food is increased.

The enlarging the pasture of plants, and fitting the vegetable food for entering their roots, have also the same effects. By both the vegetable food is diminished. It is

obvious, that, by these operations, plants are assisted in extracting this food from the soil.

The oils which it contains, it is probable, are soon exhausted: having a strong power of attracting acids, and forming salts, it is natural to suppose that these salts do more than work upon its own oils: they will also attract and dissolve the oils which they meet with in the soil; and would exhaust it of the vegetable food which it contains, was it not for the strong absorbent quality which it communicates. This quality, it is probable, remains after the operation of the salts is over; and thus, upon the whole, the soil is rather bettered by it.

We had occasion to show, that the difference betwixt poor and rich soil consisteth in the different powers of attraction. As this marle has so strong an absorbent quality, if it is applied in large quantities, and frequently repeated, it is possible that it may communicate such an attractive power to the soil, as to enrich it in a very high degree, so as to need no further manuring, but by proper tillage may be made to attract from the air in the winter season such a quantity of vegetable food as is sufficient to nourish a crop in summer.

As this kind of marle does not exhaust land of its vegetable food, as the other marles, or as lime does, it may be applied to land exhausted by them, or it may be repeated. As it dissolves sooner than the other marles, its effects will be more sudden; and as it does not dissolve so soon as dung, its effects will not be so soon over.

A late author supposes, that the marle found below moss is compounded of earth and the alkaline salts of rotten wood. He explains in what manner he imagines it is formed. If there is a marle compounded of these ingredients, it is different from any of the marles that have been mentioned. However, it will operate much in the same manner. It will communicate a power to the soil of attracting the vegetable food from the air; it will enlarge the pasture of plants, and it will prepare the vegetable food for entering their roots.

As it contains a large proportion of salt, its effects will be sudden and violent. It is not proper therefore that a great quantity of it should be applied.

As its effects are sudden and violent, it cannot be expected that they will last long. It is probable that they will be soon over after it is entirely dissolved.

The salts which it contains, will make it operate chiefly in dissolving the vegetable food in the soil, and fitting it for entering the roots of plants. By this it will exhaust the soil, if care is not taken to prevent it, by the application of dung, or turning the land from tillage into grass for pasture.

There is another kind of marle that goes under the name of shell marle, and in some parts of the country is found in great plenty. It seems to be almost wholly lime, and it operates in the same manner.

Ashes contain a large proportion of salt; they attract acids more violently than any other thing as yet known, but they soon lose their virtue.

The effects of ashes will then be of the same kind with lime. But as ashes contain salt, their operation will be more sudden; as they attract acids with greater violence, and sooner lose their virtue, their operation will be more violent, and sooner over. This is confirmed by experience. The first crop after land is manured with ashes is commonly very luxuriant, and the second crop exhausts almost the whole of their virtues.

As the effects of ashes are sudden and violent, they should be applied in very small quantities; and as they operate in the same way with lime, they should not be applied to land exhausted by lime or marle; should not be followed by these, nor repeated.

Turf is composed chiefly of vegetables; that which remains then after burning, must be of the same nature with ashes. To these the fertility communicated to the soil is chiefly owing. It is found from experience, that in proportion to the number of roots contained in the turf, the burning turns out to advantage; and therefore land, with a tough sward of grass upon it, is recommended as the kind most proper for being improved in this manner.

The heat which part of the soil receives from burning the heaps of turf is supposed to contribute to its fertility: but this can have little influence, except to destroy any seeds or roots of weeds that may be in the land.

In burning the turf, care must be taken to cover the heaps in such a manner as to prevent the fire from breaking

ing out into flame. Where this happens, it is observed, that the ashes lose part of their virtue, and that the parts of the field manured by them are not so much enriched as the other parts are by the heaps of turf that are burned without flame. It is natural to think, that the earth of the turf, when properly piled up, will retain the oils of the vegetables, and prevent them from ascending into the air in smoke and flame.

This makes some difference betwixt the manuring by burning, and the manuring by ashes. However, as the oils contained in burnt turf are in very small quantities, we may well suppose that they will soon be exhausted by the salts; and therefore, though the effects of burning may be more violent, yet they will be equally sudden; and as soon over.

To prevent burnt land from being exhausted, one crop only, or two at most, should be taken, and then turned into grass for pasture. If a little dung is added after the first crop, its fertility will be the longer preserved.

Soot cannot be procured in such large quantities as to be used by itself, excepting in the neighbourhood of large cities; it is needless therefore to insist upon it.

It contains oil, salt, and earth. These, it seems, are compounded in such a manner as to be ready to be conveyed into the roots of plants by water. For the effects of soot, when spread upon the surface, are discovered immediately after the first rain. It promotes vegetation in the same manner as dung, or shell marle. It increases the food of plants by the ingredients of the vegetable food which it contains. It enlarges the pasture of plants, enables the soil to attract the vegetable food from the air, and prepares it for entering the roots of plants by the salt that it contains, which is of the alkaline kind, attracts and ferments with acids, and attracts and dissolves oils.

As it contains great plenty of vegetable food, and as its effects are sudden, it must be laid on in very small quantities. Sowing it in the spring on winter corn or grass, seems to be the most proper way of using it.

When the quantity laid on it is but small, and its effects sudden, it cannot be supposed to last long. Its virtues are commonly exhausted by one crop.

When its effects are over, the soil is left in the same situation as before it was laid on, not exhausted of its vegetable food, as by lime or ashes; and therefore it may be repeated; or it may be followed by these manures, as it is very proper to be applied to land that is exhausted by them.

All the plants that grow upon the rocks within reach of the sea, are good manures. Those that grow upon the rocks that are almost always covered by the water, are the richest.

Some kinds of sea-weed are burnt for kelp. This it is thought, turns out to greater advantage than using them as manures. The best kinds for manures cannot be reached, as their roots are almost always below water; but they are frequently driven on the shore by the sea. A considerable quantity of them may always be expected on the shore in the neighbourhood of the rocks, where they grow, when a spring tide, heavy rain, and a high swelling sea all happen at the same time. The spring tide exposes their roots to the air, the fresh water falling in rain loosens the roots, and the high swelling sea tears them up. Sometimes the tide carries them to a considerable distance.

They are of a soft pulpy nature, easily dissolved, and soon putrify; and they contain oil, salt, and, earth. They must promote vegetation, therefore in the same manner as dung or soot.

Their effects are sooner over than those of dung mixed with vegetables from a dunghill; for they sooner dissolve and sooner putrify.

They may be applied to soil in any situation, and are very proper for land exhausted by lime or ashes.

When their effects are over, the land is in no worse a situation than before they were applied, and any kind of manure may be applied after them.

The oftener they are applied, the land becomes the richer; for the earth of which they are compounded is of the absorbent kind. This is confirmed by experience. The land near the shores, where these sea-weeds are in greatest plenty, and have been long used as manures, are amongst the richest in Scotland, and have been kept almost constantly in tillage.

They are preferable to dung, in this respect, that they do not produce such a quantity of weeds. Every person that has used these manures, knows, that weeds do not appear in such plenty upon land manured with sea-weed, as upon land manured with dung. This seems to confirm the

opinion of those, who assert, that the great quantity of weeds mixed with the dunged land, are produced by seeds mixed with the dung. But it is submitted, whether this difference is not owing to the great quantity of salts contained in the sea-weed and applied with it, which at first destroys some of the seeds and roots of weeds. Salt, applied in too large a quantity, is undoubtedly a poison to many plants. According to Mr. Tull's experiments, a small quantity of salt water destroyed a plant of mint. It is observed likewise, when any grass upon the shore is overflowed by a spring tide, it withers away in a few days, and does not recover till it gets a plentiful shower. Then indeed, by the freshness of its verdure, it is distinguished from the grass that was not overflowed by the salt water. That it is the salt in the water that destroys the plants, is obvious: for the quantity of fresh water would have had no such effect. And it is probable, that the oils attracted by the salts, and carried down by the rain, are the cause of their recovery.

In many places, particularly near the sea-shore, broken shells are found in beds. These are used by some as a manure.

They ferment with acids, and, like other animal substances, contain oil, salt, and earth. The oil and salt are not in great quantities in proportion to the earth, and they take a long time in dissolving.

Their operation must be of the same kind with that of shell marle, but slower and weaker.

They make some addition to the vegetable food by the ingredients of this food of which they are compounded. They communicate to the soil a power of attracting this food from the air; and they dissolve it by the salt which they contain and produce. And they increase the pasture of plants by the fermentation.

They operate chiefly by enlarging the pasture of plants and preparing the vegetable food for entering the roots. They are so long in dissolving, that the quantity of oil communicated in a season must be small in proportion to the salts which they produce. Though these are their principal operations, yet in them they are inferior to lime, marles, or ashes.

As they take a long time to dissolve, and do not operate quickly, it is necessary to apply them in large quantities. For without this their operations will scarcely be perceptible.

For the same reason it may be expected they will continue for a considerable time. They will continue till the shells are wholly dissolved, and all their oils exhausted in vegetation.

As they operate chiefly by enlarging the pasture of plants, and fitting the vegetable food for entering their roots; they will in some degree exhaust the land of its vegetable food, though not so much as lime or ashes do, as they communicate some oils to it in dissolving. It is not proper therefore to apply them after lime or ashes, to repeat them immediately, or apply lime and ashes after them.

If they are taken up from below the surface, as must happen most commonly, it is proper to allow them to lie some time exposed to the air before they are ploughed down. This will not only assist their fermentation, but will also promote their putrefaction.

As lime, when mixed with them, takes a very strong band, it is probable, that the mixing them together in the application may in some cases produce very good effects.

It is a practice in some places to sow turnep, buck-wheat, pease, &c. on land; and when grown up, to plough them down for manures.

These may be called vegetables in an entire state, to distinguish them from dung made of putrified vegetables; though no vegetables can be a manure till it is putrified.

As these vegetables receive their food from the soil on which they grow, it is natural to think, that when ploughed down, they do no more than restore what they have taken; and therefore, that by this operation land cannot be rendered more fertile than before; at least, cannot communicate such a quantity of vegetable food to it as may be done by frequent ploughings. For the vegetables, though ploughed down, are not all preserved; a part of them being uncovered, is blown away by the winds. Besides, the plants while growing, cover the surface, and prevent the vegetable food in the air from entering the soil; whereas, when land is frequently ploughed, none of its vegetable food is exhausted, and it is exposed to receive all the benefit from the influence of the air. But, notwithstanding this, some assert

assert from experience, that a crop of such vegetables as those mentioned, ploughed down, render land more fertile than frequent ploughings without the application of manure.

To account for this upon the principles established, let the following things be considered.

The soil, manured by ploughing down a crop of vegetables, receives all the vegetable food contained in the seed sown. This quantity in pease and buck-wheat is not very inconsiderable. The quantity in one grain is probably as much as there is in a whole stalk after the seed is fully ripened. It is observed, that plants, when cut green, exhaust land of its vegetable food, but in a very small degree to what they do when allowed to carry seed.

Some of the plants mentioned push down their roots below the reach of the plough, and bring up the vegetable food lodged there to the surface. Pease, turneps, clover, and other plants push down their roots very far; and whatever vegetable food they find, is sucked up; and when they are ploughed down, this vegetable food is lodged near the surface, and thereby the quantity within the pasture of some other plants, such as wheat and barley, is increased. A late author makes a calculation of the quantity of vegetable food which clover in this manner communicates to land, and represents it as very considerable. In few places the soil is so deep as to have the vegetable food in great plenty beyond the reach of the plough; and therefore it is probable, that this author, in his calculation, makes the quantity of this food brought near the surface by clover much greater than it really is. However, it is certain, that as plants push down their roots below the reach of the plough, they there find nourishment, which is communicated to their stems and leaves; and therefore, when these are ploughed down, the quantity of vegetable food near the surface is increased.

The covering of the surface seems to be an advantage; for thereby the air in the soil, not having a free communication with the external air, becomes putrified, by which a fermentation is raised, and the vegetable pasture enlarged. Whatever is the cause of this fermentation, the fact itself is obvious. Every farmer knows, that when the soil has been covered for a considerable time by a strong crop of pease, or any other kind of corn laid down, and what is commonly called flooring, though naturally hard and stiff, becomes mellow, soft, and free, and obviously in a state of fermentation. It is probable, that this is occasioned by the corruption of the air, or of the water, which the covering of the surface prevents from being exhaled.

To these things it may be added, that it is not impossible but the plant, when growing, may suck in the vegetable food from the air in as great plenty as the soil would have done, though there had been no plants growing upon it. If plants have this faculty, considering what an immense surface is exposed by them to the influence of the air, the quantity of vegetable food acquired cannot be inconsiderable.

Having thus considered the effects of ploughing, harrowing, rolling, and manuring land, in order to produce a large crop of wheat, we shall now proceed to the cultivation of this useful species of grain.

It has been very justly observed by the ancients, as well as moderns, that wheat will grow in almost any part of the world, and that, as it is the plant most necessary to mankind, so it is the most general and the most fruitful. It thrives not only in temperate climates, but also in very hot, and very cold regions; and, when sown in places where it never grew spontaneously, succeeds as well as where it has been always common. The success of our crops of wheat in America plainly proves this: and in Peru and Chili in particular, where this grain was not known till the Europeans introduced it there, it now produces, as large crops as in most parts of Europe.

Wheat should be sowed in autumn, and always when the ground is moist. In the downs of Hampshire, Wiltshire, and Dorsetshire, farmers begin to sow their wheat in August, if any rain has fallen, and even employ their people to sow one place whilst they reap another, if wet weather interrupts them in their harvest: for if the corn is not forward in autumn, so as to cover the ground before winter, it seldom does well on those high dry lands, especially if the ensuing spring proves likewise dry. In low strong lands, some husbandmen think they are in good season, if they get their wheat into the ground by the middle of November; nay, it sometimes is Christmas, or even later, before all their wheat is sown. But this late sown wheat, besides being apt to run too much to straw,

especially if the spring be moist, is liable to be thrown out of the ground by frosts.

In general, all wheat succeeds best upon strong soils, especially if they have been well drained, so that the corn lies dry: but as some sorts of this grain thrive better in some soils than in others, it might redound to the public welfare if more particular observations were judiciously made, in regard to each kind, than have hitherto been. The white egg-shell wheat is reckoned best for light lands, and to sow with rye for meslin; because it ripens soonest. It should also be the earliest in the ground. This species is much sown in Essex, upon their hazely brick-earths, or loams; as the red wheat, and the Poland bearded wheat also is there, and in Hertfordshire upon stiff yellow clays. The white Poland, or pole-rivet wheat has not a hollow straw, and therefore is not so subject to lodge as other corn that has. This kind is particularly fit for lands where the crop is apt to run much to straw.

In Oxfordshire they have a sort of wheat which they call long-coned wheat, and reckon the best for rank clays. Its straw not being hollow, it is the less liable to lodge; and farmers observe, that it is the least apt to be mildewed, or be eaten by birds; from which last it is greatly guarded by its long rough awns; but the flour of it is somewhat coarse. Their white kind of red-eared wheat has a white ear and a red grain, and is a very good sort for clayey land. It yields a good crop, and seldom smuts.

In Staffordshire, they reckon the red Lammas or bearded wheat the best for cold lands or stiff clays.

In Berkshire is a wheat called pendulum-wheat, from the hanging of its ear, much like the cone-wheat.

In Northamptonshire, they have a sort of wheat with a white straw and reddish ear and grain; much commended for the plumpness and largeness of the grain, and the strength of the straw, which prevents its being subject to lodge; nor is it apt to be eaten by birds. They have also a red-eared bearded wheat, and a sort of pollard or duck bill wheat, as it is called, known in Sussex by the name of fuller's wheat, which has so close and thick a husk, that the birds never injure it. Mr. Miller observes, that this sort of wheat grows very tall, and, if it be sown too thick, is very apt to be lodged by rain and wind; for that its ears are large and heavy, and incline on one side as the grain increases in weight: but that, if its roots are at a proper distance from each other, it will tiller greatly, and have strong stalks, and that the grain of this wheat yields more flour in proportion than that of any other sort. The awns of this wheat always drop off when the grain is full grown.

Smyrna wheat, commonly called many-eared wheat, because several lesser or collateral ears grow around the bottom of the main ear, which is very large in its state of perfection, requires more nourishment than the common husbandry in a large way can give it, and therefore is not cultivated by our farmers: But it would, probably, do extremely well in the horse-hoeing husbandry, where the quantity of food can be enlarged almost at pleasure. For the same reason maize, commonly called Turkey or Indian corn, is fitted for this last husbandry. See MAIZE.

Some gentlemen have been curious enough to procure their seed wheat from Sicily, and it has succeeded very well as to the growth: but the grain of this species has proved too hard for our English mills to grind.

The best time for sowing wheat is about the beginning of September, especially if any rain has fallen; a circumstance so essential, that, if the earth be very dry, the farmer had better stay till friendly showers have moistened his soil, then put his corn in ground, where it will not grow before it has been wet, let the time be ever so long. Mr. Mortimer says he has known wheat to be so musty and spoiled by laying long in the ground, before rain came, that it has never grown at all: to which he adds, that he has likewise seen very good crops of wheat from seeds sown in July. It is a general practice among farmers, to make choice of a time for sowing their wheat when the earth is moist: and the writers on agriculture have likewise, in general, recommended that practice; but without assigning any reason for it, or such reasons as are by any means satisfactory. This is the more extraordinary, because sowing dry, is almost universally recommended and practised, in sowing other seeds. The ground of this difference appears to be, that wheat being subject to be smutty, the seed is commonly brined and limed, which has been found in a great measure a security from that distemper in the crop.

crop. It is nevertheless true, that sound good seed, from a good change, produces, for the most part, sound crops of wheat, free from smutiness; and when such seed is sown dry, or without steeping, it is most adviseable to sow it when the land is dry. When the seed is steeped, it imbibes moisture, more or less, in proportion to the condition of the seed, and the time it lies in the steep, and a vegetation commences: if the seed in this state is laid in dry earth, and the weather for some time continues dry, the vegetation is checked, which kills or much damages the seed. Another inconveniency also arises from delaying to sow, and waiting for rain; the season for sowing is delayed; and if much rain falls, the earth consolidates, which renders it less proper for receiving and nourishing the seed, it being a general maxim with gardeners, and with husbandmen, in other cases, that seed thrives best upon fresh tilled ground. At all events, the husbandman should certainly have his wheat-sowing finished by the middle of October. Whoever neglects this, shews, in so doing, a want of proper œconomy in his affairs, and will have cause to repent the delay.

Early sowings require less seed than late ones, because the plants then rise better, and acquire strength to resist the winter's cold. More seed should always be allowed for poor lands than for rich, because a greater number of plants will perish on the former. Rich lands, sowed early, require the least seed of any.

Another circumstance which the husbandman should carefully attend to in sowing, is that his estimate of seed be formed, not from the capacity of any particular measure, but from the number of grains which that measure will contain; because the grains of some growths of wheat are much larger than those from off other lands, though of the same species, and perhaps equally good. By not considering this, the ground will of course frequently be sown too thick, or too thin: though I believe farmers are seldom apt to run into this last extreme. That they too often commit the former error, so manifestly contrary to their interest in every respect, is demonstrated by reason and by daily experience: but neither of these is sufficient to make them deviate from the beaten track. Instead of the usual allowance of three bushels of seed-wheat to an acre of land, repeated trials have shewn that half that quantity is generally more than sufficient: consequently a great deal of corn is actually thrown away; for the expence of purchasing seed, which most skilful husbandmen do, at least every other year, amounts to a considerable article in large farms, and in a whole country, merits the attention of the public, especially in scarce years: besides which, the future plants, crowded together by being thus sown too thick, and not having a sufficient space allowed them for their sustenance, cannot yield near so fine and plentiful a crop as they would otherwise produce. A fair trial, made with proper care, would soon convince farmers of their error in this respect; for if they but examine a field of corn sown in the common way, they will find few plants with more than two or three stalks, unless by chance, where some of them stand so as to have room to spread. These will have six, eight, or ten stalks, and frequently many more: but a field of wheat sown with only a bushel of good corn has been known to be well covered with healthy vigorous plants, each of which has had from six to fourteen, or more stalks, covered with long well nourished ears, full of fine plump grain, of which it has yielded a much greater quantity than any of the neighbouring grounds sown with the common allowance. If the land is good, and the plants stand at a proper distance from each other, few of them will produce less than the above number of stalks and ears. But farmers think they shall have no crop if the ground is not covered with the blades of corn by the spring: whereas, if they would have patience to wait till the plants put out all their stems, they would be amply convinced of the contrary. Every one must have observed, in places where foot-paths are made through corn fields, that, by the side of those paths, where the corn is thin, and has been trodden down in the winter and spring, the plants have stood erect, when most of the corn in the same field has been laid flat upon the ground; an advantage which can proceed from no other cause, than that their stalks are stronger from their having more room; for those of the other plants are drawn up tall and slender by being too close together.

More seed is commonly sowed upon new broken up ground, than upon that which has been longer in tillage.

From half an inch to three inches is the usual depth at which wheat is planted, according to the nature of the soil; the stiffest lands requiring the shallowest sowing, as was before observed. The general custom is, to sow it under furrow, which is certainly most adviseable, if the soil be shallow, to prevent the plants being thrown out by the winter's frosts, or their roots being left bare by the drying winds in the spring. Some sow in broad-cast, either with a single cast, or double bout, harrowing once between; after which the ground is again harrowed several times, till the seed is well covered. However, a great deal of it will become the prey of the birds, in this manner of sowing. On the other hand, in planting the corn deep, there is the greater danger of its being eaten off by worms between the grain and the blade.

Great care should be taken to guard against the rooks just at the time when the wheat is shooting up. These mischievous birds perceive its sprouting much sooner than the farmer can, and are led by the shoot to pick it up. They must therefore be carefully kept off the ground for a week or ten days at this season; for at the end of that time the blade will be grown up, and the grain so exhausted of its substance, that they will not give themselves any trouble about stealing it. They never molest the wheat which is sown about Michaelmas; because so much grain of the late harvest then lies scattered about the fields, that they find it easier to pick up that, than to search for corn under ground in the new-sown lands.

No part of husbandry requires the farmer's attention more than keeping his land free from weeds; yet few trouble themselves much about this essential article, are sensible of its importance, or understand the proper method of doing it: nay, many do not even know which weeds are annual, and which perennial; a distinction highly necessary to be made by every person who would keep his ground clean and in good order, and without which the greatest industry will often be baffled. Annual weeds may be soon destroyed, if taken in time; but if they are neglected, their seeds will ripen, and sow themselves in such abundance, that much additional labour and expence will be required to do that which might have been performed with ease at the beginning, without subjecting the corn to be robbed of its nourishment by bad neighbours. The common method of weeding is very absurd: for in that practice the weeds are to grow till the wheat begins to ear and they are in flower; by which means the ground being covered by the corn, all the low weeds are hid, left to ripen, and scatter their seeds: only the tall weeds are taken out; and if the people employed are not careful, many of these will escape them, by being so intermixed with the stalks of the wheat, as not instantly to be distinguished. At the same time, great numbers of the plants of wheat are broken and trod under foot by the weeders.

To obviate these inconveniencies, Mr. Miller recommends the method now practised by good kitchen gardeners, who clear their ground with a small kind of hoe, which, if used among the wheat early in the spring, before the ground is covered by the blades of corn, will effectually eradicate all the weeds, especially if this work be done in dry weather; because being small, they then soon wither and die. If the ground happens to be very full of weeds, it may be necessary to go over it a second time, about a fortnight after the first, to cut up those which may have been too small to be noticed. By this means the corn will be kept clean, freed from robbers, which would deprive it of due nourishment, and there will not be time for new weeds to grow so as afterwards to do it any great prejudice: for the ground will be so much shaded by the corn, that the weeds will thereby be kept down in such manner as not to ripen their seeds before harvest.

If, at the time of this operation, some of the plants of corn are cut up where they grow too close, the rest will be greatly benefited thereby: "but in this," adds Mr. Miller, "I fear that few of the old farmers will ever agree with me, though what I mention is not from theory, but from experiments repeated with great care, and such success, that the produce of twenty rods of ground was much greater both in weight and measure, than that of the same extent in the very best part of the field, where this was not practised; and the stalks of the corn thus thinned stood upright, when a great part of the crop in the same field was lodged."

Both the advantage of having the plants of corn at proper

per distance from each other, and that of keeping them quite free from weeds, too difficult, not to say almost impracticable tasks, to be completely effected in the common method of sowing, are fully obtained in the New Husbandry, as will soon be evidently shewn.

M. Duhamel and Mr. Miller justly blame the practice of those who either turn hogs in among their wheat, to destroy part of it when it grows too thick; or sheep to eat it down, when they think it too rank. The absurdity of the former is self-evident: and in regard to the latter, it is well known, from long experience, that the leaves, or blades of corn, are necessary to draw in nourishment from the air and dews, for the increase of the stalk and ear. To be thoroughly satisfied in this, Mr. Miller cut off the leaves of some plants of wheat, alternately, early in the spring, and always found the stalks of these plants much smaller, the ears shorter, and the grain poorer, than those of the intermediate plants whose blades were not cut. Several experiments made by M. Duhamel have proved, not only that all plants are impeded in their growth, and rendered less perfect in their productions, but often even killed, by stripping them of their leaves: and this is confirmed by Mr. Miller, who adds, that he has frequently observed in gardens, that plants divested only of their lower leaves, plucked off by ignorant persons upon a supposition of their drawing the nourishment from the head, have been greatly weakened thereby. The same will undoubtedly hold good with respect to corn: besides which, cattle, and particularly sheep, will often bite so close as to destroy the crown of the plant from whence its future growth should proceed.

Wheat is ripe when its straw is turned yellow, its ears hang, no greenness appears in the middle of them, and the grain is hard when bitten.

It was formerly a custom among farmers, to delay reaping their wheat till it was very ripe, except in the neighbourhood of London, where their land was sown early, warmed with good manure, well tilled and kept clean from weeds; in these circumstances, and their reaping before the wheat was very ripe, their harvest was much earlier than in remote countries, particularly westward: for this reason, some industrious reapers began wheat harvest near London, and from thence they proceeded westward, reaping still as they went on towards Wiltshire, where they came in time for the harvest, and all the way thither; by this means, they had a long harvest, and earned much more money than those who reaped in only one part of the country.

But many of the west country farmers do now reap their wheat, almost as early as about London: for they do not let it stand to be so ripe as they did formerly, and find their account in cutting it greener; for such wheat has a better colour than the thorough ripe, and sells for more money at market; and one skilful farmer, who cuts his wheat very early, and generally sells it at a high price, assured me that he found upon trial, his wheat reaped early, was heavier in the bushel, than the same wheat, when it stood till thoroughly ripe: the reason of which appears to be, that wheat cut before it is quite ripe, handles best, being smoother, and more slippery, than the very ripe, which contracts a roughness that prevents its lying so close in the bushel as the smoother early reaped wheat.

Hence it appears, that the greater weight of this grain, cut green, is not in consequence of the grain filling and ripening in the straw, after it is cut (for this farmer's wheat was commonly among the first at market), but because, the wheat that is cut early is a smaller grained corn, and lies closer in the bushel, which, in that respect, is no advantage to the farmer; and he is also liable to some loss in threshing, it requiring more labour to thresh it clean, than thorough ripe wheat, and more of it is usually left in the straw: but the advantages of reaping it early, more than balances these inconveniencies; as such corn sells at a better price, and there is a greater chance of good weather to harvest it.

Good weather in harvest is of great importance to the farmer, and to the public: and the delay of but a few days is sometimes attended with very bad consequences. In the year 1757, much of the wheat being ripe, or so near ripe, that it might have been harvested; but many farmers being willing to have it thoroughly ripe, and depending too much on a continuance of fair weather, delayed reaping a few days. In the mean time the

weather altered, from fair to a small driving rain, which continued so long with very little intermission, that the ripest corn, though not lodged, sprouted as it stood upon the stem to a very uncommon degree. The unripe corn escaped much better, and did not much of it sprout, but continued to vegetate, fill and ripen, till the return of fair weather. The damage, however, was very great, and the price rose in proportion: for much of the corn that had not sprouted, so as to be visible, had begun to vegetate, and this being ground, together with the sprouted and sound corn, damaged the whole to such a degree, that the bakers could not make good bread of them; and the bad effects were severely felt that year and for a considerable time afterwards.

From four to five quarters an acre is reckoned a good crop: but some would hardly credit how much beyond this the produce of good ground, thoroughly well cultivated, may be increased. Those who are sensible of the vast advantages of a perfect culture will not be surprised at Mr. Miller's assuring us that he has known eight and ten quarters, and sometimes more, reaped from an acre, over the whole field, where the corn has stood thin upon the ground; and that he has been informed by persons of great credit, that even twelve quarters have been reaped from an acre of land drilled and managed with the horse-hoe.

Both wheat and rye may be cut somewhat before they are thoroughly ripe, especially if they be lodged; for if the straw be broken, it will no longer convey any nourishment to the grain. M. Duhamel seems to think this is even the most eligible way for wheat, because the grain will harden afterwards in the sheaf; whereas, if it be let stand till it is too ripe, it will shed greatly in cutting, binding, and carrying home. It is partly to prevent this inconvenience, that good husbandmen tie it in the evening, and carry it off early the next morning. The ancients reaped their corn before it was full ripe, as Pliny informs us. And indeed it must be allowed that very great disadvantages necessarily attend the letting of some sorts of corn stand till their grains have acquired their utmost maturity. Both the chaff and the fodder are the worse for it; and, if such ripe corn takes wet, the increase in malt is lost, if it be barley, it having already spent itself; and if it be wheat, the quality of the flour is greatly impaired, as well as the quantity considerably lessened. But if corn be cut greenish, it will bear a pretty deal of wet without damage; for it will not imbibe the water like full ripe corn, but only take in so much as to be kindly fed thereby. Again, if any sort of corn be blighted, the sooner it is cut down, though but half ripe, the better it will be; for nourishment can no longer be conveyed to it by the straw; but it will be fed by lying in the ear. The straw would become more and more brittle, by standing till the corn is ripe; and the grain comes the clearer from the husk, when threshed, if this blighted sort be cut early.

One man, with a binder, may reap an acre of wheat, and somewhat more of rye, in a day, if the corn stand well; he will also clear about an acre of peas, vetches, &c. in the same space of time.

The medium price of wheat, in this country, is about five shillings the bushel. If it be much under four shillings, the farmer cannot pay his rent and live; and if it exceeds six shillings, the poor sort of people cannot afford to purchase wheaten bread. A bushel of wheat weighs from fifty-six to sixty pounds; a bushel of barley, from forty-four to forty-seven pounds; and a bushel of peas, from sixty-three to sixty-six pounds.

"The husbandman, says Mr. Duhamel, cannot have a more favourable season to get in his harvest, than that which is afforded him by hot and dry weather; for the quality of the corn is improved, and the grain is rendered much fitter to keep, by the sun's having acted powerfully upon it, either towards the latter part of its standing, or just after it has been cut: though it is true, on the other hand, that this very circumstance renders the ears more apt to shed their grain, and that the value of a sowing is often lost thereby. To prevent this, as much as possible, the corn is first laid in grips, and then tied up in sheaves, in the cool of the evening, or early in the morning before the heat comes on; and the mowers of oats frequently work during part of the night, to avoid the excessively fatiguing sultriness of the noon. These poor people, whose task is infinitely laborious, are liable to many grievous disorders; especially the reapers, who, being obliged to stoop to their work,

work, almost to the very point where the rays of the sun are most violently reflected by the earth, breathe a perfectly burning air. This forces them to drink copiously of liquors, which, being heated by the sun, allay their thirst only for a few moments, and I strongly suspect, often occasion severe illnesses: the inventing of a machine, engine, or instrument, by which the hardness of this labour might be mitigated, would therefore be a truly useful discovery, and I most heartily exhort all ingenious persons who have a mechanical turn, seriously to think of it.

"The two usual ways of cutting corn, are either with the scythe or with the sickle. The former is commonly used for oats and barley, or, sometimes, for very thin, short wheat; and the sickle is generally appropriated to the reaping of tall and thick wheat and rye. The scythe dispatches so much more work than the sickle, that the difference of expence between reaping an acre, and mowing it, is nearly in proportion of five to two.

"Every part of the mower's body labours and fatigues, and his work requires greater dexterity than that of the reaper: but as the mower is always in a kind of standing posture, he has the advantage of being refreshed by every breeze of air; which the reaper, for the reasons before mentioned, has not.

"I do not despair but that some engine may, one time or other, be found out, to ease these very hard labourers, and expedite their work. In the mean while, I am persuaded that M. de Lille's following account of what he himself has practised on his own estate, will afford satisfaction to all my readers, who will be pleased to observe, that he does not relate matters of mere speculation, but real facts: things actually executed by him, and which I should certainly have tried, if I could possibly have been in the country when our harvests were got in.

M. de Lille's Account of his Method of mowing Wheat.

"When I first put a scythe into the corn, I was of course laughed at by some of my neighbours, because they had never seen any such thing. I let them enjoy their jokes; but persevered in my undertaking, which I have now practised sufficiently to be able to point out minutely its advantages, and its inconveniencies; for I allow that, though the former are very great and numerous, it is also attended with some of the latter.

"The year 1751 was very rainy; our grass rotted upon the ground, our corn was poor and infested with weeds, and the weather continued extremely bad during all the harvest season. One of my fields of wheat, containing about fifteen acres, was, in particular, in such wretched plight, that I did not think the crop worth taking off. However, after walking over it, and viewing it on every side, I found that the quantity of grass and other growths upon it, might, if mowed, afford a great deal of fodder, which would make me some amends for the total loss of my lucerne. I therefore determined to let my horses have it all, with the little wheat which appeared here and there. This first made me think of mowing a field of wheat; though I soon recollected that I had met with the hint before, in some writings. Accordingly I set my mowers to work: my field yielded a great quantity of fodder; the grass, mowed within two inches of the ground, shot up anew, and afforded excellent pasture; and lastly, my bailiff, more saving than I had been, ordered the trusses to be thrashed, and got out of them as much wheat as was yielded by other grounds.

"Whilst I was congratulating myself upon the success of my operation, by which my horses and cattle were provided with plenty of fodder for the next winter, I learnt that the husbandmen in Hainault, Flanders, Artois, and other adjacent parts, never cut their corn down otherwise than with a scythe; but at the same time I was informed that they do not mow wheat in the same manner as oats: that the scythes are not made alike for both these works, and that there are some other essential differences.

"These observations were a sort of proof that the practice had been found to answer, since it was still continued; and I concluded, that if my operation, imperfect as it was, had succeeded so well, I might expect far greater advantages when it should be performed regularly: but, not to be too strongly prejudiced in its favour, I resolved to make a trial upon about thirty acres only.

"By dint of enquiry, I found within a few miles of me a husbandman who came from the province of Artois, and

had been used to this very business. I talked with him; he told me how the work ought to be done, pointed out its advantages, and I retained him for my intended next year's mowing of wheat: but as the season was pretty far advanced, and there was not time to procure from his country other people equally well acquainted with the practice, to follow the scythe, and do the whole completely in every respect, he instructed two young lads, as well as he could. In short, nothing was wanting but a mere matter of form, by the neglecting of which some of the lifts of the cut corn were misplaced, so that there were ears at both ends of the sheaf.

"I ought not here to forget the clamour raised by this novelty. I made the experiment upon the finest wheat; because my new workman had told me, that the stronger the corn was, the better and more regularly the mowing would be performed. My neighbouring husbandmen, and all the reapers employed by them, thought me out of my senses, and some of them even came to reason the matter with me. They meant well, and I took it kindly; but desired them carefully to notice the event.

"My experiment was made upon three pieces of wheat, of ten acres each, situated in a much more extensive field of the same corn; so that there was the fairest room to make a just comparison between the operation of the scythe and that of the sickle.

"Some of the neighbouring husbandmen had the curiosity to see the work performed, and were surprised to find that less corn was shed in this way, than in the common practice of reaping with the sickle. They thought the method good; but made a few objections to some particular circumstances, in which the experience of subsequent years shewed them that they were wrong. Their entire approbation then followed; and their mowers finding that they should be able by this means to cut down all their corn without the assistance of strolling strangers who often do their work very badly, gladly learnt the new method, and commended it to others.

"This work required a precaution which has been duly attended to ever since: it is, to pick all the stones from off the land every year, as carefully as possible. The expence of doing so is a very trifle, when compared to the advantages attending it. All the roads around my land, which were formerly impassable in winter, are now firm and good, fit for any carriage. We no longer hear of horses lamed, or waggons overturned by them; and which is equally true, I find that my ground now requires a less quantity of seed.

"I have now practised this method, in an extensive manner, during five successive years, in the course of which I have had opportunities of experiencing every circumstance necessary to be considered in order to determine its real merit; I mean, mowing in rainy weather, and cutting of corn either bent, laid flat, totally lodged, or lodged only in particular places, and in various directions. I shall first describe the mechanism of this mowing, and then point out its advantages, with the objections of my neighbours, which will shew the only inconveniences I have met with.

"The Flemish mowers whom I employed in the year 1753, brought with them scythes exactly like ours. I saw no sort of difference in their size, make, manner of being mounted, or even in the hooks they were trimmed with; so that I found I had been misinformed by those who told me in 1751, that this work required an instrument different from that which is used for mowing oats. It was not till the year 1755, that the ingenious workman pointed out some very proper alterations, which have since been made.

"This intelligent mower observed, that the common scythe cannot suit any ground but such as have been ploughed flat; that it therefore was least of all proper for our lands, which are ploughed in ridges of ten or twelve furrows, raised very high in the middle; and that its hooks broke the straw, plucked off numbers of ears, and did not lay hold of many short plants which grow in the bottom of the furrows, whereby a loss was occasioned, or take up the intermixed grass and weeds so exactly as might be wished. To remedy this, he took a scythe at least six inches shorter than those which are commonly used, and, instead of the hooks, substituted what he calls the bender, consisting of two shoots of willow, or other green wood, placed semicircularly upon the handle of the scythe, where the hooks are commonly set. To this end there must be four holes

in the handle, so that the end of one twig may be put into the lowermost hole, and its other end into the third, and the two ends of the other twig into the second and fourth holes. The scythe thus trimmed is to be used in the manner shall now explain.

"When a mower sets about cutting down a crop of oats, he places himself so that the corn is at his right-hand, from whence the action of the scythe throws the waving towards his left. The mower of wheat, on the contrary, proceeds from outside to inside, so that the corn which he is next to cut is always at his left-hand; and that which he has just cut, being collected by the bender, is rested, inclining a little against the adjoining uncut part.

"A helper, which may be a boy of twelve or fifteen years of age, or an elderly woman, follows the mower at the distance of four or five feet, with a reaping hook, or a stick about a foot and a half or two feet long, and by putting that through the interval between the sloping late cut wheat, and the standing corn against which it rests, takes up the former, gives the straw ends a gentle stroke or two upon the ground, to form that parcel into a grip, and lays it down at his right-hand. This should be done very expeditiously, because the picker-up, as this person is called, is followed by another mower; and it should also be done dexterously, because the greater or less quantity of gleanings depends thereon. There should be as many pickers-up (we call them binders,) as there are mowers.

"The posture of the mower is a circumstance of such importance, that I think myself happy in having taken particular notice of it in 1754. In cutting grass, and oats, the mower goes in such manner, that his feet, which are moved alternately at each stroke of the scythe, describe two parallel lines. But in the mowing of wheat, the mower's track should be upon a single line, so that his right foot, which should be foremost, be driven forward by the left, at each cut of the scythe; not unlike the attitude of a fencer when he advances.

"An accident which had like to have over-set my whole operation in the year 1754, demonstrated to me the necessity of this different posture. I employed for mowing my wheat, men who used to come yearly to cut down my oats: they were seven in number. On the third day of their labour, five of them fell ill; upon which I set three others to work: but the consequence was, that I had ten sick people to take care of at the end of the week. I visited them, inquired into their ailments, and found that some of them had a fever, but that all of them complained of violent pains and soreness under their left ribs. At first, I was inclined to think them pleuritic; but, upon a close examination, and upon considering the nature of the work they had been at, I saw that their illness proceeded from badly managed hard labour, the stress of which had been made chiefly on the left side. I therefore ordered them to take their rest.

"The next day, upon visiting my infirmary, I found that two of the mowers were returned to their work. I went out to them, and saw, even at some distance, that their posture in this work was the same as if they had been mowing of oats. This immediately shewed me the cause of their pains. The scythes which they then used had the common sort of hooks, and were much heavier than those with only wicker benders. I took up one of them, put myself in the posture of a mower of oats, and shewed them, that as a much greater weight rested upon the hooks of the scythe when they mowed wheat, than when they cut oats, it was not possible for them, in the posture they had chosen, to move that increased load to the left, without an irksome twist of the body. Then, putting myself in the posture of a fencer, as I had seen my plentiful mowers do the year before, I demonstrated to them, that the body was thereby placed in such an attitude as enabled it to exert the greatest strength, when, by the motion from right to left, it had the greatest load to support, and that, by the same means, this load was carried round without fatiguing the ribs of either side. My man took back his scythe, tried as I directed, was convinced of the truth of my demonstration, taught his companions the same method, and they have done their business easily ever since. I thought it necessary to relate the circumstance of this accident, because I am satisfied that even the strongest men would sink under the labour of mowing wheat, if they were to stand in the same posture as the mowers of oats.

"Such is the manner in which this operation should be performed, when the corn stands upright, that is to say, in the most favourable years. I ought too add, that the

mower should take care to place himself, for his work, in such manner that his left hand may be toward the wind. The corn is then naturally inclined over the scythe, and is the more easily cut closer to the ground. The resistance of the wind, be it ever so little, helps to keep the corn which is cut steady upon the benders of the scythe, and facilitates the motion which rests it against the uncut corn, where the binder takes it.

"The mower is not hindered from mowing close, by the wind's blowing at his back; but the corn which he cuts will not be so exactly collected by the bender: some of the ears will be a little scattered: but the greatest inconvenience is, that it does not rest so well against the standing corn, but is often blown down; which renders the binder's work slower, and more troublesome, and occasions greater gleanings.

"The wind is in a bad corner for the mower when it blows in his face. It then occasions a loss of stubble, and a great dispersion of the ears.

"But the worst of all winds for this work, is that which blows upon the right hand of the mower. The stubble then remains long, and so great a quantity of ears lies scattered about, that one would hardly think the ground had been harvested. My mowers did not place themselves in this manner of their own accord: but I made them do it for a quarter of an hour, to try the effect, of which I am fully convinced.

"When the corn is inclined, or bent, the mower takes it in the direction of its bending from left to right: which has the same effect in calm weather, as if the wind blew towards his left.

"Corn which is lodged cannot be easily mowed inward, because the binder would be incessantly impeded by the intangling of his grip with the uncut corn. A good mower judges by his eye, which part it is most proper to begin at, and takes advantage of the wind when it can be of service to him. The method which I have seen most commonly practised, has been by taking the corn in the direction of its bending, and throwing it in waves. The work thus done, is neatly performed: no remains of stubble are seen after the mowing: but the field looks like a meadow.

"Corn laid absolutely flat, and intangled, is the most difficult to cut well. I have seen a mower take it in every various direction in which it was beaten down, as if the wind had been constantly at his back, and by this means he has cut as close as if it had been only lodged. My wheat was in this condition in the year 1757, and was mowed very regularly: only the work was somewhat longer about, than generally is in other cases.

"I shall not speak of rainy seasons till I come to the objections against this method of cutting corn; because they have nothing to do with our mowing, and the only thing requisite in such cases is to keep the corn from sprouting in the ear: but I shall here relate the advancement which I find in this practice.

"The preservation of my fellow creatures is so dear to me, that I look upon the means of lessening their excessive hard labour at a time when the heat alone is enough to over-power them, as the first and greatest advantage resulting from this method. Now I see that a good reaper, with his sickle, can scarcely cut an acre of wheat in a day, let him toil ever so much; whilst the mower will dispatch from an acre and a half upwards of two acres, according to his skill and dexterity. I have, indeed, met with but few able to exceed two acres, when they have done their business well: but we may reckon that a good mower, taking them one with another, and the corn as it runs, upright, lodged, intangled, &c. will clear an acre and a half, or perhaps an acre and three quarters, in a day, neatly, and without wasting any of it. This mower does then three fifths more work than a reaper can. It is true, he has not the grips to tye up, because the person, who follows him does that part: but he is obliged to whet his scythe when he comes to the end of the field, and still oftener when the corn does not grow thick; besides which, notwithstanding all the care that can be taken to clear the ground of stones, not a day will pass without his meeting some which will oblige him to have his scythe new hammered; and lastly, when he has finished a row, he must go back to the other end of the field before he can begin another. All this takes up at least as much time as the reaper's binding up what he has cut: and in regard to the hardness of labour on each side, I believe that every one who rightly considers the nature of their respective

works, and their postures in working, will allow, that the mower's toil and fatigue is three fifths less than that of the reaper.

" Another circumstance, well worth attending to, in this method is, that the mower is not exposed to those injuries from thistles, thorns, and other noxious plants; which often prove fatal to the reaper.

" From the first of these advantages result several benefits: 1. A greater celerity of the necessary work. Not a year passes without the husbandman's experiencing that some part or other of his corn ripens too suddenly; and this unexpected maturity, being exceedingly heightened by the least delay, occasions a great waste by the shedding of the grain, both when the crop is reaped with the sickle; and in loading and unloading it when carried home: whereas the scythe, by clearing in two days a field which could not be reaped in less than five, in the common way, guards against that excessive ripeness.

" 2. This method of cutting down the corn requires fewer workmen. I must here explain myself; because the fact would contradict me, if it be objected that a mower and a binder are necessary in this way, for what the reaper alone does in the other. But I consider, that to harvest ninety acres, for example, of wheat, I must employ ten men at least twenty days, with their sickle; whilst seven mowers, and their binders, (fourteen people) easily do my business in ten days. The difference then is equal to sixty days work of one man: and if I do not intend to get my harvest in quicker with the scythe than with the sickle, I take but four mowers and four binders, eight persons, of which the four last stand me in less expence than three reapers; because I employ for this business young people who would not be strong enough to reap with the sickle. Consequently I have two workmen the less, and some advantage in the comparison between the grown-up man, who has a higher price, and the lad who answers my purpose.

" 3. The thus employing of children, old women, and men whose constitution is not robust, would be an advantage to the inhabitants of the place. It would afford the means of subsistence to a greater number of people, and prevent idleness and beggary; an important object upon many accounts. Almost every parish would find within itself hands enough to get in its harvest, without being obliged to have recourse to accidental passengers, who often work badly, require exorbitant wages, and sometimes leave their master in the middle of the harvest, if they do not submit to their unconscionable demands.

" Let us leave speculation, and notice some advantages which are evident beyond contradiction. 1. It is not a small one to have a greater quantity of straw, and that straw intermixed with more grass and other fodder, than when the corn is reaped in the usual way. This does not need any proof; for every one knows, that the scythe cuts as close to the ground as the mower pleases. Experience has shewn me, that the stubble has not been left two inches long upon our mowed fields, where the stones had been carefully picked off; whilst the sickle generally leaves it eight or nine inches long, and sometimes much more when the ground is infested with thistles and other stubborn growths, which make the reaper lift up his hand to avoid them. The straw is therefore plainly six inches longer when cut with the scythe, than with the sickle; a difference which may be valued at a sixth part more than that which is usually reaped in the common way.

" 2. The green fodder in the mowed fields shoots up anew when cut, and affords excellent pasture after the corn is taken off. The same demonstrative evidence as before, will again take place here with those who but consider, that the reaper, leaving the stubble either eight or nine inches long, takes off only the very tips of the grass which chance to be within his grip; so that being then near its time of maturity, it ripens its seeds, sows them, and withers away: whereas, when the scythe cuts it within two inches of the ground, in its greenest and most un-ripe part, the yet remaining eyes, and the crowns of the roots, send forth new shoots, which form a good after crop for cattle.

" 3. The pasture upon fields mowed with the scythe, is attended with an advantage, in regard to cows, which may perhaps be peculiar to my country. I know not whether it be the same elsewhere. We find every year, and I have always taken particular notice of it, that our cows cease to yield milk during the first week of their feeding among the wheat stubble. I take the reason of this to be, that the stubble gets into their nostrils, pricks them, hinders them

from feeding, and makes them range the whole field over in quest of grass unattended with this irksome inconvenience; so that they spend their time in running about, without grazing. I do find that this accident happens to cows which are turned in among the short stubble left by the scythe: the grass there soon shoots up a-new, and yields me plenty of pasture, especially if a little rain happens to fall after harvest.

" It results from hence, that the husbandman is enabled to feed more cattle than he could otherwise do, to save his saintfoin or lucerne, and to have a greater quantity of dung; as I have experienced with almost incredible success.

" I now proceed to the objection, which I shall state in the same order as they were made; that is to say, as each year gave room for one or other of them.

" The first was that the scythe must make the corn shed very much by shaking it considerably. To affirm the contrary may seem paradoxical; though the assertion will be proved from manifest principles; and by facts. To judge rightly of my proposition, it will be necessary to compare the operation of the scythe with that of the sickle; both of which I have examined very attentively.

" The reaper presents his hand to the corn, and with wide extended fingers, grasps as much as he possibly can; after which to bring the lower part of the stalks so close together that the sickle may encompass the whole of his grip, and at the same time to give it a tension which renders the action of the sickle more certain, he gives it a violent shake and at that instant cuts it. The grip thus cut is generally entangled with the standing corn; or the reaper, when going to lay it down, finds that he has missed cutting a stalk, or perhaps more, which he then breaks with a jerk of his hand. Thus several shakes precede that which the corn receives afterwards when it is tied up.

" The scythe has not these effects. I have already explained the mechanism of its operation, and shewn that the corn cut without any violent shake, is carried gently by the bender (or cradle, as we more commonly call it) upon the scythe, to the standing corn, against which it rests inclined till the binder takes it away to tie it up.

" To prove my proposition by facts, I instance the following. After my wheat was mowed in the year 1752, in the manner before related, upon the three several spots of ten acres each, which were parts of much larger fields, I went, with four other persons, purposely to examine with all the care we could, what quantity of grain might have been shed by the mowing. We found none at all in the two first mowed pieces; but a great deal in the other parts of the same fields which had been reaped with the sickle. In the last piece, which was not cut till the corn was riper, we found little grain in the mowed part, but incomparably more in the other. I did not repeat this search every year with the same care, because I had not always the same conveniences of making a comparison: but I have seen enough to be certain that no grain is shed unless the corn be exceeding ripe, and that much less is then lost by the scythe, than by the sickle.

" The following more important objection was afterward made by a sensible husbandman, who observed to me, that, in a rainy year, the corn cut after this manner must be more liable to grow in the ear, than that which is reaped in the common way, because the heads of the grips not being supported here by a pretty high stubble, the wet cannot well drain off; and that the grain will imbibe a great deal of moisture from the grass underneath, when the ear is beaten down upon it by rain, which will render it very apt to sprout as soon as the sun shines upon it. I had been told how to guard against this accident, but did not try the method till the year 1756, when it answered perfectly well.

" This method consists in laying the grips in a triangular form, so that the head of one rests upon the foot of another. This operation is neither long nor fatiguing: nor does it require, in order to do it quick, anything more than a little dexterity in closing the triangle, by making the foot of the third grip support the ears of the first. The rains which fell during the harvest of 1756, rendering the getting in of that year's crops extremely troublesome, my neighbours had a great deal of sprouted corn, but mine escaped by this method; and what little I had, proceeded from that which remained unmowed when the rain became incessant.

" With regard to the sheaves, when bound, my Flemish mowers

mowers informed me, in 1753, of their practice when they are overtaken by lasting rains. It is, to heap upon one another, ends to ends, as many sheaves as they can possibly cover with one, which is then opened and laid over them. My people did not practice this method, which I believe the best; but they secured my corn by other means; which answer extremely well, and are generally known.

"From the above objection my husbandman derived another, relative to the difficulty of drying the grass and weeds intermixed with the corn, in rainy years, and the danger of housing the sheaves when full of that trash; which may ferment and be the occasion of the rotting of a whole pile of wheat. I cannot answer this objection otherwise than by experience. The harvests of 1756, and 1757, were certainly not favoured by the weather: yet all the wild growths which were cut down with, and bound up among my sheaves, were well withered when they were housed. No sort of smell which indicated the least fermentation was perceived in any of my barns; the threshers did not find any thing that looked like it: and the straw which is taken from those barns to feed my horses, attests that there was not any.

"I now come to the last objection; by so much the more serious, as it is one of those inconveniencies which I cannot remedy but to which I readily submit. The ears of the corn, says the objector, do not lie so even in your grips, as in those which are reaped with the sickle: some of them are in the middle, and others at the very bottom of the sheaf; so that your corn is not threshed so well or so regularly, and you thereby lose perhaps a considerable part of it. 2. All the grass and weeds contained in your sheaves are threshed with the wheat, and their seeds are mingled with the corn when the thresher measures it out: consequently you pay him for threshing his trash, which again increases the labour and pay of the winnower.

"All this is true: but let us discuss the matter a little more thoroughly. There are ears in the middle and at the bottom of my sheaves; but they seldom are of any other kind than those which we call backward or late ears; the weak productions of sickly plants, or of seeds not perfectly sound. Repeated examinations have convinced me, that very few others are in this case; and these ears hardly part with their grain at any time, in whatever manner they are threshed; for though the grains be torn from of them by the action of the flail, the inmost husk still adheres to the corn. These diminutive imperfect grains are so great a detriment to the fine plump, well nourished corn, that they lessen its value if not carefully separated by winnowing; after which they serve to feed poultry. If these ears escape the flail, the straw is so much the better. Our horses and other cattle reap therefrom a benefit which we ought not to grudge, because, I think it turns to our advantage.

"The threshed grass and other wild productions, do indeed yield a considerable quantity of what are commonly called bad or useless seeds, for the beating out of which I pay the thresher. But the grass which occasions this expence, saves me that of a great deal of sainfoin and lucerne which my cattle would consume; and it would be unjust in me to complain of the additional charge in the winnowing, since my manager has thought of applying those seeds to domestic purposes, such as feeding fowls, &c. which prove more profitable to me than an equal quantity of the finest corn.

"A real increase of expence, is what I pay the thresher beyond the common price of the country. This difference, which consists in two-pence or three-pence for a quarter of wheat, is but a just compensation for his extraordinary trouble in unbinding and binding up again perhaps an hundred and fifty sheaves, and sometimes more, for what an hundred sheaves generally yield, when reaped in the common way. But this expence is so amply repaid by the extraordinary quantity of straw obtained by my method, that I rate the difference at more than the value of five quarters of corn, which, to silence contradiction, I will suppose to be otherwise lost in my practice. Still my crop is cut down and housed with far less toil and expence, than if it was reaped."

"They begin ploughing in the Isle of Thanet, says a correspondent of the editors of the *Museum Rusticum*, about the first week in November, contriving so that the wheat season may be over by the end of the month.

"In the spring, if the wheat is ranks and the weather dry, they feed it down with their sheep, which they think

makes the wheat branch more, and settles the earth about the roots of the plants. Experience has convinced them, that this method of sowing wheat after trefoil, is better than sowing it on a fallow; for the land hereabout is naturally very light and hover, and the wheat on that account very much subject to be root-fallen. To prevent this, it is no uncommon thing for them, as soon as they have sown their wheat, to drive a flock of sheep over the land, to settle the earth close to the seed.

"Their crops of wheat here are generally three, four, and five quarters on an acre; which last is, indeed, a very large crop, when it is considered, that the land is in general, by nature, poor and barren, and that it is almost entirely owing to the industry and good husbandry of the farmers that it is at all brought to bear wheat: in fact, they are an assiduous people, and spare neither costs nor labour to improve their land.

"On the light land here they for the most part sow about fourteen pecks on an acre, but on the richer lands they allow four bushels.

"The farmers here never sow the seed produced by their own land; they find their wheat succeed much better by change; for which reason the seed which they sow on the light hover-land they chuse to procure from a gravel or deep cledge, or clay land, taking care that the soil on which the seed has grown should be as different as possible from that on which it is to be sown.

"Instead of making artificial steepes with great parade, they make use of that which providence has put in their way, wetting their seed with salt water, which they fetch from the sea: and they afterwards sprinkle it with lime, to prevent the smut: they are also particularly careful to clear their seed from wild oats, cockle, &c.

"I know no part of England where there are better farmers; for though they keep their lands constantly cropped without fallow, which they call sowing a round tilth, yet do they so manage matters, as to keep them still in good heart.

"They reap their wheat very high here, leaving as much straw as possible in the field: this they say they do to save barn-room. Some farmers here have a practice of sowing rye to make bands for their sheaves, the straw being longer, and as they think tougher, than that of wheat. The reaper makes the bands, which he cuts as low as he well can, and binds the sheaves.

"The wheat stubble, which, as I said before, is left very long, is generally mown for the maltsters, as they burn it in their kilns to dry their pale malts for the London market. The greatest part of this island is a light chalky soil, so that wet summers in general agree best with it; and it is by this means the farmers here get so much money: for when the crops fail in other parts of the kingdom, they are almost sure here to be very large; and they have the great convenience, besides, of water carriage to the London markets. It is extremely pleasant, towards the latter end of the summer, before harvest, to ride over this little island: I do not imagine there is a more improved spot in the kingdom; the fields are all kept so clear from weeds, that they resemble a well kept garden; they grudge no expence in hoeing, weeding, ploughing, or manuring: and experience has long ago convinced them that they pursue a right method. Their practices are many of them good and worthy imitation; it would therefore be great pity if they were not made known, by some means or other, to the rest of the kingdom." *Museum Rusticum*, vol. I. p. 3.

"It is now upwards of seven years that I have been tenant of a considerable farm in Essex; but as there are some particular circumstances attending this farm, I must beg leave to say a few words on the subject:

"The soil, which is, for the most part, a fine mellow loam, or what is in general called a good wheat soil, was in very good heart, and not impoverished; yet the last tenant broke on this farm, and the landlord lost by him near two years rent; for his crops of wheat were continually damaged by smut, let him take what care he would of the seed, and were besides often laid, and the land got very foul, though he was not sparing of his fallows:

"On the contrary, since I have occupied this land, it has borne large crops of good sound wheat, with very little smutty corn, and barley, oats, peas, beans, and other things in proportion. What will appear still more surprising is, that I do not lay on half so much dung as he did.

"It will now, perhaps, be necessary to explain this seeming paradox. At no great distance from the farm lives the landlord, who is a man of fortune, and drives a set of horses. This gentleman keeps no land in his own hands, so that he was for many years obliged to buy all the straw used for the litter of his stables, which amounted to a very considerable quantity: however, when the last tenant of this farm came into it, having been a servant in the family, he offered to supply the squire with straw for his stables, provided he might have all the dung except what the gardener had occasion for. The squire thought this a good proposal, and the farmer imagined he had the best of the bargain; so the matter was soon settled.

"Now, you are to understand, that the squire kept, besides seven coach-horses, a stable of hunters, a number of road-horses, and a pack of hounds; so that there was made on his premises, in a year, an incredible quantity of rich dung.

"The farmer imagined he was now in a fair way of making his fortune; for his father had taught him, that the man who can command dung is always sure of large crops: but this did not prove true in the present case.

"To proceed; my predecessor went on ploughing his land, got his fallows in good order, dressed them largely with dung, and always sowed them with wheat.

"His crops of this noble grain, however, by no means answered his expectations: his wheat constantly looked well and promising in the winter and the early part of the spring of the year; but as it advanced, it grew rank, and at harvest was either run all to straw, and was besides very smutty, or else, if a heavy shower of rain happened to fall, it was lodged, matted, and grew. This was indeed a very mortifying circumstance, but our farmer could find no remedy for it. He several times, without success, tried folding some sheep on his wheat; but this part of husbandry, for want of skill, he managed so badly, that he lost two entire crops, for he had scarcely the return of his seed at harvest. This could never hold long; so that in the end he was, as I said before, broke and ruined.

"This man never could be persuaded that any part of his loss was to be attributed to the dung he laid on his land, though he constantly manured it with the horse-dung before it was half rotten, and without any mixture to allay its great heat; this kept the soil in a constant state of fermentation, and stocked it with weeds, insomuch that, when I took possession of the farm, some of the soil was absolutely mouldy, and stunk again, it was so rank.

"I will now inform you of my method of management, that you may be enabled to judge how far I was benefited by the errors of my predecessor.

"I found sixty acres of fallow ready for sowing with wheat: these, as the land was rank, I sowed with the winter tare, which I knew, by experience, would choke the weeds, and abate the rankness of the soil. In some parts, where the soil was not so rank, I ploughed in the tares in order to sow wheat over them; in other parts I suffered the tares to stand for a crop, which, however, was not considerable, they ran so much to straw or haulm.

"When the tares were off, I got the land instantly in order and sowed the whole with wheat, of which I had a better and cleaner crop than had been known upon the land for upwards of seven years before: this all my neighbours acknowledged: however, it was neither clean enough, nor considerable enough, to satisfy me. Some of your readers may perhaps wonder what I did with my tares, as but few are sold at the country markets; but I must inform them, that I live within ten miles of a sea-port town, whither I sent them at various times, in order to their being carried by sea to London.

"I am to observe to you, that I continued the agreement of giving the squire straw for his dung; but I made a use of it very different from my predecessor.

"I make it a rule never to manure for wheat, or sow wheat on a fallow. I do not indeed allow many fallows on my land; and when I do, I generally sow my fallow with barley, to which I allow four or five ploughings. This commonly yields me a large return, and I have a good crop of wheat after it.

"This, however, is not my general method; for I am very fond of the hoeing husbandry, to practise which, in some degree, is the only infallible way of keeping land clean. To begin then with my method, I never lay dung alone on my land, let it be ever so rotten; but as soon as I get any long dung from the squire's, I carry it to my compost-heap, where it is mixed in alternate layers of

beds, with fresh virgin earth, (if I can get it) lime, or chalk, lime-rubbish, scorings of ditches and ponds, turf, leaves of trees, and all the dung and offal of my family, of the hog-yard, the poultry-yard, and the dog-kennel. As to my pigeons dung, I always preserve it to mix with foot, and use the mixture as a top-dressing for my wheat, whenever it happens to be too backward in the spring.

"But to return to my compost: I have always several distinct heaps of different ages, and I sometimes leave it three years before I use it, and never lay on any under two years old.

"When I have got a plot of ground in order, I give it a thorough good dressing of this compost, which I immediately plough in. I then sow it with some crop that requires hoeing; such as horse-beans, broad-beans, or white or grey peas. During the whole summer, I take care to keep these crops very clean by hoeing, especially if the season is rainy; and I am particularly cautious in preventing any of the weeds from perfecting their seeds.

"When my hoeing-crop, which generally more than pays me all my expences, is off the land, I immediately get it into as fine tilth as I possibly can, by repeated ploughings, and then sow it with either wheat or barley, whichever is likely to pay me best; for little as some of your readers may think of it, barley, when it is sown on good land well prepared, is very frequently as profitable a crop as wheat.

"By thus sowing my wheat after a hoeing-crop with dung, I have always a good return of clean corn, often five quarters on an acre; and my land will still be in heart enough to give me a reasonable crop of oats; after which, without any fallow, comes my hoeing-crop, &c.

"When I sow barley after the hoeing-crop, I suffer wheat to follow it; and then it is that, if I find it necessary, I give the wheat in the spring a top-dressing or foot mixed with pigeon's dung.

"I sometimes allow only six pecks of wheat-seed to an acre: this is when I sow over it, in the spring of the year, eighteen pounds of broad clover-seed, which I harrow in with a pair of very light harrows; and it does not in the least damage my wheat-plants. I leave the clover only two years on the land; for the second year, after I have mown the first crop for hay, I suffer the second to grow very rank, (having given my land a slight dressing from my compost dung-hill the preceding year) which I plough in, and over it sow wheat, to be harrowed in on once ploughing.

"These crops of wheat are smaller in quantity than any others I get, but the grain is finer, plumper, brighter, and heavier, generally selling for more at market, as being always very clean and clear from seeds of weeds.

"In my method of farming, some particulars are to be noted. In the first place, as my crops succeed one the other very quick, I am under a necessity of having all my stubble extirpated before I give the land the first ploughing after the crop is off. If it is a wheat or bean-stubble, I generally have it all pulled up by hand by women and children; barley and oat-stubbles I have torn up by a pair of loaded drags, and afterwards gathered into heaps and carted to the compost heap. This I do to prevent the stubble from being buried by the plough, and from growing mouldy in the land; from which mouldiness I have great reason to think smut often proceeds.

"Another thing to be noted is, that I allow less seeds to my land than most of my neighbours, my quantity being from seven to nine pecks of wheat, from nine to twelve of barley, and about twelve of oats to an acre of land; but it is always to be presumed that the seed I sow is good. If any farmer should imagine that these quantities are too small, let him suppose every wheat plant to occupy a space of six inches square, which is small enough: let him then calculate how many such spaces there are in a square acre. When he has done this, let him proceed to count how many grains of wheat there are in a pint, which multiply by the number of pints in nine pecks, and he will find by the result that I, in fact, allow too much seed." *Museum Rusticum, vol. V. p. 104.*

"I have, for some years last past, held a considerable farm in the county of Leicesters, and have, thank God, met with some success in my practice.

"My methods of farming are thought by many to have something peculiar in them; yet, as I do not often miscarry, no one has a right to find fault with me.

"Great part of my farm is very good wheat land, the soil being a substantial loam.

"I frequently

"I frequently, as well as the rest of my neighbours, make use of lime as manure; but then I use it differently from what they do.

"The common practice is, to lay about forty bushels of unslaked lime on an acre, which makes a peck on every square perch, (half a bushel when it is slaked.) On wheat land they spread the lime at the same time they sow the seed; but this is a way I do not much approve, and for this reason I vary my practice: The method I use is as follows: I sow my wheat without laying on my manure; but in the beginning of the month of February I get, for every acre of land I intend to lime, twenty bushels of that manure, unslaked, and forty bushels of sand, or the rubbish of a brick kiln.

"Towards the latter end of the month I cause the lime to be slaked, which doubles its measure, and very well mixed with the sand; immediately after which, in the last week of the month, I have it scattered by way of top-dressing over the green wheat; and as rain generally succeeds, it is soon washed down to the roots of the plants, and gives them a vigour and strength of growth that is really astonishing to a person who had never seen this method practised.

"This is my way, if I see the weather is inclinable to be wet; but if it is dry, and not likely to rain, I double the quantity of sand, in order to take away all danger of the wheat-plants being burnt, or hurt, by the strongly corrosive power of the lime.

"The above method I would willingly recommend to the attention of your readers; and though I have benefited greatly by it, yet need they not take my word, as it is so very easy to make a small trial, and form a judgment from the success they may have.

"I must observe, that I look upon it to be almost a matter of indifference what kind of sand I use, except that I prefer lime-stone sand to the crystal sand, as being most absorbent, and in truth prefer the rubbish of broken bricks to either.

"It will perhaps be unnecessary to tell your readers my motive for this preference; yet that I may not be thought obscure, I shall do it.

"When lime is slaked, it crumbles and falls into very minute particles: the smallest of these particles are, together with the moisture that adheres to them, absorbed by the large open pores of the brick rubbish, which afterwards disposes them by slow degrees to the soil on which it is laid, for the support of the crop: this occasions the operation of the lime to be more equal; the parts which were not absorbed, are first attracted by the earth; these nourish the young plants, which, in time growing stronger, have power to draw from the absorbent the particles it had reserved for their use." *Museum Rusticum*, vol. III. p. 366.

"Almost every part of this kingdom has a method of farming peculiar to itself; and this I have often found to be true, in the many journies I have made through various parts of the island.

"A short time since, my occasions calling me down into the west, I stopped for a few days in Wiltshire, where I could not help observing, that the wheat-corn was remarkably backward, though it in general promised to be a good crop.

"I thought it worth my while to ask some of the neighbouring farmers the reason of this appearance, when I was informed that most of the wheat was sown late, owing to a wet autumn, which prevented them from giving their land the necessary ploughing for that crop sooner than November, December, and even January.

"The soil is a pretty good loam, on a chalky bottom: and I found they often sow late; but whenever they do it, they take care to allow an additional quantity of seed, generally one fourth, or a third more than they use when they sow early.

"I was also told, that many benefits often resulted from such late sowing; particularly, the crop is generally clearer from weeds; for in early-sown wheat, poppies, and other noxious weeds, are very apt to get a-head, and injure the corn. I even saw in my walks many early-sown fields, which rather seemed to be under poppies than wheat, as the poppies were in full bloom, and made a glaring appearance.

"The Wiltshire farmers, the best of them I mean, often give their land four ploughings for wheat; and they find their advantage, as it is by such means brought to a fine tilth, and yields a good crop.

"Another advantage they told me they had from sowing

their wheat late, was, that in the blooming season the weather was generally fine; whereas in a wet summer, the bloom is often washed off from the forward-sown wheat.

"But it must not be imagined this method of sowing wheat late is indiscriminately pursued: in many circumstances it would be very imprudent to do it.

"This method of husbandry must, to meet with success, be chiefly practised on fallows, where the land is good, and has been well dressed.

"Every crop, and method, has dangers to encounter; and the chief danger of sowing late is, that a frost may come on just as the seed begins to sprout; but then good land, well dressed, is not so subject to this misfortune as poor, unmanured land, that has, perhaps, been not half ploughed.

"I find, from enquiry, also, that it is dangerous sowing wheat on clover lays on one ploughing only, unless it is done sooner than the middle of November; for the turf or grass-lay forms a crust immediately under the seed corn; and this not only prevents its taking a firm rooting, but also exposes it to the ravages of the field fowls, which are, at this season, particularly voracious, as having a scarcity of food; and the infant plant is, besides, liable to be killed by the frost, just as it is about sprouting and shooting out its first leaf. It stands, therefore, to reason, and is warranted by experience, that wheat should not be harrowed in on a clover lay, on one ploughing, so late after the middle of November, as the danger is great, though the loss may not always be certain." *Museum Rusticum*, vol. III. p. 1.

"As I have been many years a farmer, it is not to be wondered at that I should know something of husbandry.

"Experience, which is an excellent mistress, has, in fact, bestowed on me most of the knowledge I have acquired. I imagine, therefore, that an account of the result of this experience will not be unacceptable to your readers.

"Most farmers chuse to sow wheat on a fallow; we, in Essex, on the contrary, often, not without good reason, avoid it. Every fallow designed for wheat requires a good dressing of rotten dung, or some other manure; and this dressing, we imagine, often is the cause of a smutty crop, if laid on uncompounded; therefore, whenever I sow my wheat on a fallow, instead of laying on my muck-heap unmixed, I make it into a compost in the preceding spring: this compost consists, according to the nature of the soil it is to be laid on, either of chalk, light earth, and rotten dung, or of lime, clay, and dung, laid in a heap, in alternate layers, or beds.

"This compost-heap I cause to be frequently turned during the course of the summer, till it is thoroughly mixed, and forms one united mass of manure, rather crumbly than otherwise.

"With this manure I dress my fallows in the same manner farmers lay on their rotten dung alone; and I find, by experience, it is less apt to heat and canker the wheat-seed, and it is also much less inclined to mould and burn the seed.

"This, I say, is my method of management when I sow my fallows with wheat as a first crop; but I more generally approve of making wheat the second crop after barley, oats, beans, or peas.

"I am sensible many of your readers will be surprised at this method, and exclaim, that it is impossible to get a good crop of wheat but after a good fallow; yet I know the contrary: it is from experience I know it; may I not therefore venture to assert it?

"When I intend to sow wheat as a second crop, I lay my due quantity of compost on the land some time before I sow it with barley, oats, beans, or peas.

"When this crop is off, the following year I sow wheat. You may suppose the land to be duly prepared by well-timed and careful ploughings; but I am to premise, that after beans and peas, being hoeing crops, the land is much sooner brought into good tilth, than after oats or barley.

"The wheat sowed the second year of the fallow is, with me, generally a good crop, and almost always clear from smut and pepper-wheat.

"If, by any accident, the wheat should be sickly, or pining, after Christmas, I bestow on it a top-dressing of wood-ashes, soot, if I can get it, or coal-ashes, if the soil happens to be strong: this seldom fails answering my expectation; checking the growth of the weeds, and forwarding that of the corn.

"It is very frequently that I sow wheat in this manner

for a second crop; but when I have an opportunity of chusing, which I cannot always do, as I must suit my crop to my wants; I prefer, for the first crop, beans or peas, either of which I take to do the land nearly as much good as a fallow.

"Neither peas nor beans are, in my opinion, great impoverishers; and the frequent hoeing which they both require, if they are properly cultivated during their growth, brings the land into finer order than the best regulated course of husbandry with the common implements could effect.

"Wheat succeeds particularly well after either of these two last-mentioned crops; and I have found, by experience, that if peas or beans are made intermediate crops, and are well and properly hoed during their growth, land of a moderate quality may, without being impoverished or hurt, be made to bear a continued succession of crops for many years; but it must be understood that it should, from time to time, be refreshed with proper dressings of well-prepared compost.

"I know many farmers think there is no such thing as carrying on a course of husbandry without allowing, once in three or four years, a year of fallow; but such are little acquainted with the benefit resulting from hoeing crops: and it is this benefit that has of late induced farmers to sow such immense quantities of turneps in the counties of Norfolk, Suffolk, Essex, and other counties adjacent.

"Many of the advocates for intermediate fallows think that the earth requires rest; but this is a great mistake; for I could easily make it appear that, with a proper method of husbandry, land might be almost continually cropped, without being impoverished or worn out.

The real benefit accruing from frequent fallows is, that they allow the husbandman time and opportunity to bring, by good tillage, his land into proper order for the reception of the seed; but in the method of husbandry I would recommend, the land would always be kept, by frequent stirring, in such good tilth, that the time betwixt gathering the crops, and sowing the next succeeding seed, would be abundantly sufficient for any preparation it might require; for it is a well known fact among husbandmen, that when land is well tilled, and kept in good order, one ploughing will go much further than three where the land has been neglected, is rough, and grown hard and cloddy, through inattention or laziness." *Museum Rusticum*, vol. III. p. 3.

"A wet harvest, says an old husbandman, is what a farmer dreads more than almost any thing, as it hurts the quality of his corn, increases his expences, and greatly lessens his profits.

"So much depends on the well getting-in of our bread-corn, that every man, who knows any thing, that can forward so good a purpose, is, I think, in duty bound to communicate it for the benefit of the public.

"It is a well-known maxim that wheat should be left for some days in the field, after it is cut, before it is inched: this, the farmers think, and not without reason, improves its quality; the dews plump the kernels, and the sun brings it to a proper and perfect state of maturity.

"These then are the benefits that result from leaving the sheaves some time abroad; but it is necessary the weather should be fine, or great losses are often the consequence of this practice.

"Sometimes, when the farmer least expects it, the weather sets in foul, and it rains for several weeks successively: it is then very difficult to preserve the wheat from being greatly damaged, notwithstanding the many contrivances that have been thought of for this purpose.

"Some shock their sheaves, setting them up in thraves of six sheaves of a side and two to cap them; but this is a very dangerous method, and never to be practised after much rain has fallen: if the sheaves were dry when the thraves were set up, from an expectation of its raining, it is of great service; but if the sheaves are first suffered to be wet, ten to one but the corn sweats, sprouts, and rots, by being so close confined from the action of the air.

"After all, I am apt to think that it is full as well not to cap the shocks; for if the rain is not very heavy and constant indeed, the ears, provided they do not touch the ground, will dry nearly as fast as they are wetted.

"In Middlesex, Kent, and some parts of Essex, they generally bind their wheat as they reap; but then it must be supposed that their crops are, for the most part, pretty clear from green weeds, which would otherwise cause the sheaves to sweat violently in the mow, and greatly damage the corn.

"When a farmer is so unfortunate as to have his wheat sheaves thoroughly wetted, if fine weather ensues, I would by all means advise him to unbind them, and afterwards spread them out to be dried by the sun. This simple method will often prevent great losses, and the wheat may at last be got in, in tolerable good order.

"If the rain, however, should continue long, and there should be danger of the kernels growing, which by observation he may easily judge of, I would advise the thinking farmer instantly to carry it home, wet as it is, and afterwards manage it as I shall direct from my own frequent experience.

"When the waggon, or cart, comes home loaded with sheaves, let them be thrown promiscuously into the bay of the barn, and not regularly moved; for it is necessary they should lie hollow, that the air may get into the vacuities, and prevent the sheaves from heating during the little time they are to continue in the situation above described.

"Let our farmer next prepare some cutting-boxes, such as horse meat is cut in, in Kent, and some other counties. The number of these boxes should be according to the quantity of wheat he has wet; but three or four constantly kept going will do a great deal of work.

"With these cutters, let the ears be cut off from the wet sheaves; and when a sufficient quantity is collected from all the boxes, let them be put loosely up in sacks, and carried to a malt-kiln, there to be regularly and gradually dried; and when the first parcel is done, another is to succeed, and so on till the whole work is completed.

"This method I can from my own experience recommend to your readers; and it is less expence than would at first thought be imagined. The heat of the kiln may be kept up higher than when malt is drying, as the chaff of the ear will prevent the kernel of the wheat from being damaged by the fire, unless the heat is very intense indeed: but it will, however, be proper to keep the ears gently stirred with a fork, or rake, during the time they are drying.

"In this management the farmer will find great advantages; and his wheat will, with a very inconsiderable additional expence, be nearly, and sometimes quite as good in a wet harvest, as if it was housed in ever so good order, in fine sun-shining weather.

"If, by chance, after you have cut off the ears from the sheaves, the weather should change and become fine, you may often dry them without the assistance of the kiln, by spreading them thin on a large threshing-cloth, and turning them frequently with a wooden rake; and even, if by this method you should not entirely dry them, it will still bring them so forward that the kiln will easily complete the cure.

"I must, however, before I conclude, caution the farmer not to suffer the kiln to be much heated, unless the ears are kept constantly stirring during the time they are drying." *Museum Rusticum*, vol. II. p. 106.

"Give me leave, says a practical farmer in Warwickshire, to mention to you a practice which, however, I do not absolutely recommend, though with me it succeeded, and, as I have been informed, has done so with several other farmers who have ventured to make the experiment.

"A few years ago, after what I thought a good fallow, I sowed a field containing five acres, with wheat. The soil was a good loam, but rather light than stiff, and inclined to be stony. The wheat-plants looked healthy during the whole winter and promised fair to yield me a plentiful crop; but in the spring, warm rains coming on, brought such store of weeds, that my wheat was in danger of being choked.

"I was for some time puzzled what to do; for it being now the latter end of May, and the wheat being on the spindle, and some even in the ear, to weed it with hooks would have been endless, not to mention the damage that would have been done to the plants by the weeders feet.

"I had at one time thoughts of mowing wheat and weeds all together, and drying them to make fodder for my cattle: intending, if I had done this, to have got the land as fast as possible in order, and sown it again with wheat the succeeding autumn.

"However, in looking over the field, I found no great deficiency of wheat plants; but they were in most places so over-topped by the weeds, as to be scarcely visible, and in the furrows, in particular, not a blade of wheat was to be seen.

" My method of ploughing for wheat seed in this land is, to make narrow fitches, but wider than a ridge, and more rounding, being not so sharp on the back.

" Whilst I was meditating what to do in this matter, a gap was by some accident made in the hedge, and a parcel of my sheep got into the wheat field.

" As soon as I saw where they were, apprehending great damage, I ordered them to be immediately driven out, and the gap mended.

" On taking a survey, I was not a little surprised to find that the sheep, instead of doing any damage to the wheat, had done it great deal of good, for they had eat up almost every weed which grew in that part of the field next to the pasture.

" Encouraged by this accidental discovery of a propensity in sheep to eat weeds rather than wheat, I turned a hundred of my flock into the field, two or three hours in the morning and the evening, for several days together, till all the weeds were nearly consumed.

" On inspecting my field afterwards, I found the sheep had done very inconsiderable damage to the wheat, but the weeds were eat down so close that they could never again get a-head; the wheat going on prosperously, and yielding me at harvest a plentiful crop of clean, good corn, which was more than any of my neighbours could that year boast of.

" Whilst the sheep were eating the weeds, I found they mostly walked in the furrows, as being easier to their tread than the sloping sides of the narrow fitches; and this might be one reason of their doing the wheat so little damage by their treading.

" In this new method of husbandry I took, however, one precaution, which I am apt to think greatly contributed to my success.

" The precaution I mean is, that I never let them lie in the field at night, as the weight of their bodies when they lay down to sleep could not have failed doing great damage to the plants." *Museum Rusticum*, vol. III. p. 31.

" Permit me, says another experienced farmer, to communicate to your readers, for their benefit, I hope, a little of the experience I have in many years acquired.

" Being now grown old, and retired to spend the remainder of my days in this city, I trouble myself but little about the practical part of farming; yet did I some years ago occupy a considerable tract of ground in Norfolk.

" I shall, for this time, confine myself to the propriety and impropriety of feeding wheat down with sheep in the spring; a practice which has by many been hitherto but little understood.

" This practice, when prudently adopted, is replete with many and great advantages; but if indiscriminately adopted, nothing would sooner ruin a farmer.

" The advantages to be derived from it are, that it affords feed for your wethers and ewes after the turneps are consumed, and before the spring feed comes in; it causes the wheat to tiller and branch more than it would otherwise have done, and of course produce a larger and better crop; it brings, by the rich manure it affords the land, the crop forward, and makes it heavier in the scale, as well as plumper in the bushel.

" The disadvantages attending this practice are, that, in certain circumstances, it checks the growth of the corn, and makes the second shoot diminutive and small; of course the ears are lean and poor, and the crop in proportion. It gives the weeds an opportunity of getting a-head, and ruining the crop, to the farmer's great loss and disappointment.

" I shall, to be better understood, relate some cases which happened to myself, as I find them noted in my journal, for I always kept one.

" In the year 1742, I had ten acres of wheat, which after Christmas, seemed proud. The soil was a loose loam, and I had, when I fallowed, laid on plenty of dung.

" I turned into this field a parcel of sheep on the twenty-second of January, in order to feed it down, which they did; but the weather coming in milder than I expected, the weeds which had been brought in with the dung, got such a head, that I was above twenty pounds loser by feeding it.

" In 1744, I fed, very indiscreetly indeed, another piece of wheat of fifteen acres. The land was poor, and had not been well dressed, so that about the 10th of March, the

wheat plant stood very thin. I turned in some sheep, thinking it would afterwards branch more, and produce a better crop; but I was disappointed, for the sheep bit off the knot of the plant, and I had, I think, the worst crop I ever reaped.

" The next year, 1745, I had another thin crop of wheat on much the same land as the last: I turned in some sheep the 6th of February, before the knot was above the ground within reach, and it succeeded; for, as I gave it a good top-dressing within a fortnight, it tillered and branched so well, as to produce a much better crop than I expected.

" I could relate to you many other circumstances of this nature, but it would take up too much room; I shall therefore proceed to make some observations on my general experience in this matter.

" I find wheat should never have any sheep turned on it, unless it is forward in January, and likely to be lodged at harvest, except now and then, with great precaution, when you want to thicken a crop.

" Such wheat only should be fed down as was as early sown: and I hold it a bad practice if the land is rich with dung.

" Wheat should not be fed down, unless the land is pretty clear of weeds, and has strength and substance enough to afford the wheat nourishment in plenty, that it may get in-to ear at the proper season, notwithstanding the growth was so checked.

" There is in every plant of wheat a certain knot, or crown of the root, as I call it, from which all the branches issue; now if this crown is nipped off by the sheep, a dwindled production is the certain consequence; for this reason, sheep should never, (unless it is in a very backward season, and then it will not be prudent to feed wheat down at all); I say sheep should never be turned on it after the middle of February: the best time in general, is the latter end of January, or even the middle of that month.

" If seasonable rains follow, provided the ground is clear of weeds, it will be greatly to the advantage of the farmer.

" If the farmer has the least doubt of the strength of his land, towards giving the checked plant nourishment, I would by all means have him afford his wheat a top-dressing of foot, ashes, malt-dust, or whatever other proper manure he may have at hand, provided he is sure it is quite clear of weeds.

" Let not the industrious farmer be at all uneasy if, after feeding down his wheat, he perceives the plants stand at a distance one from the other; for if he has practised this piece of husbandry, with the precautions above noted, he may depend upon it, that every plant will throw out a number of branches, and that he will have a field full of stalks at harvest, and a crop that will surprise him.

" I am very fond of recommending wheat crops to the farmer's attention, not only because it is the most noble of grains, but also because, if well managed, it is the most profitable.

" We must not always judge the farmer's profits by the produce of his land; which some of our readers may think odd; but I will make it appear by an example from my own practice.

" In the year 1743, I had two fields of twenty acres each, in wheat; one of which yielded me, at harvest, at the rate of four quarters an acre throughout; the other yielded me only twenty bushels, one acre with another; yet I got more by the last than the first. The case was thus; falling short of dung, I was obliged to buy; but it was so dear, that I only bought enough for the first field, giving the other two ploughings extraordinary, instead of manuring it; and these ploughings I reckon at a mere trifle, as my horses would otherwise have stood still." *Museum Rusticum*, vol. III. p. 151.

" I have often thought that it would be of great service to the public, if, by any method there could be determined a mean weight for any given quantity of corn, and likewise what number of grains, upon an average, ought to be contained in each ear, and the proportional weight between the ear, with the grains in it, and when taken out; and likewise the proportional difference between the weight of the whole stalk, including the ear and the grain.

" But in order to settle this medium, under our present consideration, it will be absolutely necessary, in the first place, to make accurate and impartial experiments for a number of years, and then, by comparing the produce and

and the weight, &c. of the whole, both separately and together, we may come pretty near the mark in view:

"In order therefore to pursue the plan I had laid down, in the beginning of the harvest of the year 1757, I got three acres of common red Lammas wheat out of ——— field, August 26th. I then cut of the stalk close to the ear, which I weighed with the corn in it: I then weighed the grains when rubbed out of the ear, and cleared from the chaff: in the next place I compared the difference, and then counted the number of grains in each ear respectively; and at the end of every year set down the weight of a cubical inch of the product of that harvest.

"But in order to give a clearer idea of my method of proceeding, I will set down the weight, &c. of the corn which was gathered from the first field, in columns, in the manner I entered it in a book kept for that purpose, which will be sufficient to explain the whole without a multiplicity of figures.

Numbers of ears, when and where got.	Weight of the ear with the corn in it.	Weight of the grain when free from the chaff.	Difference.	No. of grains in each ear.
1757.	3 3 gr.	3 3 gr.	3 3 gr.	
Three ears got in ——— field,	1 0 1 5 0 0 19	5 0 0 19	5 0 0 5 5	28
August 26.	2 0 1 2 0 0 17	5 0 0 17	5 0 0 4 5	27
	3 0 1 7 0 1 1	0 0 6		36
Total.	1 0 14 0 2 18	0 0 16		91

"I proceeded in the same method with each of the three ears taken out of fourteen other different fields, during the time of the same harvest; then casting up the sum total of each column, and dividing their products by the number of ears gathered that season, the quotient would give me the mean weight, &c. of an ear of that harvest, and its number of grains, &c. &c.

"I then made a cubical vessel containing exactly a square inch; and having mixed all the corn together, I filled the above vessel, and weighed its contents with the greatest accuracy; which weight I set down, repeating the operation seven or eight times, having well mixed the little heap of corn together, after each trial, and then set down the weight of each as before: and as there would sometimes be the difference of a grain or two more or less in each cubical inch, I divided the product of the whole by the number of times the experiment was made, and set down the quotient as the mean weight of a cubical inch of corn for that year, which in 1757 I found to be 3 dr. 12.3 gr. I have persevered in this method every year since: but to avoid troubling you with the particulars of each, I will give you at one view the mean weight, &c. the number of grains in an ear, and the weight of a cubical inch for each of these last seven years past, and after that the medium of all taken together.

"I made use of apothecaries weights, upon account of the smaller subdivisions of the ounce into drachms, scruples, and grains, which I have afterwards, in reckoning up the weight of the bushel, reduced to troy, and averdupois. But we will now give the result of the seven years experiments in the following columns."

A. D.	Mean weight of each ear with the corn in it.	Mean wt. of the grains alone.	Difference.	No. of grains.	Mean weight of a cubical inch.
	3 3 gr.	3 3 gr.	3 3 gr.		3 3 gr.
1757	0 1 10 5	0 1 5	0 0 5 5	38	3 0 12 3
1758	0 1 5	0 1 0 5	0 0 4 5	30 4	3 0 13 3
1759	0 1 8 2	0 1 2 4	0 0 5 8	37 6	3 0 14 5
1760	0 1 14	0 1 4 4	0 0 9 6	36 8	3 1 4 3
1761	0 1 9 5	0 1 4 5	0 0 5	36 6	3 1 4 3
1762	0 1 17 4	0 1 8 3	0 0 9 1	36 5	3 0 16 5
1763	0 1 10 1	0 1 3 3	0 0 6 8	35 5	3 0 17
Total	3 1 14 7	2 2 8 4	0 2 6 4	251 4	23 0 2 2
Mean wt.	0 1 10 67	0 1 4 5	0 0 6 62	35 9	3 0 17 457

The total divided by seven gives the mean weight, &c. &c. of the whole together, as in the preceding line.

"The first of the above columns (the date of the year not being reckoned) shews us, at one view, what we may

expect a single ear of Lammas wheat, separated from the stalk, to weigh upon an average; and the second what its produce in grain should weigh when separated from the chaff: the next division gives the difference, being the weight of the ear and chaff alone without the grain; the fourth, the number of grains in each ear; and the last, the weight of a cubical inch; which latter we shall further consider, and see what will be the mean weight of a bushel, omitting the odd grains and decimal parts, as immaterial in so large a measure.

"As the standard Winchester bushel contains 2150.4 cubical inches, if the above weight of one, viz. 3 3 17.457 gr. be multiplied by that sum, the product will be 73lb. 8 oz. 12 dwt. troy. But this standard bushel is in fact too small, the real contents of a bushel dry measure being 2178 cubical inches, which, according to that calculation, will give 74lb. 7 oz. 19 dwt. which sums reduced to averdupois weight will stand as follows:

Troy { 73 8 12 } equal to { 60 10 8 6 } averdupois.
 { 74 7 19 } { 61 6 15 9 }

"But it will be proper to take notice that none of this corn was weighed till thoroughly dry, and seldom till the harvest after it was got, and sometimes later; therefore there must be some allowance made for the loss of weight by keeping: which I found upon trial to be about four grains yearly in a cubical inch, and considerably more the first year, especially if the corn happened to be got in a wet harvest: therefore I think we may fairly estimate the mean weight of a bushel of wheat, containing 2178 inches, to be about 62 lb. avoirdupois weight.

"I know that a bushel of good wheat is, by the generality of writers upon agriculture, calculated at about 64 lb.; but our present enquiry is not whether it is good or bad, light or heavy of its kind; but what is the medium betwixt the two extremes, in order the better to judge of its qualities, according as it falls short of, or exceeds, that determined weight.

"The fields out of which the corn was gathered for the above experiments, are mostly situated within a circle of ten or twelve miles round the town of Warwick, and some of them in Northamptonshire; and in soils of different kinds, and such as have been productive of good, bad, and indifferent crops.

"With regard to the observations, which I now offer to the public, they may be assured that they have been made with the greatest accuracy, and, barring any errors in the calculations, without the least deviation from the truth.

"My method of gathering the ears of corn was, to crop them standing during the time of harvest, always endeavouring, as near as I could guess, to take such as were of a middling growth, avoiding the fullest ears, as well as those which were shrivelled or flinted. I therefore generally got them from about the middle space between the ridge and the furrow; I then carefully wrapt up the produce of each field in separate papers, to prevent the corn from shedding, or intermixing.

"The column which shews the difference between the weight of the ear with the corn in it, and that of the grains alone, is meant only as relative to the ear itself, without the stalk added to it, which latter was always separated from it. But I have since made some few experiments with regard to the proportional weight between the whole stalk and ear, and its produce in grain; and I found the former to be to the latter as about sixty-seven to seventy-two. But I cannot depend so much upon the justness of this calculation as of the others, it being only tried upon the produce of one harvest.

"It must be observed that the weight of corn will vary more or less by keeping, according to the nature of the grain itself, the seasons that it has had for its growth and maturity, and the dryness or moisture of it when reaped: for notwithstanding, it was before observed, that there may be an annual loss of about four grains in every cubical inch upon an average, yet it may so happen that the weight of it may even be increased by keeping, as was really the case with regard to the corn which was got in the harvest of the year 1762, after an excessive dry summer; for I found, upon weighing a cubical inch of the same corn, a year after the first trial, that it had actually increased in weight 2.6 grains, which I can by no means account for, but upon a supposition that the corn contained

ed in the ear, having been so thoroughly dried, whilst standing by the preceding heats and great drought, there was no room for any further evaporation of aqueous particles; but that, on the contrary, being laid up in this extreme state of dryness, it must even imbibe moisture afterwards, from the coolness of the place where it was reposit- ed; by which means the grain would become more plump than when fresh gathered, and would consequently increase in weight. From hence the reason is very obvious, why corn that is thoroughly ripe, and well inned, will under- go a much less change by keeping, than that which has been plumped up by preceding rains, though perhaps it may be laid down as a rule, that the more the external coat of the grain is extended by redundant moisture from within, the more will it appear shrivelled and wrinkled, whenever that moisture is evaporated, which it must lose upon being kept for any considerable time in a dry place: therefore it will be most to the advantage of the owner to have such corn spent as soon as it is sufficiently dry for common use, and not to hoard it too long in the granary, as the heap from the above mentioned cause will be daily decreasing.

"If further experiments of this kind were to be tried in other parts of this kingdom, and even in different cli- mates; and if the result of each observation was to be compared with the others, we might probably come still nearer to the medium which we have been aiming at; and the same trials might be made with any sort of grain." *Museum Rusticum, vol. II. p. 175.*

"The experiments made by the above ingenious gen- tleman are very accurate, though, in my opinion, much too small to determine matters of such importance: but he has, I think, fallen into a mistake that I also did in trying some experiments upon wheat, viz. in supposing that a middling ear is a standard for computing the crop. This, indeed would be the right rule, provided there was a regu- lar gradation in the ears above and below the middle size: but, in fact, it is otherwise; there are generally more small ears than large ones, and yet the corn in the large ears may weigh most.

"To explain this, let us suppose a person going to choose some middling ears as they stand in the field: he must do this either guessing by his eye, or by measuring some of the different sizes, and taking those of the middle size as near as he can. The sizes can only be determined by their length and fullness: and if, for example, the longest are five inches, and the shortest one, the medium is three inches. Now, though those of three inches are undoubt- edly the middle size, yet, unless the weight and measure of the corn in the ears below three inches are equal to that of the ears above that size, the calculation of the crop from the three-inch ears will be wrong. This will be seen in the following tables.

"I once took an account of great part of a sheaf of red Lammas-wheat; but having mislaid my notes of it, I shall at present take notice chiefly of an experiment made upon white Lammas wheat, of the crop of 1762. The ears and straw of this crop were in general very short; but the corn was remarkably fine, full, and heavy. The wheat of this experiment was raised upon clover lay, and the crop about twenty bushels upon an acre. A nine gal- lon bushel of this wheat weighed above seventy pounds averdupoise, which is usually reckoned the full weight of good wheat, though some will weigh more, as the best generally did that year.

"In February 1763, I took some of this corn out of a middling sheaf, and, as near as I could, of the middle- sized corn: but it was taken out all together, and with- out separating of it. I sorted what was thus taken out, into four parcels, nearly according to the length of the straw, in order to discover the proportion between the ears and straw of different lengths; but there seems to be little certainty in this.

"These four parcels were weighed separately, ears and straw together; then the ears by themselves; and, last of all, the corn when separated from the chaff.

I weighed twenty of the first parcel by themselves that had the longest straw, and longest and fullest ears: and afterwards weighed them singly, taking the weight and measure of each, as in the table.

"Being desirous to know the weight and produce of the ears of different lengths, I sorted each parcel according to the length of the ears, differing one from another about half an inch; and I weighed these subdivisions separately, noting the length of the ears, and the number of chests and grains in each. The length of the ears was measured from the bottom of the lowest chest that had any corn in it, to the top of the ear. The longest ear was three inches and a half, but there being only one of that length, it is included among those of three inches and a quarter. The twenty ears first weighed are included in the sixty-three large ears in this last weighing.

"Several ears have some very small grains in them: these are set down in the table, but not reckoned in the weight, because I supposed them not marketable, and that they would go to the tailing, or off-fall corn. Of these small grains two thousand one hundred and eighty-seven weighed an ounce averdupoise. The rest were weighed by troy weight, as below.

The weight of the four parcels.

		oz.	dw.	gr.
250 of the longest (the straw 28 to 36 inch)		18	18	4
500 of the second size	24 to 32	26	17	10
550 of the third	20 to 26	11	7	30
250 of the fourth	16 to 22	5	4	18
1250 ears with the straw		62	8	10

Twenty with the longest straw, and longest fullest ears, weighed singly.

	Inches.	Chests.	Gr.		oz.	dw.	gr.
1 ear	3 $\frac{1}{2}$	20	40	The corn in these twenty ears wd.	1	2	12
1 do.	3 $\frac{1}{4}$	18	41				
1 do.	3 $\frac{1}{4}$	17	39				
1 do.	3 $\frac{1}{4}$	17	35				
1 do.	3	16	34				
1 do.	3	17	35	The chaff	0	5	15
1 do.	3	17	35				
1 do.	3	16	34	The straw	1	0	21
3 do. each 3	3	17	101				
10 do. each 2 $\frac{1}{4}$	15 to 17	325		The ears and straw	2	9	0
20 ears							

333.684 = 34.2 grains in each ear upon a medium.

"In the first of the following tables are inserted the assortments of the four parcels, by the length of the ears, with the number of chests and grains in each, and the se- parate weight of the ears, grain, and chaff. I must ob- serve, that by accident I missed taking the distinct weight of the two hundred and fifty smallest ears: they are set down in the table as I computed them, in proportion to the third, or preceding parcel, which may differ a little from the real weight; but this cannot be much, for the weight of the whole parcel is right.

"In the second table, the length, weight, &c. of the twenty largest ears, are set down in the first line: in the second line are the sixty-three large ears, including these twenty: and the third line contains the two hundred and eighty-eight smallest ears. They are set thus together to give the more easy comparative view of them. The next three lines of this table shew the weight, &c. of all the middle-sized ears, and of all those above and below the middle-size, brought thus together also by way of compa- rison. To these I have added, in the following columns, a calculation of the number of chests in each assortment of ears, and the mean number of grains in each chest; also, the number of grains, and weight of a mean ear, of each assortment.

"The last table shews the total weight of the corn, chaff, and straw, upon an acre, agreeable to this experiment, reckoning the crop at twenty bushels of nine gallons, or seventy pounds, averdupoise per bushel.

"The very small grains are not reckoned here, for the above reasons; and that the waste, in reaping, carrying, threshing, and some left in the straw, is more than they amount to. But by adding them, and allowing for about seven or eight inches long of stubble, the total weight of the crop may be nearly estimated.

A table of the length, weight, &c. of one thousand two hundred and fifty ears, sorted according to their length.

Ears. No.	Length. Inches.	Chefts. No.	Grains. G. Sm. do.	Wt. of Fars. Oz. Dw. Gr.	Wt. of Grain. Oz. Dwt. Gr.	Wt. of Chaff. Oz. Dw. Gr.	Wt. of Straw. Oz. Dw. Gr.	Total Weight. Oz. Dw. Gr.
20	2 $\frac{3}{4}$ to 3 $\frac{1}{4}$	15 to 20	684	1 8 3	1 2 12	0 5 15	1 0 21	2 9 0
7	2 $\frac{1}{4}$ to 3 $\frac{1}{4}$	16 18	215 11	0 8 3	0 6 9	0 1 18	} 7 11 16	
11	2 $\frac{3}{4}$	15 16	300 11	0 11 21	0 9 5	0 2 16		
80	2 $\frac{1}{4}$	14 15	1930 60	3 13 10	2 17 13	0 15 21		
85	2	11 14	1600 110	2 18 18	2 5 6	0 13 12		
47	1 $\frac{3}{4}$	9 12	738 31	1 5 8	0 19 18	0 5 14		16 9 4
250			5467 223	10 5 15	8 0 15	2 5 0	8 12 13	18 18 4
8	3	17 18	265 4	0 10 12	0 8 8	0 2 4		
17	2 $\frac{3}{4}$	14 16	443 29	0 17 9	0 13 4	0 4 5		
108	2 $\frac{1}{4}$ 2 $\frac{1}{2}$	14 15	2405 70	4 4 9	3 8 13	0 15 20		
164	2	11 14	2925 145	5 2 14	4 0 0	1 2 14		
203	1 $\frac{3}{4}$ 1 $\frac{1}{2}$	9 11	2727 121	4 10 0	3 10 0	1 0 0		
500			8765 369	15 4 20	12 0 1	3 4 19	11 12 20	26 17 16
40	2 $\frac{1}{4}$ to 2 $\frac{1}{2}$	13 16	827 50	1 10 12	1 3 13	0 7 0		
65	2	10 13	1075 70	1 15 15	1 7 14	0 8 0		
107	1 $\frac{1}{2}$	8 10	1350 45	2 1 33	1 12 17	0 8 20		
38	1	6 7	293 5	0 8 19	0 6 19	0 2 0		
250			3545 170	5 16 11	4 10 15	1 5 20	5 11 9	11 7 20
250	$\frac{3}{4}$ 3 $\frac{1}{4}$		1622 78	2 13 13	2 1 16	0 11 21	2 11 5	5 4 18
1250			19399 840	34 0 11	26 12 23	7 7 12	28 7 23	62 8 18

A comparative view of the above one thousand two hundred and fifty ears of wheat.

	Ears. No.	Length. Inches.	Grains No.	Wt. of Grains. Oz. Dw. Gr.	Chefts. No.	Grains per Cheft.	Grains in a mean Ear.	Weight of a mean Ear.	
Largest	20	2 $\frac{3}{4}$ to 3 $\frac{1}{4}$	684	1 2 12	333	2.054	34.2	27.990	} Grains. Troy.
Large	63	2 $\frac{3}{4}$ 3 $\frac{1}{4}$	1907	2 19 14	1012	1.884	30.269	22.696	
Smallest	288	0 $\frac{3}{4}$ 1 $\frac{1}{4}$	1914	2 8 10	2016	0.949	6.645	4.034	
Large	291	2 $\frac{1}{4}$ 3 $\frac{1}{4}$	7069	10 9 5	4318	1.675	24.292	17.288	
Medium	314	0 2	5600	7 12 20	3849	1.454	17.834	11.681	
Small	645	0 $\frac{3}{4}$ 1 $\frac{1}{4}$	6729	8 10 21	6199	1.085	10.432	6.358	
Total	1250	0 $\frac{3}{4}$ 3 $\frac{1}{4}$	19399	26 12 23	14366	1.35	15.519	10.232	

Total weight of the crop upon an acre, agreeable to the above specimen, reckoning the same as twenty bushels, of nine gallons, or seventy pounds per bushel.

Wheat.	Chaff.	Straw.	Total Produce.
C. q. lb.	C. q. lb.	C. q. lb.	C. q. lb.
12 2 0	3 1 23	13 1 7	29 1 2

"Small experiments are not so satisfactory as large ones; and I could wish this had been more extensive, but I had no thoughts of offering it to the public view till I read your correspondent's letter, who has, I apprehend, gone upon a wrong rule in computing a crop, and has also chosen the mean ears too large: for though the ears of red Lammas wheat are usually longer than the white, it cannot be supposed that, upon an average, they are above double, both in weight and number of grains, as we find those were to the mean ears of this experiment. Neither is it at all probable, that the mean ears of the common crops in any part of England, and in the same year, should be heavier, and contain more grains in them than the very largest ears of this experiment.

"The ears of this wheat being from three and a quarter to three quarters of an inch in length, the medium is two inches. I have ranged all these together in the second table. They are a fair medium in regard to length; and they are so also as to the fulness, because they are all included: but, as appears in the table, they are not so in respect to the weight of the grain, which is the rule for the medium of the crop; for the small ears are more than double the number of the large ones, and yet the large ears are the heaviest. If, in order to make the number of ears equal, we choose the mean ears shorter than two inches, the inequality of weight will be greater than before; and if we take our medium higher than two inches, the weight may be made equal, but this will increase the disproportion in the number: and hence I think it is evident, that we cannot fix upon any size of ears that will

give us a just medium of the crop. The same will happen in other crops, for they all vary one from another in the size and number of ears: and, as we cannot be certain of their real proportion as they stand in the field, it is impracticable to calculate a crop from those of any size.

"The calculation of a crop from a mean ear is made by multiplying the weight of grain in that ear by the number of ears upon an acre. A mean ear of this experiment weighed, as in the table, 10.232 grains troy, and the crop was about twenty bushels upon an acre. Your correspondent reckons the weight of the mean ear at 24.05 grains troy, upon an average of seven years; so that, reckoning the same number of ears upon an acre as in this experiment, his crops will amount annually to forty-seven bushels per acre, of seventy pounds, averdupoise, per bushel. These are such crops, as I suppose, no considerable extent of contiguous lands in England produce annually; and are, doubtless, more than double the common crops upon an average.

"The disproportion in the number of small and large ears is very remarkable, and also their disproportion in size: for, if we calculate from the twenty largest, we shall find that forty-three of them weighed as much as all the two hundred and eighty-eight small ones, viz. one large ear produced as much corn as seven small ones, and the grain in them also larger, and consequently more flour in them: for one hundred of the large ears weighed seventy-eight grains troy, and one hundred of the small but sixty grains; so that four grains of the large ears were heavier

heavier than five of the small. This great difference is not from any defect in the rudiments of these small ears, but is occasioned principally from bad culture, and a defective nourishment; because we see that the plants raised from the same seed will have larger or smaller ears, according as they are cultivated. It might, however, be useful to know at what period of their growth those small ears are stunted, and whether they are produced from the original plant, or from the tillers. I am not furnished with experiments to determine these points, but recommend them to the enquiry of your readers.

"It is certain that the ears of wheat, in general, do not arrive to the size that they are naturally capable of: and if it was known at what period they are formed, the stunting of them might, in some degree, be prevented by a dressing, or other culture, at that period. That there is some such period in nature may appear from other circumstances in the growth of this plant. There is a particular season for its tillering, or spreading; another for its upright growth; and one for its blossoming and forming the seed; and probably one also for the ear being formed: and the growth of it, in respect to each of these, may be promoted by culture, or retarded by a defect of nourishment, at these periods.

"When the season of tillering is past, no culture will make this plant throw out more branches; and after the ear is shot out, it is then impracticable to make it larger, viz. to increase the number of chests. Again, when it has blossomed, no art will cause the stem to rise higher. And, last of all, after the time of blossoming, there is no adding of one grain more than is already formed in the ear; though, in all these cases, an addition, or improvement, may be made by culture, if applied at the proper time.

"It is therefore of importance to know the periods of growth of the different parts of the plant, and that if we happen to miss assisting of it in one, we may improve it in another. If the season is lost to increase the number of tillers, we may enlarge the ears: or if that is also omitted, we may increase the number of grains in the ears, and make them larger and fuller of flour.

"To shew this more plainly, with respect to the grain, let us a little consider the structure of an ear of wheat. The grain is placed in a cell, consisting of two valves or leaves; and there is one leaf extraordinary on each outside of the chests, which seems intended as a fence or security against accidents to the outward grains. The chests about the middle of the ear are the largest, and usually consists of four, five, and sometimes six or seven cells: and the number of cells decreases towards the top and bottom of the ear. If the ear is examined when in blossom, we may see what number of grains each chest is formed to produce: or this may be seen afterwards by the number of double valves, which are properly the chaff; for these remain though the grains have proved abortive, and therefore by counting the leaves of chaff, allowing two to each grain, and two extraordinary to each chest, we shall find what number of grains each chest might have produced.

"The outward grains of the chests are commonly the largest, and smaller towards the middle, and often stunted grains, or none at all, in the middle cells; and this, notwithstanding most of these had blossoms in them, and the grains had made some progress, or begun forming. They are later than the outside grains, as if last impregnated.

"The number of these deficient, or missing grains, is greater than might be supposed without examining them. In a favourable season most of the cells have grains in them; and, if examined at the time of blossoming, the grains may be seen in different degrees of maturity; many of them, with the naked eye, and others with a good glass; but though they appear then in general to be fresh and in a growing state, a considerable number of them is afterwards stunted, or die away entirely. In an ear of red Lammas wheat, of six inches long, twenty-five chests, and two hundred and eighty-six leaves of chaff, I have counted seventy-four grains some time after blossoming; by which it appears, that this ear might have produced one hundred and eighteen grains; and yet at harvest I have not commonly found above sixty grains in an ear of that length. I have likewise this season counted fifty-four grains in an ear of white Lammas wheat, of three inches and a quarter long, nineteen chests, and one hundred and

seventy-four leaves of chaff; so that this ear might have yielded sixty-eight grains: but we see in the above tables that the fullest ear, of the same sort of wheat, and the same length, yielded only forty-one grains; and three of the same length yielded but thirty-eight grains and one third each, upon an average.

"The tillage and dressing of land for wheat is done for the most part, before the wheat is sown, and the benefit of these gradually decrease; whereas the wheat requires a gradual increase of nourishment, both in order to form large ears, and afterwards to fill them with large grain. And hence appears the great defect of the common husbandry, and points out the advantages of top-dressing wheat in the spring with foot, or other light manure, which brings the plants a fresh supply of nourishment when they want it most; and hoeing, when it can be performed at the proper times, particularly the deep, or horse-hoeing, has the same effect of producing large ears; and for filling them, the horse-hoeing is the most effectual, as that can be performed at the critical time, and when the plants are large.

"It has been commonly supposed, by those who practise the New Husbandry, that the most important hoeing for the purpose of filling the ears with good grain, is soon after the wheat has blossomed: but this, I believe, is a mistake, and that it should be performed immediately before the wheat blows; for before that is over, the grain is considerably advanced. I have found no less than seventy-seven grains in an ear of red Lammas wheat, of four inches and three quarters long, and at the same time a considerable part of the blossoms still remaining on the outside of the ear.

"This is above one third more than usually comes to maturity in an ear of that length; so that it seems very probable the ears would produce near one third more corn than they commonly do, were they to be assisted at that time with sufficient nourishment. But this would come too late after the blossoming is over; for by that time, some of the weak grains die, and others are stunted, so as not to be recovered again by any future hoeings. A check at this critical time seems to have the same effect as it has upon a grain of corn, or other seed, after it has begun to vegetate: if that is put a stop to, it never recovers.

"From the great number of small ears in a crop, and the deficient grains in all the ears, we may plainly see the advantage of good culture, and of taking the proper seasons to apply it. The New Husbandry is, in this respect, much to be preferred; and also because much fewer plants will produce an equal crop; in which there are several advantages, besides saving above half the seed. This method of culture is, indeed, so much superior to the common husbandry, not only in raising wheat, but plants of almost every kind, that it is to be wished it was more promoted.

"I am sensible that several gentlemen have objections to this husbandry, arising partly from a misinformation of Mr. Tull's practice and success, and partly from the difficulty they apprehend in overcoming the prejudices of the farmers to any new methods.

"That they are very tenacious of old customs, is readily admitted, nor are they to be too much blamed on that account: but that they cannot be prevailed with to alter them, upon rational evidence, and proper encouragement, is, it is apprehended, carrying the argument too far, as this tends to discourage all attempts of improvement.

"One of the reasons assigned, why the farmers cannot be brought to practise the New Husbandry, is the difficulty of managing a drill-plough for sowing corn, which is admitted, though that is not so great as some have supposed; for I have seen a husbandman learn to manage such an instrument, who, after one day's practice, could sow with it four or five acres a day, with the proper quantity of seed, at a less expence than common sowing and harrowing.

"Some have objected farther, that the farmers cannot practise this husbandry, because they are ignorant of its principles: but these principles are not many, nor hard to be understood, so far, at least, as relates to practice; and in fact, the practice of the New Husbandry is easier than the old, because it is founded upon clear principles, which often is not the case in the old husbandry.

"It seems that several gentlemen are not for introducing

eing this new method, because they are not convinced that it is, upon the whole, better than the old. If we may credit those who have gone furthest in the practice of the New Husbandry, those gentlemen abroad in particular, who have published their experiments, there seems to be no doubt of its superiority: but as it is a matter of great importance that this fact should be fully established to the satisfaction of all gentlemen, from whose influence and example the most valuable improvements are to be expected, the trial is not difficult, nor very expensive: a small farm, with some variety of soils in it, cultivated in the several methods by way of comparison, and exact accounts kept of the expence and produce of each, would determine this point without any reasonable doubt.

"In matters of this sort, speculations and reasonings are not to be relied on without experiments; and the larger they are, they will be the more convincing. Whether something, like what is here proposed, might not have the desired effect, and likewise be a means of making useful discoveries in vegetation and the culture of plants, is submitted to the consideration of those who have at heart the improvement of agriculture.

"A more extensive plan is necessary for introducing new methods into common practice, and which might comprehend the farmers, and also the husbandmen, who execute and excel in the performance. It is recommended to your readers to consider and propose what they think the most probable means for attaining these desirable ends." *Museum Rusticum*, vol. III. p. 38.

"It is certain, says another ingenious husbandman, that many strange reports were raised of Mr. Tull, and his husbandry, by prejudiced persons; and his book being printed for the author, some booksellers were much offended, and employed several hands to write against him, which they did in a most scurrilous manner, asserting many things that were false, and misrepresenting others. Some of these he takes notice of himself, in the additional parts of his work. I shall mention only one instance how ready people were to give credit to such false reports. "Last summer," says he, "the vulgar in general believed, in a country but twelve miles distant from me, that I always carried my dung and threw it into a river: now there is no river nearer to the barton where my dung is made, than is the farthest part of my land; so that the expence of losing my dung would be greater than spreading it on any part of my farm. Besides, I live in a country where farmers buy dung at a good price; but it is known that I neither sell nor waste any dung. Against such lying tongues there is no defence."

"But a principal cause, that the reports of his bad success in his wheat crops have gained so much credit, I believe, is, that the additions to his Essay are out of print, and not generally known; and it is chiefly with a view to inform your readers of them that I write this letter.

"Mr. Tull began his scheme of successive wheat crops with four rows. Afterwards he found that three rows were better, and was in that practice, of drilling three rows upon a ridge, when he published his Essay. Upon further experience he found, that two rows produced as good crops as three or four, and were more easily managed. This he recommends as his last and best method; and altered his drill-plough to his practice of planting only two rows upon a ridge, of which he gives a cut and description in his Addenda and Conclusion. By this alteration, his drill is much less complicated, and less difficult to manage, than that for planting three rows, described in his Essay.

"The gentlemen abroad, who are now promoting the New Husbandry, have gone into the practice of planting three rows upon every ridge, supposing that to be the best method; and the drill-ploughs invented by M. Duhamel, and M. de Chateaucieux, are constructed to sow three rows.

"From the practice of the gentlemen abroad, and other instances that might be given at home, it is evident, that they had not seen the additions that Mr. Tull made to his Essay, in which, besides his different method of drilling, there are several very material improvements in the manner of hoeing and cultivating wheat, and other crops; and from these last parts of his work may be also seen, that the reports of his bad success, in repeated wheat crops, are without any just foundation.

"In order to shew this more clearly, it may be proper to premise a short chronology of the progress of his husbandry, collected from his own account of it; in which it

is to be observed, that as the year, at that time, was by some reckoned to commence the first of January, and by others the twenty-fifth of March, and the crops at other periods, it occasions an uncertainty of sometimes a year of this account.

Mr. Tull began his horse-hoeing husbandry about
the year — — — 1723
his successive horse-hoed wheat crops 1726

He published his Specimen — — — 1731
his essay — — — 1733
his Supplement to the Essay — — — 1735
his Addenda — — — 1737 or 1738
His conclusion is dated March 31, — — — 1739
(All these are printed in small folio.)

He died about the year 1741.

"As to his practice of raising successive crops of wheat, he made the experiment first upon part of a field, which had not been dunged for some time, and upon this part he continued to raise wheat for twelve years, without the assistance of any manure. In the Preface to his Essay, he says, "The particular scheme of raising annual crops of wheat, without dung or fallow, is as yet only upon probation; but by the six crops I have had in that manner, I see nothing against their being continued." In the Supplement, page 249, he tells us, "There is now the eleventh crop of wheat on the same field, (except that in the ninth year, by accident, of having contracted to let my farm, it was drilled with white oats) and I do not yet see any reason against its being continued for wheat annually, as long as it is kept in this culture." In the Addenda, page 261, "The field which last year had the eleventh crop of wheat," (as in page 249) "has now the twelfth on it, very likely to be a good one." And in the conclusion, he says, that the twelfth crop of wheat, upon this field, "was the best, I believe, that ever grew on it. It is now the thirteenth crop, likely to be very good, though the land was not ploughed crossways;" which he mentions it was the year before, in order to alter the size of the ridges.

"I have here collected what he says of this field in particular, as it was his field of experiment, upon which he had raised the most crops of wheat, without any manure. Let us next see what crops he had upon his lands in general.

"He begins his Addenda with acquainting the reader that he was desired to take an exact account of the crop of an acre of horse-hoed wheat, part of a field of twenty-five acres, in order to see the difference between that and the crop of a small piece of ground, drilled upon the level, and hand-hoed. This acre being measured, and the crop reaped, and threshed by itself, yielded twenty-nine bushels and three pecks of clean wheat, nine gallon measure. But he observes that great waste was made by the reapers of this acre; and some damage was done to the corn by cattle; for which allowance being made, he reckons the real produce of this acre to have been thirty-two bushels, or four quarters of wheat.

"He then proceeds to give an account of the crops of wheat upon his other fields, which, including the above-mentioned field, were in all one hundred and six acres. The corn was not threshed when he wrote this; but it appears by his account of the crop, as I have computed it, that these one hundred and six acres produced, upon an average, nearly twenty bushels of wheat per acre.

"If the quality of this land is considered, none of it rich, and the greater part light, and of a thin staple, this cannot be called a bad crop. But there was another very important circumstance, which ought to be considered: Mr. Tull was now advanced in years, and in a very bad state of health; was frequently confined to his room, and sometimes to his bed; inasmuch that, as he tells us, he had not seen some of his crops from the time they were sown till the spring following. And in his Supplement he says, page 225, "My agriculture having been carried on by common day-labourers, without any body to inspect them, (except when my diseases suffered me to attend them, which for several years last past has been very seldom) cannot be expected to be all well managed; for though they can do it well when they please, yet their will being above controul, I must be content with their doing some tolerably well every year."

The dust of the master's feet is a kind of manure so necessary in every scheme of husbandry, that no person of experience in such matters; who reflects upon these circumstances, would have reason to be much surprised, if Mr. Tull's crops had really failed as much as has been supposed; and if we also take into the account, that these day-labourers whom he employed, and who had the management of his agriculture at the critical seasons, were then generally, as such men still are, prejudiced against the new husbandry, I think his success, notwithstanding these disadvantages, is a strong argument in favour of this husbandry.

"But let us proceed to what Mr. Tull says further of these successive wheat crops. In the Addenda, page 263, he tells us, "I have now six score acres of wheat, an hundred acres of which are on the stubble of the last year's wheat crop."

And in the Conclusion, p. 273, "The crop of the six score acres of wheat, that was growing at the time of publishing my Addenda, was much greater than the crop the year before it, and would have produced more grain in proportion, if the heavens had been as propitious; but the heavy rains that fell when the first planted was most in blossom, diminished the filling of the ear and its grain, yet not so much as of most sown wheat, especially of the early-sown, which generally escapes the best in this common calamity. The burn-baked wheat, being always early sown, I am informed, had next to no grain in it; and this is the most expensive sort of husbandry, the tenants pay such exorbitant fines for the liberty of ploughing this land."

Again, page 274, "The same six score acres that was wheat the last year, is planted with wheat now, and is all of it as strong and likely for a good crop as in any of the former years, though there is but about one acre of it dunged. The whole is the freest from weeds before hoeing that ever was seen, and the sown wheat in the neighbourhood the fullest of them."

"I can shew, at this instant, one of the experiments I have recommended, which, though it be on less than two perch of ground, must convince every man who sees it (and doth not renounce the evidence of his reason and senses) that pulverization by instruments can vastly exceed the benefit of common manure."

"It is to such experiments that I leave the progress of my horse-hoeing husbandry, assuring the public, that in all my practice, which is now thirteen years, I never have met with one instance that gives me the least suspicion of the truth of the principles I have advanced; and that, I believe, they have nothing to fear from enemies, but the false relation of facts, or fallacious arguments."

"Mr. Tull mentions here, that he intended this to be his last crop. He lived about two years afterwards. Whether he continued to occupy his farm, I am not certain; but if he did, and his crops were worse than the preceding years, that could not be justly attributed to any error in the principles, but to the other causes above mentioned. We see here that he appeals to an experience of thirteen years: nor can it be supposed, or admitted, that a person of Mr. Tull's understanding would go on from year to year to enlarge his plantations of wheat to the extent of one hundred and twenty acres, had he not been fully sensible of the advantage of so doing."

"The repetition of wheat crops upon the same land may, by many persons, be supposed rather a matter of curiosity than of any great use; a change of crops being the general custom, and supposed to be the most profitable: but this is not so clear as some imagine. The custom is founded upon the supposition that change of crops is necessary; which, though it may be true in the old husbandry, is not so in the new: and, without doubt, the change is often hurtful to the farmer; for, not to insist on the extraordinary labour necessary to prepare the land, and the loss of the season, if it cannot be got into proper order in time, or, which is as bad, sowing it, though not in proper tilth to receive the seed, the main point of all is, whether the profit of these several different crops is really more than hoed successive crops of wheat, or other corn commonly propagated? In answer to this, I believe it is not very difficult to shew, by a fair comparison of both, that the hoed crops are the most profitable, even including the clover and turneps in the old husbandry. Nor is a profitable change of the crop, or the advantage of obtaining sometimes three

crops in two years, peculiar to the old husbandry; for the same may be had to greater advantage in the way of hoeing.

"There is another circumstance in the old husbandry, very unfavourable to the farmer. As he is under a necessity of changing his crops, he cannot adapt them to the soil. Most farms have land in them of very different qualities, and these are not equally proper for the production of plants of every kind. The strong land, that is very fit for beans, wheat, and clover, is not equally so for peas, barley, and turneps. But the farmers commonly vary their crops according to the custom of the country; and the consequence is, that most of their lands are planted in their turn with crops not the most suitable to them; which is an inconveniency that may be avoided in the New Husbandry."

"Having pointed out the additional parts of Mr. Tull's work, it is hoped that we shall soon have a new impression; but as it may possibly be some time before the last parts of his work are re-published, I shall, for the benefit of such of your readers as incline to practise the New Husbandry, take notice of one or two important alterations in the horse-hoeing culture."

"In the Essay, Mr. Tull directs, that the hoe-plough should be brought as near as possible to the rows at first, and when the plants are young; but that the subsequent hoeings should be at some distance from the rows, lest the plough should tear off too many of the roots, and destroy the plants; also that the last hoeing should throw the earth of the intervals up to the plants which he thought necessary for their better nourishment, when they were grown large. His last practice was different in both these respects."

"For in the Conclusion, page 272, he says, "At the second hoeing, the plough goes in the furrow of the first, making it deeper and nearer to the wheat: the third hoeing fills up this furrow; and then, at the fourth hoeing, the plough goes in the same place as the second, turning the mould into the intervals. It is remarkable, that though the furrows of the second and fourth hoeings be deep and near to the rows, seeming to deprive the wheat of the mould which should nourish it, whereby one would imagine, that these furrows, lying long open, should weaken or starve it; but it is just the contrary, for it grows the more vigorous: and it is the observation of my ploughmen, that they cannot, at these hoeings, go too near to the rows, unless the plough should tear out the plants."

"If I may presume to assign the cause of this surprising effect, it is, in my opinion, the following, viz. this open furrow has a double surface of earth, which, by the nitre of the contiguous atmosphere, is pulverised to a great degree of minuteness near the row. The roots that the plough cuts off on the perpendicular side of the furrow, send out new fibres to receive the pabulum from this new-made pasture; and also part of this superfine powder is continually falling down into the bottom of the furrow, and there gives a very quick growth to those roots that are next it, and a quick passage through it into the earth of the interval, where they take likewise the benefit of the other side of this pulverised furrow. When it is said that air kills roots, it must not be understood that it kills a plant, unless all, or almost all its root, is exposed to it, as it is not in this case. Some think there are roots that run horizontally below the plough into the interval; but of this I am not convinced."

"It is not often that we plough above four times, and then the furrow is turned towards the row at the third time only."

"Whether these furrows lying long open next the rows, in very hot dry climates, may be prejudicial, cannot be known but by trials."

"The practical hoer will find this method of going close to the rows of wheat and other plants, of great service to him, not only in the vigour of his plants, but also in the more perfect tillage of his land, and a considerable saving in hand-hoeing, weeding, and manure."

"The other circumstance, of a large plant growing more vigorous, and the seed filling better, by ploughing the earth away from one side of it, is so singular, and opposite to the common practice of gardeners, that should it succeed generally, it may lead to something new in the theory of vegetation." *Museum Rusticum*, vol. III. p. 159.

A comparative calculation of expence and profit between the drill and the common husbandry; taken from Mr. Baker's Report to the Dublin Society of his experiments in agriculture, for the year 1765. Published by order of the Society.

An estimate of the expence upon a plantation acre of wheat, in the common husbandry :

	l.	s.	d.
To the first ploughing, commonly called breaking for fallow, eight horses eight shillings; two ploughmen one shilling and four-pence; two drivers one shilling	0	10	4
To the first harrowing, four horses four shillings; a driver six-pence	0	4	6
To the second ploughing, commonly called gau-rowing	0	10	4
To the second harrowing	0	4	6
To the third ploughing, commonly called stretching	0	10	4
To sowing the seed, eight horses eight shillings; two ploughmen one shilling and four-pence; two drivers one shilling; the feed-man eight-pence	0	11	0
To feed wheat, one barrel	1	0	0
To rent for the year of fallow	0	18	0
To ditto, the year the crop is growing	0	18	0
	5	7	0

In this account forty shillings are charged for forty horses, employed in the culture of one acre of wheat, in the common husbandry; a charge which ought to be considered by the farmer, for he actually buys and maintains his horses for this business.

The crop which follows wheat is generally oats; but sometimes peas are sown instead of oats: with some, the practice is to let the peas follow oats, in which case they fallow only every fourth year; but where land receives no other assistance than what arises from fallow, it is a bad practice not to fallow every third year. It is the general practice to plough but once for oats, and therefore it shall be stated so; but it is a much better practice to plough the wheat stubble once before winter, and again in the spring.

An estimate of expence upon an acre of oats :

	l.	s.	d.
To ploughing once	0	10	4
To seed oats, two barrels	0	12	0
To harrowing 4s. 6d. feed-man 4d.	0	4	10
To one year's rent	0	18	0
	2	5	2

These two crops consume three years; after which the farmer is to begin again, and to incur every article of expence stated in the above accounts, in order to obtain two crops more.

An estimate of expence upon a plantation acre of wheat in the drill husbandry, the first year :

	l.	s.	d.
To ploughing 4 times, to prepare the fallow	2	1	4
[This is the same charge as in preparing for the common husbandry.]			
To harrowing twice for ditto	0	9	0
[This is the same also.]			
To rent for the year of fallow	0	18	0
[This charge is saved after the first year.]			
To harrowing with the drill harrows	0	0	6½
[Four acres a-day may be harrowed with one horse.]			
To sowing with the drill plough	0	1	1
[From 3 to 5 acres may be sown in a day.]			

To seed-wheat, generally 5 stone, but suppose 6	0	6	0
To the first or winter hoeing	0	1	7
[Two acres may be hoed in a day, two horses, ploughman and driver; the design of this hoeing is to leave the plants dry, and to meliorate the earth.]			
To the spring hoeing with the cultivator	0	1	1
[To deepen the soil, one horse, ploughman and driver.]			
To the third hoeing, i.e. to return the meliorated earth to the corn	0	1	7
[To make the corn tiller, i.e. to increase its branches.]			
To the fourth and final hoeing	0	1	1
[To fill the grain and render it large.]			
To rent the year the corn is growing	0	18	0
	4	19	3½

N. B. Although the drill culture for the first year is very near as expensive as the common, yet, after taking the first crop, the expence and labour of fallow, and loss of time, is not to be incurred again, as is unavoidable in the common husbandry.

An estimate of expence upon an acre of drilled wheat, after the first crop :

	l.	s.	d.
To ploughing the land once	0	10	4
[One ploughing is all that is necessary.]			
To harrowing with the drill harrow	0	0	6½
To sowing with the drill plough	0	1	1
To feed wheat	0	6	0
[Be it remembered, 5 stone is enough.]			
	0	17	11½
To four times horse-hoeing, as before stated	0	5	4
To one year's rent	0	18	0
	2	1	3½

Thus the land is sown again with wheat every year, and instead of 4l. 9s. which is the farmer's expence in the common husbandry, exclusive of one year's rent of the land: in the drill method it is no more than 17s. 11½d. and the total expence, instead of 5l. 7s. is no more than 2l. 1s. 3½d. rent included; whereby there is a saving of 3l. 5s. 8½d. an acre.

Before the account of profit and loss upon these different methods of culture be stated, it will be necessary to take notice of an objection, which may perhaps be made to the above charge of ploughing in the common husbandry. It is pretended, that three quarters of an acre may be ploughed in a day, with one plough: but can it be done effectually? The land may, indeed, be scratched, but cannot really be ploughed as it ought to be. The farmer ought to be cautioned against a trick too frequently practised in ploughing. When a ploughman enters his plough, and passes across the field, he turns a sod about a foot broad: when he is to return, he enters his plough about four feet distance from the outside of the former furrow, and so turns another sod of the same breadth, which, when turned, just meets the former sod; thus four feet of the land appear to be ploughed, whereas the fact is, that the two feet lying under the sods is not touched with the plough at all. This deception, added to the practice of just skimming the ground, enables hirelings to undertake ploughing at 6 and 7s. an acre. But if a plantation acre of land be well and effectually ploughed, 10s. 4d. as charged above, will not appear too much; and it is, in fact, supported by the common course of business. When wheat is to be sown, it is the general custom to send a barrel of seed into the field with two ploughs, which is to sow an acre of land, and that is the usual day's work for two ploughs in the general course of business. Let us see then, what the expence will amount to. Eight cattle will be 8s. two ploughmen 1s. 4d. two drivers 1s. and the seedman 8d. which in all makes 11s. and corresponds with the above charge.

W H E

W H E

Dr. One acre of wheat and oats in the common husbandry, for fifteen years.

Per contra Cr.

		l.	s.	d.
To the expence on a wheat-crop,	2d year	-	5	7 0
To the expence on an oat crop,	3d year	-	2	5 2
To the expence on a wheat crop,	5th year	-	5	7 0
To the expence on an oat crop,	6th year	-	2	5 2
To the expence on a wheat crop,	8th year	-	5	7 0
To the expence on an oat crop,	9th year	-	2	5 2
To the expence on a wheat crop,	11th year	-	5	7 0
To the expence on an oat crop,	12th year	-	2	5 2
To the expence on a wheat crop,	14th year	-	5	7 0
To the expence on an oat crop,	15th year	-	2	5 2
			38	0 10
To clear profit in 15 year	—		27	19 2
			66	0 0

		l.	s.	d.
By the produce of wheat,	9 barrels, at 20s.		9	0 0
By the produce of oats,	14 ——— at 6s.		4	4 0
By the produce of wheat,	9 ——— at 20s.		9	0 0
By the produce of oats,	14 ——— at 6s.		4	4 0
By the produce of wheat,	9 ——— at 20s.		9	0 0
By the produce of oats,	14 ——— at 6s.		4	4 0
By the produce of wheat,	9 ——— at 20s.		9	0 0
By the produce of oats,	14 ——— at 6s.		4	4 0
By the produce of wheat,	9 ——— at 20s.		9	0 0
By the produce of oats,	14 ——— at 6s.		4	4 0
			66	0 0

Dr. One acre of drilled wheat, for fifteen years.

Per contra Cr.

		l.	s.	d.
To the first and 2d year's expence	- -	4	19	3½
To the - - - 3d year's expence	- -	2	1	3½
To the - - - 4th year's expence	- -	2	1	3½
To the - - - 5th year's expence	- -	2	1	3½
To the - - - 6th year's expence	- -	2	1	3½
To the - - - 7th year's expence	- -	2	1	3½
To the - - - 8th year's expence	- -	2	1	3½
To the - - - 9th year's expence	- -	2	1	3½
To the - - - 10th year's expence	- -	2	1	3½
To the - - - 11th year's expence	- -	2	1	3½
To the - - - 12th year's expence	- -	2	1	3½
To the - - - 13th year's expence	- -	2	1	3½
To the - - - 14th year's expence	- -	2	1	3½
To the - - - 15th year's expence	- -	2	1	3½
		31	16	1
To clear profit in fifteen years	—	52	3	11
		84	0	0

		l.	s.	d.
By the produce of wheat,	2d year, 6 barrels,		6	0 0
By the produce of ditto,	3d year, 6 ———		6	0 0
By the produce of ditto,	4th year, 6 ———		6	0 0
By the produce of ditto,	5th year, 6 ———		6	0 0
By the produce of ditto,	6th year, 6 ———		6	0 0
By the produce of ditto,	7th year, 6 ———		6	0 0
By the produce of ditto,	8th year, 6 ———		6	0 0
By the produce of ditto,	9th year, 6 ———		6	0 0
By the produce of ditto,	10th year, 6 ———		6	0 0
By the produce of ditto,	11th year, 6 ———		6	0 0
By the produce of ditto,	12th year, 6 ———		6	0 0
By the produce of ditto,	13th year, 6 ———		6	0 0
By the produce of ditto,	14th year, 6 ———		6	0 0
By the produce of ditto,	15th year, 6 ———		6	0 0
			84	0 0

	l.	s.	d.
To clear profit arising upon an acre of land in fifteen years in the common husbandry	52	3	11
To clear profit arising upon an acre of land in fifteen years in the common husbandry	27	19	2
Greater profit on the drilled acre, in fifteen years	24	4	9

which amounts to 1l. 12s. 3½d. per annum, for fifteen years, on the acre, more than by the common husbandry.

In the drill husbandry the crops are stated at three barrels of wheat less upon an acre than in the common husbandry, that it may not be supposed to be over-rated; but in the common husbandry, the crops are rated at the highest; fourteen barrels of oats an acre, are also allowed in the common husbandry, which every farmer must admit to be a great allowance upon the general produce.

That the drill culture will produce six barrels an acre, is fully proved in Mr. Baker's Report at large, which will be shortly published, where it will be shewn, that much more has been produced.

Doubtless it will be observed, that in fifteen years, fourteen wheat crops are obtained in the drill husbandry; in the common husbandry only five wheat and five oat crops: the five other years are not only lost, but are an heavy expence to the farmer.

A farmer having forty acres of tillage, supposing him to direct his attention to bringing it to the drill culture, would make in fifteen years 969l. 10s. more than he can in the common husbandry; which is such an advantage, that the greater profit in the drilled acre in fifteen years will purchase the fee-simple of that in the common husbandry, at twenty-seven purchase, valuing the land at 18s. an acre.

Thus it appears, that in every fifteen years the fee-simple of all the tillage lands of the kingdom is lost to the community by the common course of tillage.

In stating these accounts, no mention is made of fences, water, cutting the land, weeding and reaping, as these articles of expence depend on a variety of circumstances, but, in general, will be more on the common husbandry than on the drill.

Mr. Baker began the horse-hoeing culture of wheat before he was fully master of the practice, as appeared by the event: for his crops, during the three years that he practised this culture, declined every year, and for that reason he gave it up as unprofitable; which, without doubt, discouraged many from engaging in it, particularly in Ireland. His ill success was not, however, from any error in the principles, which is evident from Mr. Tull's own success, and of others since, who have practised this husbandry on wheat much longer than he did; and it appears from the account given by Mr. Baker, that he deviated from the methods necessary in this cultivation of wheat.

1. In the horse-hoeings from the wheat, his hoe-plough was not brought so near the rows as Mr. Tull directs, and as he himself and others since have practised.

2. He gave his wheat but four horse-hoeings, which were not enough; for though Mr. Tull, when he became perfect in this culture, gave commonly but four hoeings, Mr. Baker's land required more to keep it in that state of tilth and pulverization that is necessary in such strong, stiff, churlish land, as Mr. Baker describes his to be.

3. Two of Mr. Baker's four hoeings were performed with M. de Chateauvieux's cultivators, which have no earth-board, and do not turn the furrows; which the hoe plough does, and is necessary in hoeing wheat. By turning the furrows frequently, a new surface of earth is every time exposed

exposed to the action of the atmosphere : and to this we must ascribe the increased fertility of the land, whereby it is enabled to nourish the crops of wheat repeated every year ; for it has no manure, nor any assistance but from tillage : if that is abridged, and it has not due exposure, the crops must decline, as Mr. Baker's did, partly from this defect in the manner of hoeing.

4. In horse-hoeing wheat, if the crops are found to decline, there are two remedies directed by Mr. Tull, and practised by skilful cultivators, viz. to give the land more hoeing in the proper season, which increases its fertility ; or to sprinkle a little soot, malt-dust, coal-ashes, or other fine manure, upon the rows of wheat in the spring, about the beginning of February ; one or both of these will, without doubt, restore the land, and improve the crop. Had Mr. Baker done so, when he perceived his crops were declining, he might have gone on with success, as some others have done, from eight to ten, to near thirty years.

Though we, happily, in this kingdom, are not under the same necessity as some foreign countries of building large edifices for public granaries, because our harvests are much less apt to fail us ; yet as this work is perhaps too presumptuously intended for general use, it is incumbent on me to speak of those effectual, though expensive means, of guarding against dearth, or even famine, as well as of the cheaper and easier methods, by which every farmer may be enabled to enjoy the advantage of preserving a large quantity of corn in a small space, without danger of its heating and fermenting, of its being preyed upon by destructive animals and insects, or of its being spoiled through the ignorance or want of judgment, of inattentive servants.

Corn reaped in a dry year, and especially that of the growth of a hot country, is well known to be the most perfect, and the fittest for keeping ; as, on the contrary, experience has proved that the softer and less ripened grains of wet years and rainy harvests should always be disposed of for more immediate use, though their too great humidity, which would infallibly occasion a putrefaction, if not remedied in time, may be exhaled, and they may then be preserved a long while in very good condition, as will be shewn from repeated facts and proper experiments.

The ancient Romans imported annually vast quantities of corn from Egypt, a very hot and dry country, scarcely ever watered but by the periodical overflowings of the fruitful Nile ; and they found this grain answer much better than any of their own growth, both for yielding plentiful crops, when sown in Italy, and for keeping in their public granaries, where they frequently preserved it many years perfectly sound. Pliny tells us, that, in his time, they kept corn a long while in subterranean caverns, made in a dry soil, and so closely stopped that not a breath of air could enter. They then covered the bottom with straw, and laid upon that the corn in the ear. We have the concurrent testimony both of the ancients and moderns, that it will keep thus perfectly well for at least six or seven years ; and an accident, not long ago, discovered a parcel of corn thus preserved at Amiens, where, though it had been laid up during a great number of years, it was found to be fresh and good, neither worm-eaten, rotten, nor mouldy. This was certainly owing to the moist air having been kept out, and with it the eggs of animals, and seeds of those minute vegetables which we see in form of mouldiness on such corn as has been less carefully defended from their access. In effect, experimental philosophy has proved that the air is the great source of corruption ; for even the most corruptible substance, such as meal, butter, milk, and the like, have been preserved fresh four months in the exhausted receiver of an air-pump.

There still is, near grand Cairo, a vast subterranean magazine of corn, defended with good walls, and called Joseph's granaries. It is hardly to be supposed that they are quite so old as the days of that patriarch ; but they abundantly prove the utility of such places of store, by the vast quantities of grain annually preserved in them.

Many parts of Africa, the corn of which country, and particularly that about Algiers and Tunis, will keep much longer than the growth of any other place, abound with granaries of this kind. They are deep pits made in the solid rock, but just wide enough at their top for a man to go down into them, but they grow larger immediately after, and are usually squares of from thirty to forty feet in diameter. In these the great men of the country preserve their corn. They first cover the floor with straw, then

spread upon that a layer of corn, upon this another, but thin bed of straw ; then another couch of corn ; and so on, till the whole cavity is filled ; observing all the while, as the heap rises, to place straw between the corn and the sides of the walls. When this is finished, they cover the mouth of the entrance with a sort of hurdle, over which they lay about two feet thick of sand, and over this they raise a ridge of earth, well beaten together, in order to throw off the rain both ways, that none may settle there on the place and soak into the magazine. The corn thus stored up always keeps three, four, or more years, very sound ; and not unfrequently the proprietor being taken off by the cruel despotism of the Eastern governments, the magazine is forgotten, some accident discovers it many years afterwards, and the corn is almost always found perfectly good in it. All the care they take, by way of preparing the grain, is to expose it two or three days to the heat of the sun, to dry it thoroughly before they carry it into the magazine.

In the duchy of Lithuania, and in the Ukraine, the people always preserve their corn in nearly the same manner, in wells or pits made in dry places : but great care must be taken there in the opening of these stores ; for people who have descended into them, before they had sufficient communication with the fresh air, have been killed by the damps.

The Russians too preserve their corn under ground in deep pits of almost the figure of a sugar-loaf, wide below, and narrow at top. The sides are well plastered, and the top is covered with stones. They are very careful to dry their corn well, generally by means of ovens, kilns, or stoves, for their summer is too short to effect it sufficiently, before it is laid into these repositories.

The same thing is practised with unvaried success in the island of Malta : and also in Gascony, the Vivarais, and other southern parts of France, the corn of which is remarkable for keeping many years longer than that of any other province in the same kingdom. M. Duhamel tried this method in the Gatinois : but his corn was so spoiled there by its humidity when laid up ; that country being subject to wet and moisture, and his grain, in this trial, not having been previously dried in an oven or stove.

Upon the whole, it is evident from these, and from many more instances, which might be alledged, of the practice of other countries, that subterraneous granaries, properly made, in a thoroughly dry soil, are the best of all repositories for keeping of the corn ; but, at the same time, experience shews that this method will not succeed in our climate, the sun here not having power to exhale the moisture from the corn, sufficiently to prevent its fermenting when laid in a large heap. I must likewise add, that when one of these subterranean magazines is opened and exposed to the air, it must be emptied immediately, and the corn taken out of it must be thoroughly sifted and screened, or it will soon corrupt. Some think it more nourishing, when it has been well preserved, than that which has been kept in granaries above ground.

The marquis of Santa Cruz, author of many excellent remarks on the political and military state of different nations, observes, that the corn of Galicia and the Asturias will hardly keep from one year to another, because of the humidity it contains, which rots and decays it : but that the corn brought thither from Castile will keep good many years. This last is therefore the only kind that the Spaniards ever venture to lay up in their public granaries : and the sole difference, in M. Des Landes's opinion, between it and their other sorts is, that it is grown in a country where there is less rain in summer. They might indeed, if their religion and policy did not forbid their having intercourse with the Moors of Barbary, once their conquerors, easily import from Africa plenty of some of the best corn that the world affords, perfectly ripened, thoroughly dried, and, in all respects, fit for keeping many years.

The great objections to public granaries, even in countries where the uncertainty of the climate, the indolence of the people, the ill-judged form of government, and various other causes frequently combine to render them highly necessary, is the expence attending such establishments ; generally so great, that none but a monarch can, or a state, properly undertake them : and they, most certainly, cannot do any thing more laudable, more truly noble, in countries whose misfortune it is to be exposed to the dreadful calamities of want and famine, or to depend upon the precarious assistance of their neighbours.

Though

Though subterranean repositories for the keeping of corn are preferable to all others in countries proper for them; yet, even the common granaries may, with due care, and perhaps some few alterations, be rendered much more serviceable than they generally are. The principal cautions necessary to this purpose are, 1. To guard against the too great humidity which always prevails in places where there are many doors and windows: 2. To prevent a too free access of the external air, because this brings in with it the eggs of a vast number of different insects, which prey upon and destroy the corn: and, 3. To take care that the corn be thoroughly dry, and as clean as possible, when it is laid up. These are the three general rules to prevent its corrupting.

The chief cautions to be observed in the erecting of granaries are, to make them sufficiently strong, and to expose them to the most drying winds. Sir Henry Wotton and Mr. Worlidge agree particularly in these; both judiciously advising a northern aspect for these buildings, because that quarter is coolest and most temperate; and the latter rightly observing, in general, that the best granaries are those built of brick, with quarters of timber wrought in the inside, whereto to nail well joined boards so closely to the wall, that there be no room for vermin to shelter themselves. Floors of plaster are reckoned the best, because they are cool in summer, and, if well made, do not retain dampness in the winter. There may be several stories one above the other; for the shallower the corn lieth, the better it will keep, and the more easily it is turned. Some have a small hole in the floor of their upper granary, through which the corn descends into the lower one, like the sand of an hour-glass; and after it is all come down into the lowest granary, it is conveyed back into the upper one; so that it is kept in continual motion, which is a great means of preserving corn.

The granary in the city of Schönbauk, in the vale of Parinburg upon the river Elbe, which is a store-house for the wheat of which the mum is made at Brunswick, is built nearly in this manner. It is three hundred feet long, eighteen feet wide within, has seven stories, each of which is seven feet high, and large windows all around to open and shut close according as the wind fits. By this means, the dross and dust are carried off as the corn is turned; for which a west wind is always preferred, because it is the driest. At each end of this granary, and in the middle, are stoves for fire, in damp weather, and at the going away of great frosts and snows, to prevent moisture. There are also on each side of this building three long troughs or spouts, in the upper loft; and in fair weather men throw the corn out of this loft into those spouts, through which it falls into others, about ten feet wide at the top, and eight or ten inches at the bottom, by which it is conveyed into the lower story, from whence it is wound up again by a crane fixed in the upper loft. By thus falling from one story to another, the corn is cleansed by the wind from all dust and chaff, and receives the benefit of the air, &c. These troughs or spouts are put on and taken off as occasion requires, to any of the windows; that when vessels come to lade corn, it may be conveyed, through them, into the proper barges, without being carried thither by men, or cattle. The wall of the two first stories is two bricks and a half thick, that of the three next is two bricks thick, and the thickness of the two uppermost is a brick and a half. Fourteen thousand quarters of corn may be kept in this granary.

Mr. Mortimer, who gives us this account, which is taken originally from captain Andrew Yarranton's *England's Improvement by Sea and Land*, adds, that the ears of corn, cut off from their stalks, and packed up close in a tight cask, will keep very well, and that this is the best, he indeed says, the only way of carrying any sort of corn over the sea, in order to sow it in a foreign country.

The public granaries at Dantzick are seven, eight, or nine stories high, and have a funnel in the middle of every floor, to let down the corn from one to another. They are built so securely, that the corn does not contract any damp, though they are surrounded with water on every side, in such manner that vessels come up to the very walls for their lading, which is let down into them, likewise through pipes or funnels, with very little labour and charge. No houses are suffered to be built near them, for fear of accidents by fire.

At Zurich, in Switzerland, corn is kept eighty years, or more, in the public granaries, which are very spacious, and

well aired by means of many square wooden pipes which pass through them.

The twelve companies of London, with some other companies and private persons, had formerly their granaries at the bridge-house in Southwark, under the superintendence of a justice of the peace, a steward, and two masters. These granaries were built on two sides of an oblong square (now used for a wharf) one of which stood north and south, and was near an hundred yards long. Along this side were lattice windows which faced the north-east; and on the other side, which was about fifty yards long, the windows looked to the north. The opposite sides had no apertures. All the windows were about a yard high, without any shutters, and ran on in a continued series, with very small partitions, sufficient only to nail the lattices to. Each of these granaries was three or four stories high; but the lowest, or ground story, which was twelve feet high, was used only for a ware house.

In Kent, two square holes are made at the end of the floor, and a round one in the middle, by means of which the corn is thrown from the upper into the lower rooms, and back again, the better to turn and air it. The screens used on this occasion are made with two partitions to separate the dust from the corn. The dust falls into a bag, and when it is sufficiently full, it is thrown away, the pure and good corn remaining behind. By these means corn has been kept thirty years in this country: and it is observed that the longer it is kept, the more flour it yields in proportion, and the purer and whiter the bread is; only the superfluous humidity evaporating in the keeping: for grain does not diminish in weight or bulk, after the first year.

The usual way of preserving it in our common granaries is, after it has been well sifted and screened, to spread it upon the floor about six inches thick, to turn it twice in a week, and to repeat the screening of it once a week during the first two months. It is then laid a foot thick, for two months more; and in this time it is turned once a week, or twice if the season be damp, and now and then it is screened again. At the end of five or six months, it is raised to the thickness of two feet, turned once a fortnight, and screened once a month, or as occasion requires. After a year, it is laid two feet and a half or three feet deep, turned once in three weeks or a month and screened in proportion. When it has lain two years, or more, it is turned once in two months, and screened once in three, and how long soever it is kept, the oftener it is turned and screened, the better the grain will be preserved. An empty space, about two feet or a yard wide, is always left on each side of the corn, to prevent its running down holes or chinks at the edges of the floor, and to remove it from all moisture that may proceed from the sweating of the walls, or from any defect in the roof; and another space is commonly left along the middle of the heap, if it be a wide one, to facilitate the turning of it as often as is needful. This is the general custom; and experience has shewn it to be necessary in the usual manner of keeping grain.

But all the foregoing methods of preserving corn in granaries above ground are attended with very great expence, by reason of the vast buildings which they require, and the many servants necessary to be employed to take care of these stores: besides which, too much depends here upon the assiduity, skill, and probity of those servants; and the grain is still liable to be preyed upon, wasted, and spoiled, by vermin and insects.

"It is commonly said that a farmer cannot thrive, who, for want of money, is obliged to sell his wheat under five shillings a bushel; but if he will sell it dear, he must keep it when it is cheap; and his way of keeping it is in the straw, using his best contrivance to preserve it from the mice.

"The most secure way of keeping a great quantity of wheat that ever I heard of, is by drying it. When I lived in Oxfordshire, one of my nearest neighbours was very expert in this, having practised it for great part of his life. When wheat was under three shillings a bushel, he bought in the markets as much of the middle sort of wheat as his money would reach to purchase. He has often told me, that his method was to dry it upon a hair cloth, in a malt kiln, with no other fuel than clean wheat straw, never suffering it to have any stronger heat than that of the sun. The longest time he ever let it remain in this heat was twelve hours, and the shortest about four hours. The damper the wheat was, and the longer intended to be kept, the more drying it requires: but how

to distinguish nicely the degrees of dampness, and the number of hours proper for its continuance upon the kiln, he said, was an art impossible to be learnt by any other means than by practice. About three or four and twenty years ago, wheat being at twelve shillings a bushel, he had in his granaries, as I was informed, five thousand quarters of dried wheat, none of which cost him above three shillings a bushel.

"This dry wheat was esteemed by the London bakers to work better than any new wheat the markets afforded. His speculation, which put him upon this project was, that it was only the superfluous moisture of the grain, that caused its corruption, and made it liable to be eaten by the weevil; and that when this moisture was dried out, it might be kept sweet and good for many years; and that the effect of all heat, of the same degree, was the same whether of the straw or of the sun. As a proof, he would shew, that every grain of his wheat would grow after being kept seven years.

[This is an excellent, safe, and cheap method of keeping wheat; and with regard to the difficulty of judging the proper degree of heat, that is easily determined by the thermometer—And the length of time it ought to be dried, may be known by those who are judges of wheat in the same manner as they judge of the quality of it at market.]

"He was a most sincere, honest yeoman, who from a small substance he began with, left behind him about forty thousand pounds; the greatest part whereof was acquired by this drying method." *Tull's Husbandry*, p. 65.

To obviate the inconveniences, and to point out an easier, cheaper, and surer way of keeping all sorts of grain, in granaries, in the other methods before mentioned, is the principal design of M. Duhamel's excellent Treatise on the Preservation of Corn: in which, after rightly noticing the several disadvantages attending the common practice, he proposes a method founded in reason, and on his own repeated experience, as well as that of others, whereby a large quantity of corn may be preserved in a small space, during a number of years, without danger of its heating, fermenting, or contracting a bad smell or taste, and secure from the spoil of animals and insects, at a trifling expence, and with very little trouble. All these desirable ends may be obtained, in some cases, by ventilation only; in others, by drying the corn in a kiln over a stove; and in others again by both these methods. See the article VENTILATION.

A Letter to Dr. Templeman, Secretary to the Society for the Encouragement of Arts, Manufactures, and Commerce, describing a new invented Granary for preserving Grain.

"S I R,

"Where public utility is in question, a private apology becomes unnecessary: accept, therefore, without ceremony, the following hints to be laid before the Society.

"I have long been of opinion, that a method of preserving grain from decay is much wanting; but it must be, to answer any good purpose, easy in its execution, and cheap in its process.

"The method now practised, of laying wheat in a room or a granary, and turning it frequently with shovels, and sometimes screening it, is subject to many inconveniences: it must be laid very thin, or it is apt to ferment; and by being laid thin it takes up so much space, that to lay up and keep five hundred quarters for three years only, would be considerably expensive.

"Could we preserve our corn for a number of years, it would not only be of great service to the public, but of no small benefit to the farmers. For want of doing this, we find a great, and often a sudden, variation in the price of bread corn; wheat will one year sell for five pounds a load (that is five quarters), and the next year it will rise to fourteen or fifteen pounds, or even higher.

"The rents of lands are of late greatly risen, owing to the increase of our trade; so is the price of all kinds of labour, insomuch that when wheat is low in price, the great farmers are considerable losers, and the poor ones are ruined: this is one reason why our lands are so much monopolised as they are in some counties. The great farmers, being rich, can afford to be losers for several successive years, as they are sure that once in a while the markets will rise, and not only repay all their losses, but secure them

a large profit. The poor farmers are under a necessity of selling their corn before the winter is passed: if the markets are low, they fail in the payment of their Michaelmas rent; their stock is in consequence seized, and some over-grown monopolizer in the neighbourhood adds their little plot to the many formerly separate farms he already holds.

"Were the interest of the community to be consulted, no man should be allowed to rent above three hundred acres of land: the profits of such a farm will, with proper regulations, maintain a family decently and well; and it is not requisite, or even salutary, that farmers should acquire large fortunes.

"But to return to my subject. Were a proper method projected for keeping wheat good for a number of years at a small expence, all this would be remedied, our lands would no longer be monopolized, and corn would from year to year vary very little in price. This stands to reason; for in a very plentiful year a farmer would not sell his corn too cheap, if he had the power in his hands to lay it up without great charges; and when the crops by any accident failed, the price of corn would not greatly rise upon the poor manufacturer and labourer, as what had been some years before laid up would now of course be sold at a reasonable price, and make up the deficiency, and this without loss to the farmer, and with great benefit to the community in general.

"This interesting subject has for many years employed my thoughts and attention; and I have in consequence imagined, and even executed in miniature, or rather in small dimensions, a plan, which will, I have reason to think, answer the important purposes above mentioned: my whole plan consists in building a proper granary, (the construction of which will not cost much, which will keep corn for any number of years sound, sweet, and good, and that with very little annual expence.

"I imagine the following postulata will be allowed.

"If we can preserve corn from fermentation, it will be in a way of keeping.

"To keep it from damp and moisture, is the best means of preserving it from fermenting.

"To move it frequently, give it air at proper times, and separate the dust and other extraneous matter, is certainly the best way to keep it from being moist and damp.

"Destructive insects are to be kept from it, which by frequent stirring is best effected.

"I imagine there are few, who have made this part of nature their study, but will allow the above positions: I shall therefore, without farther prelude, inform you in what manner I effect this at a small expence.

"The granary I would recommend consists of seven stories of floors, and may be built in any dimensions, provided proper proportions are adhered to.

"The form of it is square; and I shall at present suppose it to be fourteen feet square within the rooms or cells; the distance of the floor from one cell to the floor of that above it, is to be five feet: and the whole building should stand on strong posts, more or less in number, according to its dimensions, at the distance of six feet from the ground: the small stairs, or rather ladder, to go to the several cells, must be fixed to the outside of the building side-ways, with a leading rail or rope to prevent falling.

"The whole granary is to be built of what is generally called brick-noggin; that is, the whole is first framed in strong timber-work, and the interstices filled up with brick-work: the floors, beams, and joists, must be made strong to bear the weight of the corn; the inside of the cells must be well lined with dry oak-boards, close jointed, so as to leave no cracks; and the outside must be weather-boarded, the boards being strongly nailed to the timber-work of the frame, and afterwards payed over with pitch. The floors of the cells must be so contrived as to shelve towards the middle, in which part is to be an aperture six inches square, to be opened or closed by means of a sliding shutter, which must have a long handle reaching in a groove without the granary.

"On three sides of the rooms there must be a window, strongly latticed, covered with wire to keep out larger insects and birds, and with strong shutters to defend the corn from the weather; on the fourth side is a door to each room to open from without: the windows are to be small, and as close as possible to the ceiling: over the upper room or cell for the corn is a loft, on the outside of the door of which is fixed a crane to be worked within, by a winch and flyers.

"The use of the windows in the sides of the rooms, is to

to give the corn all the benefit it can receive from the wind and fresh air: the door, when the cell is empty, gives the workmen entry to sweep, dust, and clean it:

"My method of managing my corn in this granary is as follows:

"When my wheat is thrashed and cleaned, it is put up into sacks and carried to the granary: the apertures I mentioned above to have been contrived in the floor of the cells are then opened, except two, viz. one in the floor of the undermost cell, and that in the floor of the second cell, reckoning from the bottom.

"The sacks are then craned up into the loft, and emptied, through a hole made for the purpose, into the uppermost cell, whence it falls through the apertures till it reaches the floor of the undermost cell but one, where it is stopped by that aperture being shut.

"When this cell is filled to the height of about two feet from the floor, which may be seen through the lattices, the aperture in the floor of the third cell is shut by means of the slider: the workmen then continue craning up the sacks till all the cells are filled in the like proportion, except the undermost, observing the proper opportunities of shutting the apertures.

"In this condition the corn is left for a week, or somewhat longer, if it was got in very dry.

"The first stirring it receives, occasions very little trouble: when it has been in the granary about a week, a workman, after having swept and cleaned the undermost cell, which was left empty, opens the aperture in the floor of the second cell, by drawing the slider back: this lets the corn fall from the second into the undermost cell, the windows of which being open, the corn receives great benefit, as it falls, by the current of air that passes through the cell.

"When the second cell is empty, the aperture in the floor of it is shut, and the workman, going in at the door, by means of the stairs on the outside of the granary, sweeps and cleans it from all impurities, in order to prepare it for receiving the corn of the third cell, the aperture of which is next opened, and the floors being all made shelving towards the middle, the corn falls gradually through, in the same manner it did from the second to the undermost cell.

"In this manner they are all managed, till at last the uppermost cell remains empty.

"It is then left for another week, when two workmen must for a small space of time be employed: one of them goes up into the loft at the top of the granary, to work the crane, and the other takes his station on the ground under the floor of the undermost cell: under the aperture in this floor he first fixes a screen, upon which the corn falls, and then by means of a conductor at the foot of the screen, drops into the mouth of a sack which hangs to it, the bottom of the sack resting on a miller's hand-barrow: when all is prepared, he draws away the slider and lets the corn fall on the screen.

"When the sack is full, the slider is for a moment closed, till another sack on another barrow, is put under the conductor: the workman then wheels the first sack to the outside of the granary, and fastening the crane rope to it, makes the signal for the other to draw it up. Whilst this is doing, the second sack is filled, which is wheeled and drawn up in the same manner; and this method is pursued till the undermost cell is empty.

"If it is necessary to screen all the corn at this time, a small screen is fixed under the aperture of the second cell, so contrived as to have a box at the back of it, which receives all the dust, trash, off-corn, and seeds of weeds that pass through the wires: and this screen is successively fixed under every aperture, as the cells are successively emptied.

"After the first month the corn need be stirred in this manner only once a fortnight, and after the first six months, only once a month, unless the weather should prove, in autumn, very hot and damp.

"This then, Sir, is the manner in which I have for some years managed my wheat, and find it answers very well, the vegetative quality of the corn being preserved in full vigour, and no signs being discoverable in it of a tendency to fermentation.

"My country hovel is at some distance from London, in a retired quarter, consequently unnoticed; and there being but little probability of this easy method's being sufficiently known by my practising it, is the reason of my

troubling you with this long letter, flattering myself that by your means it may make a proper appearance in public: Had vanity been my predominant passion, I might have presented it to the Society in person, which, as a member, I had an undoubted right to do; but this would have been encroaching on my beloved obscurity: to you therefore, Sir, do I trust this child of my invention; and if in your hands he can be trained so as to be of public utility to my country, my every purpose is fully answered."

This gentleman's method is much the same as at Dantzick, and other places abroad, where they have public granaries for the preservation of corn; and is not necessary nor advisable to be practised in England. — Not necessary, because our harvests are, in general, more plentiful than in those countries where they have such repositories for corn. — And not advisable, on account of the prodigious expence of erecting and repairing those granaries throughout England; the continual expence of men to store, move, and deliver the corn, and the waste in long keeping. But admitting that the ends proposed by those granaries were obtained, viz. reducing the price of corn, and keeping it constantly at a more moderate price than it is now, after bad harvests, what would be the consequence? Not a regular uniform lowering of the price: for in that case, the farmers would have no expectation of making any considerable advantage by cultivating corn, which would be a certain means of discouraging the culture of it, and the cause of a real scarcity, and then the public granaries could not be supplied at a price so low, as would be of any advantage to the manufacturer and labourer. In most of those states, where public granaries are in use, they do not raise corn sufficient for the people, their dependance, in a great measure, being upon their hoarded corn. But in England, corn is an article of commerce, and a very valuable one, amounting in the century last past, to a clear profit of many millions sterling; besides the invaluable advantage of the surprising advance of agriculture, consequent upon the encouragement given to the farmers, by the exportation of corn: a measure whereof the good effects are evident, enriching the kingdom, and at the same time supplying the inhabitants with bread, in a cheaper and more plentiful manner than those of other countries, who have neglected agriculture, and depended upon public granaries.

The scheme above proposed of granaries, fourteen feet square, and seven stories of floors, would keep but a small quantity of wheat, and be attended with an expence as great, or greater, in proportion, than the large public granaries, both in their first erection, and in the expence of men and waste of corn; and, so far as they are similar to the larger, would in general be attended with the like bad consequences to the community: or if not altogether so hurtful, at whose expence are they to be erected? Few landlords would be at that expence, and few farmers could afford it. And such farmers as could afford to erect them, would hardly be persuaded to lay out so much money upon so uncertain a prospect, especially as the farmer cannot have any benefit from his money thus laid out, upon quitting the farm: for the landlord will not allow him to take away the granary, and if he was allowed that liberty, it would then be of little advantage to him to carry away the old materials: so that upon the whole, it is not probable that this scheme will ever be adopted to any general benefit.

It is therefore apparent that where corn can be kept by the farmers, they are the properest persons to keep it: for the removal of it from them, and laying of it up in any manner, will always be attended with a greater expence, and for that reason will come dearer to the consumer, than if it remained in the farmer's possession.

When the price of corn advances pretty high, and they see several stacks of corn in the yards of some of the wealthiest farmers, the lower class of people becomes extremely clamorous, charging the farmers with extortion and combination. That they endeavour to keep up the price cannot be doubted, as they look upon corn to be an article of merchandize, and are too often prompted by a covetous disposition, to keep up the price as high as they can: but in regard to a general combination among farmers, it is impracticable, for obvious reasons; and the poor should look upon such farmers who keep stocks of corn as their best friends: for should they sell all, as the little farmers are obliged to do, where else could the poor be supplied with bread, so cheap as from the farmers? If they

they have it from the dealers in corn, who hoard it, in expectation of profit by the price advancing, the poor must in that case pay the advanced price, which includes not only the prime cost paid to the farmer, but likewise all the subsequent advances upon it, of commission, carriage, warehouse-room, and the corn-dealers profit. Or if the corn is imported, the additional expences will be still greater to the consumer. Hence it is evident, that the poor cannot have bread in any way so cheap as from the farmers; and that it is the interest of the community to encourage and assist them to keep stocks of corn.

If corn is kept some years in stacks, it is liable to several casualties; the thatch is apt to be blown off, and let in the rain, and to sink down at the tops of the stack; in both which cases, which are very common, the corn will be damaged there, and to a considerable depth, unless great care is taken, and often examined, to prevent the damage. The straw is lost, or fit for nothing but dung, which, in most situations, is a considerable loss to the farmer. Another, and still greater loss, is by the mice and rats eating and wasting the corn, which is often difficult to prevent; for even the method of setting corn stacks upon saddles, which is a very good way, is not only attended with expence, but is sometimes ineffectual; because these vermin lodge in the sheaves, and in them are carried from the field into the stacks, or then get into them, by climbing up ladders, &c. that happen to be set against the stacks; and when this happens, and the corn is kept in the stacks for some years, they multiply incredibly; insomuch that often a very large proportion of the corn is destroyed by them; and there have been instances of their destroying all the corn in a stack.

Preserving corn in the grain, after it has been thrashed out, is, in many respects, preferable to keeping it in the straw; and the method of doing it, related by Mr. Tull, appears to be very ready and cheap, and may be practised by every farmer, especially with the assistance of a thermometer. The method also of keeping corn in granaries of preservation, is a very good one, and the above objections to it are fully obviated by what has been said on that head, confirmed by the experiments of Dr. Hales, M. Duhamel, and others before mentioned. That wheat may be preserved perfectly sweet for many years, by the assistance of kiln-drying and ventilation united, is undeniable, nor is there any doubt of ventilation alone being quite sufficient in general; and in very unfavourable seasons, the wheat may, for the greater safety, be first kiln-dried. And perhaps the effect of the kiln-drying may be assisted by ventilating it with warm or hot air at first, and till the moisture is discharged from it.—Upon the whole, the preservation of corn by the farmers is a matter of such importance and general concern to the community, that every person should endeavour to contribute all they can to the success of it.

A method of preserving corn, different from the others above-mentioned, has been practised with success by M. Marcel de Meziers, of Switzerland, which he relates as follows:

“As soon as the harvest is got in, I give the corn in the barn as much air as possible, to hasten the drying of the sheaves, which I find to be a matter of some importance.

About the middle of August, I get my wheat thrashed out. It costs me indeed something extraordinary; but I have ample amends made me, as it threshes, dresses, and dries better; is no longer subject to the depredations of the rats and mice; to the thefts of servants and labourers; to receiving damage by damps and hard rains; or to shedding in the barn, great part of which sheddings is generally lost. When the farmer, with the view of saving a trifle, puts off the threshing of his wheat till the winter, most of those losses are felt.

After the first day, I cause all they have threshed to be brought into a large room, the windows of which to the east and south are opened, and the floor being made very clean is covered two inches thick with the corn. As soon as it is dry enough, which may be known by its rattling when you pour it out of one hand into the other, I have it screened, which separates from it all the under corn, seeds of weeds, and dust.

I have ready some sacks, made very narrow, of coarse cloth, which have been dipped in a strong lixivium, several handfuls of green oziers having been put in-

to the ley, and into the copper cauldron where the ley was boiled. The reason of doing this will presently appear.

The sacks being well filled and fast tied, hold about three bushels (English) each. When all my sacks are filled, two tressels, about three feet high, with the backs rounded, and about eight inches wide, are set one beside the other. Upon these tressels, six sacks are laid, at six inches distance one from the other: on the intervals, five more are laid, then four, three, two, and one; so that the whole number seems to form a pyramid, consisting of twenty-one sacks. Other tressels of the same kind are used, for what remain to be piled.

When this work is completed, and the sacks are all placed in proper order, I cause the shutters and casements to be closed, and the double curtains of the windows to be drawn: the double doors are also shut, and I keep the keys in my bureau. I never touch this store but for the use of the family, and for sale; and it is very easy for me to distinguish which part is to be applied to those several uses, as I always have the precaution to pile them on different tressels.

Experience having convinced me, that every body, whether liquid or solid, which contains in itself any principle of fermentation, is most inclined to have that principle set in motion when it is long left in one situation without being moved: I never fail, towards the latter end of the month of March following, of having all the corn in my sacks again screened, observing when they are filled, to make them the same weight they were before; when they are once more laid on the tressels in the former order. About the end of June, I think it enough to empty the sacks, one into another, and replace them.

When I want my room for the new corn, I cause that of the last harvest to be carried to my town-house, where it is placed in the same order as it was in the country. In the month of October, the corn which was carried to town, is all screened, and sifted in a wire sieve, after which it is in order to go to the mill. This corn is intended for the consumption of the following year; so that the wheat which I grew in 1761, serves me for the year 1763.

As I always send to town more than I have occasion for, to supply the wants of my family, particularly when it is good in quality and low in price, I have preserved wheat in the manner above related for five years and upwards, without there being any visible difference, betwixt the grain so kept and that only one year old. I have purposely made bread of both sorts, at the same time, and diligently comparing one with the other, there appeared not to be the least advantage in point of goodness on either side.

It is true, that apprehending the dryness of the corn might occasion some inconvenience in the grinding, I caused the old wheat to be washed in several waters, till the water came away pure and unfulled; for the first water was dirty, and of a brownish colour: the wheat being afterwards dried, grinds very well. By this operation, the bread becomes whiter and sweeter, and I have experienced the same with regard to new wheat.

I may then safely conclude that in this manner corn may be preserved much longer than the time I have mentioned above to have experienced, without suffering any sensible damage; particularly, as all the damage to be apprehended, must proceed from the inward moisture of the grain, which moisture must doubtless be insensibly dissipated in the space of five years. If I mistake not, the following inferences may be drawn from the facts above-mentioned.

1. That threshing out wheat as soon as possible after harvest, preserves it from the damage and waste which must necessarily be the consequences of keeping it too long unthreshed in the barn.

2. That by putting it up in sacks when it is sufficiently dried, we guard against a winter's fermentation.

3. That the tressels keep it out of the way of rats and mice, and prevent its being damaged by any moisture, which might proceed from the floor.

4. That the sacks being impregnated with the powerful bitterness of the ozier, kept it from being attacked by any kind of insects, even flies; so much do they avoid this bitterness.

5. That the room being close shut, prevents the alterations

terations from the exterior air from having any sudden effect; on which account these alterations are to be less apprehended, and indeed scarcely at all.

6. That in case any sudden tempests of wind and rain should damage the room; and expose the corn to be wetted, it will be a very easy task to remove the sacks from the round surface of which the water will run off without soaking in; and if any should by chance be wetted, it will be easy to discover where the damage is done.

7. That every room which can be close shut, is fit for this purpose; as a shed built of timber frame-work, and lathed and plastered within, will be as fit for this use, as the most elegant granary built of free-stone. This is no small advantage.

8. That lastly, this method is neither troublesome, expensive, nor requires much attendance; the several operations being very easy, and to be done at several distant times.

The owner has it in his power, at the slightest view, to know what quantity of corn he is possessed of, and as he keeps himself the keys of his store room, it is as safe as the money in his chest.

In my method I guard as much as possible against the entrance of the air and light.

This way of preserving wheat in some sort answers the end that is proposed by kiln-drying it, which consists of drying corn in order to promote its preservation: all the difference is, that one operation is quick and forced, and the other requires more care and time.

The question may be reduced to this single point, which of the two methods with the most certainty preserves the corn without diminishing its natural substance; and with making the least alteration with respect to its nutritive and salubrious qualities.

I think myself obliged to acknowledge, that the kilns will most probably contribute to the longer preservation of the grain; but then I cannot hesitate asserting, that the other method will promote most the preservation of those qualities in the corn, which are so essential to the uses for which it is intended. The uses of wheat are, to make good bread, and for seed. In the above instance quoted from Mr. Tull, the kiln-dried wheat was very proper for seed, seven years after it was so dried; and was by the London bakers preferred to other wheat, not kiln-dried, for making bread.

Let as now, as opposed to the method I propose, make a few remarks on the preservation of wheat, in magazines of granaries, where it is laid in heaps.

It cannot but be acknowledged, that it is in this manner much more exposed to be injured by the alterations in the air, particularly in damp weather the moisture soon penetrates the floors, and the corn suffers accordingly.

It is besides very rare to find any corn, after being twelve or fifteen months in the granary, but what is attacked by weevils, and other pernicious insects. In case the roof should not happen to be weather proof, the least cracks are most dangerous. Let a single quart of water be, in summer time, poured into the middle of a large heap of wheat, and it is incredible to think what damage will be done in a short space of time.

It is needless to enlarge on the infinite number of inconveniencies which are known to attend this method of preserving grain, and by which such heavy losses have been frequently sustained.

It may perhaps be objected that this method, though very proper to be adopted by a private person, would be too expensive for a considerable magazine of corn, on account of the number of sacks which would be required.

I acknowledge that a considerable number of sacks will be necessary; yet is not this so expensive an article as may be imagined. If the sacks are bought at the first hand, they will cost less than a shilling a-piece; and with care, they will last long enough amply to repay their first cost.

The sacks certainly contribute to preserve the corn in good order, prevent waste, and are a security against private embezzlements. Lastly, as they are very easily removed, the corn may more certainly be saved, in cases of sudden fire or inundations. On the contrary, in these cases, how many difficulties are there to surmount when the corn is kept in large heaps in a granary.

Having no desire to form a scheme of a public nature, I have been content honestly, and in plain terms, to relate

what I have come to the knowledge of, by many years experience, and to lay open the inconveniencies which may attend the laying up of wheat, in the methods hitherto practised. This object is of too great importance for me to be under any apprehension that any one will think meanly of me for writing on this subject.

I have omitted all along disquisition, lest I should have extended this paper to too great a length: for instance, if we exclude the air and light, no insects will annoy the corn: but can we at the same time be secure that the wheat will not ferment, grow musty, and suffer some alteration for the worse? By guarding against the action of the air we do not exclude the air itself, which it is too ready to enter at every crack. When air is not in motion, it contracts a kind of corruption: is it not then natural that it should then communicate this corruption to bodies containing air? Let a dungeon, which has been long closely shut, be opened, and a disagreeable strong smell will surely issue from it; we must then conclude that a circulation of the air is necessary. The only question remaining is, how far this circulation may be permitted to take place, so that the alterations may not be too sudden.

"This method of preserving wheat was not published, as the author takes notice, as a scheme of a public nature, which does not lessen the value of this, or any scheme calculated to render the preservation of corn easily practised by private persons; but, on the contrary, is a great recommendation of them, the principal point in view being, to have a stock of sound corn in hand, sufficient to answer the general consumption, which cannot in any other way be obtained, and so cheap to the consumer, as in the hands of private persons, of small or moderate capitals, particularly the farmer or growers of corn; for every step it is removed from them inevitably loads it with an additional expence, which falls upon the consumer. For this reason we have enlarged upon this head, as it is of great importance to the community, and have exhibited the several and most approved practical methods of preserving corn with the greatest certainty, and at the smallest expence.

"And here, as objects of consequence, and nearly connected with the subject, we would recommend to farmers to keep their corn lands in particular as clean and free from weeds as possible, and to bind up their corn in small sheaves; both these will contribute to their getting in the corn in good order, in catching harvests, and render it the fitter for preservation."

"I forgot to observe, that I have lately seen Mons. du Hamel's methods of preserving grain, by means of chests with false bottoms and ventilators.

"This method may in some cases be of service, I allow; but I am nevertheless of opinion, that corn cannot be properly preserved, unless the whole bulk of it be frequently stirred, which by du Hamel's method is not done: could the current of air be equally distributed over the whole chests, and in due proportion, I should still think it sufficient to preserve the corn; and if corn has been kept for some time in that manner, I should rather be apt to attribute it to Mons. du Hamel's first drying it on a kiln, before he puts it into the chests, than to any regular effect of the ventilators.

"Were I acquainted with this gentleman, I would recommend it to him, to make an experiment of his method in the following manner:

"Let him first fill a chest with dry corn that has not been on the kiln: another chest should be filled with some that had been well dried; and a third with the same dried corn: let the first and second chests, at proper intervals, be ventilated, and the third be kept without ventilating, in a dry place. Were this done, I am apt to think, that after six months, or a longer time, there would not be found so great a difference as some may imagine, betwixt the corn which was and that which was not ventilated.

"In my method, the expence, as well as hazard of drying, is avoided, it being never necessary, unless when corn is got in very soft, in a wet harvest; and then a common malt-kiln answers the purpose very well.

"I should have mentioned, that in my method of preserving corn, when by frequent stirrings it is become hard and brittle, it may be laid to the height of three feet, on the floors of the cells, without any danger of damage ensuing; for when it is hard, it is not subject

to heat and ferment; neither are insects so fond of attacking it.

"I have by this time, perhaps, tired your attention, and to be plain, am not unwearied myself; shall therefore conclude with assuring you that I am, Sir,

Your very humble servant,

A MEMBER of the SOCIETY."

Mr. Marshall, in his Rural Economy of Gloucester, says, "If wheat get rank in autumn, it is esteemed good management to eat it down with sheep: not however by a few kept long upon it; but by a large flock at once.

"This is a new idea. The practice may be good. The great complaint against the early sowing of wheat is that of its being liable to get winter-proud. Eating it off, in autumn, may give it a check, and prevent that evil consequence. Eating it in spring is here considered as pernicious.

"Wheat is usually weeded with spud-hooks; not hoed, as in the Vale. One instance, however, in which a thin crop, full of seed weeds, was hoed in autumn with uncommon success, occurred in the practice of a superior manager, in this district: and others, in which wheat have been weeded in autumn, with great advantage. Where wheat is sown very early, as in this district, and the land at the same time full of seed weeds, one or other of these operations seems to be in a degree requisite."

WHEE, or WHEY: a heifer.

WHEY and WHEY BUTTER. See DAIRY.

WHINS, the same with furze. See the article FURZE.

WHISKET, a basket.

WHITE-CLOVER, a well known plant, and reckoned the sweetest feed of any of the sown grasses; and it is of most advantage to the farmer, because it is perennial, or lasts a great number of years on the land.

This plant sends forth roots at every joint, so that it thickens, and soon makes a thick sward. When land is to be laid down for pasture, the farmers will reap great profit, if, with about four bushels of clean sifted hayseed to an acre, he sows eight pounds of this clover; but it is to be remarked, that it is never to be sown with corn.

It may be sown either in spring or autumn; if in spring, it may be cut about the latter end of July; if sown in autumn, the crop will be much earlier. As soon as ever the hay is off the land, it should be rolled with a heavy roller. In laying down land with these grasses, it will be proper for the farmer to be very careful that he cleans the land of all sorts of seeds; and the hayseeds are to be sown first, immediately after which the clover is to be regularly scattered. After sowing, the land should be lightly harrowed, with a short tined harrow, to bury the seed; and a few days afterwards, if the weather is dry, it should be rolled, to break the clods and loosen it.

It will be good husbandry, if, after the plants are come up, the farmer should send in some weeders, to pull up all the tall rampant weeds which might injure the crop, for, if they are suffered to seed, they will soon stock the land.

It will be proper to take the advantage of dry weather, and roll the land three or four times, after the plants have attained some size; for the clover, as is already observed, taking root at every joint, the sward will thereby be greatly thickened.

If a farmer knows his own interest, he will sow some of this white clover-seed by itself, in order to supply himself with what seed he may want, for sometimes it is very dear. The best season for sowing is autumn, upon dry lands, about the beginning or middle of September; but in open, cold lands, much exposed, a month sooner is better: all the caution required in this autumnal sowing is to let the land be very well rolled in the month of October, before the frosts come on, and again in March.

WHITE-SCOUR, a disease with which sheep are too often affected, and by which great numbers of them die.

The following medicine has been often given with success, provided the sheep are at the same time removed into a dry pasture.

Take a pint of old verjuice, half a pound of common or bay salt, dried well before the fire, pounded, and sifted through a sieve. Then mix the verjuice with the salt by degrees; and add half a pint of common gin, and bottle it up for use. When any of your sheep are seized with this disorder, separate them from the flock, and give each of them three large table spoonfuls of the mixture for a dose, repeating it two days after, if they are not better.

WHITE-LANDS; chalky lands.

WILD OATS. See OATS.

WILDS, a term used by our farmers to express that part of a plough by which the whole is drawn forward.

WILLOW, the name of a well-known tree, of which there are several species, some of which may be propagated to great advantage, particularly that known by the name of the Norfolk willow, as demonstrated by the late Mr. North, in an Appendix to a little Treatise on Grasses, published by him some years ago. As this pamphlet may have reached the hands of but few of our readers, and will, now the author is dead, be scarcely ever re-published; we were persuaded it merited a place in our work, especially as it may serve as an example of a profitable method of cultivating trees of this kind, that may be applied to several others, only observing a due regard to the difference of circumstances.

Directions for propagating the sound-growing Norfolk Willow.

"This willow (I dare affirm) will prove very profitable to the planter, and of great utility to the kingdom in general. It will grow taller and larger in twenty or thirty years, than most other sorts of trees will in sixty or seventy. It grows very kindly, and great quantities may be propagated at a small expence. A very considerable profit from it will come to the planter in five or six years after planting: in eight or ten years more another profit will arise much larger than the first; and at last, which will be in about twenty or thirty years after planting, the profit will be surprising, as I will make it appear in the subsequent account.

"In order to begin with this willow-plantation, the land must be securely fenced from all kinds of cattle, and must be well ploughed or dug in winter, to make the surface loose, and to kill the grass and weeds. The season for planting is from November to April, and sometimes later. The driest land should be planted first.

"One year's shoots are best for sets when they are designed to make large trees. The sets should be cut to eighteen or twenty inches long; about eight or nine inches of the thick or lower ends must be thrust into the ground. A strong shoot of one year's growth will frequently make three or four good sets, but I would not advise cutting any sets from the very tops of the rods, because they will be too weak to make strong shoots the first year.

"The proper distance these sets should be planted, is about three feet promiscuously. An acre will require about five thousand. In June, after planting, the sets should be all looked carefully over: and such as have more than one shoot, should be reduced to one, and it should be minded, to leave the uppermost and strongest. The superfluous shoots should be cut off close to the set, that the bark may sooner cover the wound.

"At the same time the ground should be hoed over to kill the weeds, and to loosen the surface, in order to sow turneps, which will no ways hurt the sets, but rather be of service, provided they are properly hoed, and set out at good distances, and not suffered to grow within a foot of the sets. The winter following, when the turneps are gone, the ground should be dug all over, and, the summer after, the weeds cut down with hooks; which is the last, and all the labour of cleaning they will ever want. The best instrument to dig these plantations with, is the sort of broad-tined fork they use in Kent to dig their hop-grounds. The price, by the acre, is twelve shillings for once digging.

"When these sets have grown four or five years, about three-fourths of them must be dug up, in order to leave space for the others to thrive. If they have thrived well, in five years they will be above a foot in circumference,

and twenty or thirty feet high. These young trees will be very proper for many uses, as for chair-makers, hoops, gates, hop-poles, &c. and will surely be worth three-pence a piece upon an average.

"From five thousand sets which are planted upon an acre, at about three feet apart, certainly three thousand may be very properly taken away, and the remaining ones will not be left quite six feet apart. If these young trees are valued at but three-pence a piece, they will be worth thirty-seven pounds, but I rather believe they will be worth more. Eight or ten years after the first thinning, three parts in four should again be took up, which will be about one thousand five hundred; and five hundred or more will be left at about twelve feet apart, which should grow twelve or fifteen years longer, when they will be in fine maturity. The second thinning will be of much more value than the first; upon an average, no doubt but they will be worth half a crown a tree at least, as they will be tall and large, and may be put to divers uses. Many of them will be very proper for masts for small vessels, as the wood is light and tough.

"In twelve or fifteen years more, the remaining five hundred trees will be very tall and large, perhaps above sixty feet high, and five or six feet in circumference. The least value one may conceive must be twenty shillings a tree; so that, at the lowest profit one can set upon the produce of an acre of land, planted with this noble willow, in about thirty years at most, it will be worth six hundred pounds, and all the rent, &c. paid at the rate of twenty shillings a year. I really think I have allowed too low prices for the growth, and that it is very probable they will be worth more. The wood of this tree is very white and tough, and without pith or sap; so must be very proper for carvers, turners, &c. Boards of this wood are as good for floors, or wainscoting common rooms, as any other. I am told, by a man of great veracity and judgment, that posts of this wood, set in the ground, will outlast all other sorts, except yew, or heart of oak. He also affirms, that there is no tree upon the earth so proper for ships masts as this, as it is light and tough, and will not splinter, as fir does.

"This tree has oblong, pointed, saw-edged leaves of a most refreshing light green; at the bottom of each foot-stalk grow two small wings, which almost environ the young shoots.

"This willow will thrive upon almost any soil, so it be not too dry.

"It is also the best kind to plant, in large sets, by the sides of rills, &c. where they will produce larger lopping, and in less time than any other sort of willow will do.

"If any gentleman, &c. have a mind to make plantations of this profitable tree, it would be well worth their while to lay out the ground in some gentle meander walks; which will be but little extraordinary expence, and in a few years will give both shade and shelter.

"This willow will make the most profitable coppice woods, to cut every six or eight years, for hop-holes, and many other very useful purposes.

"They should at first be planted about two feet and a half apart; and, after five or six years, three parts in four should be dug up, and the remainder cut down within six or eight inches of the ground, to remain for stubs.

"This is also one of the best sorts of willow for basket-makers, as it grows freely, and is very tough.

"In many countries, where firing is scarce, this willow would turn to great advantage, merely for fuel; as it will grow into large billets in three or four years, and will burn very well both green and dry.

"Since I wrote this, a gentleman told me, that he knew of three willow trees being sold for fifteen pounds; but he could not inform me what kind they were; I fancy them to be the bright swallow-tail willow; for, next to the Norfolk kind, it is the largest growing sort, and best for most uses."

Mr. North calls this the Norfolk willow; but that is only a local name for this tree. It is by some called the Hertfordshire willow, and has had various other names in different places. The description he has given of the leaves, and the firm sound texture of the wood, without pith or sap, will, however, sufficiently ascertain the species to those who may not before know it. When he published this account, he advertised, that he would

furnish sets to any who might want them. As he is very lately dead, who may be his successors in his business, or whether they will continue to provide for the demand of sets, we are at present ignorant: but it would be a matter of regret, that the difficulty of procuring them should be any discouragement to those who may be disposed to make plantations of this tree.

There is an addition, which might be made to Mr. North's plan of deriving an intermediate profit from a plantation of these trees, while the principal of them are growing to due maturity. It is this; to leave at the second thinning one tree in the middle of every four, that are intended to grow to maturity; which middle tree will consequently be at more than six feet distance from any other, being in the diagonal line of the four. The trees so left should be then cut down, within six or eight inches of the ground, and suffered to shoot afterwards as stubs or pollards. In which state they will afford hop-holes, billets, twigs, for basket-work, &c. if cut at proper periods, from seven years to every other year, respectively to the purposes, for which the shoots may be wanted. This kind of plantation of pollards, with tall trees, is not so proper in a dry, as in a moist situation; because the crowding the roots may, in dry seasons, injure the growth of the trees intended to stand for wood, where there is a want of moisture in the ground. But in a wet soil, it will rather assist than retard them; and will be a constant source of profit during the whole continuance of the plantation.

Other trees may be treated in the same manner, allowing for the respective differences of each, with very great advantage, in swampy and marshy ground, as in the low parts of meadows, or the waste of manors: and the plantations will often prove a beauty and convenience in other respects. In such cases the twenty shillings per year allowed for rent in Mr. North's account may be wholly or mostly saved.

WIND-GALL, a flatulent swelling which yields to the pressure of the finger, and recovers its shape on the removal thereof: the tumor is visible to the eye, and often seated on both sides of the back sinew, above the fetlocks, on the fore legs; but most frequently on the hind legs; though they are met with in various parts of the body, wherever membranes can be so separated, that a quantity of air and ferocities may be included within their duplicatures.

When they appear near the joints and tendons, they are generally caused by strains, or bruises on the sinews, or the sheath that covers them; which by being overstretched, have some of their fibres ruptured; whence probably may ooze out that fluid which is commonly found with the included air: though where these swellings shew themselves in the interstices of large muscles, which appear blown up like bladders, air alone is the chief fluid; and these may safely be opened, and treated as a common wound.

On the first appearance of wind-galls, their cure should be attempted by restrainers and bandage; for which purpose let the swelling be bathed twice a day with vinegar, or verjuice alone, or let the part be fomented with a decoction of oak-bark, pomegranate, and allum boiled in verjuice, binding over it, with a roller, a woollen cloth soaked in the same. Some for this purpose use red wine lees, others carriers shavings wetted with the same, or vinegar, bracing the part up with a firm bandage.

If this method, after a proper trial, should not be found to succeed, authors have advised the swelling to be pierced with an awl, or opened with a knife; but mild blistering has in general the preference given to these methods; the including fluids being thereby drawn off, the impacted air dispersed, and the tumour gradually diminished. A little of the blistering ointment should be laid on every other day for a week, which brings on a plentiful discharge, but generally in a few days is dried up, when the horse may be put to his usual work, and the blistering ointment renewed in that manner once a month or oftener, as the horse can be spared from business, till the cure is completed. This is the only method to prevent scars, which firing of course leaves behind, and unless skilfully executed, too often likewise a fullness of the joint, with stiffness; the mild blistering ointment, where the sublimate is left out, is the properest for this purpose. *Bartlett's Farriery*, p. 276.

WIND-ROW, the green parts, or borders of a field, dug up, in order to carry the earth on the land to mend it; so called because it is laid in rows, and exposed to the wind.

WINE,

WINE, a general name given to any brisk, agreeable, cordial liquor drawn from vegetable bodies and fermented, particularly that procured from the juice of the grape. See the article FERMENTATION.

One and the same kind of grape proves greatly different in taste and flavour, according to the climate and exposure to the sun. In cold countries the vine, if it grows at all, never ripens its fruit; and even in France and Italy, it is constantly observed, that the grapes produced on the south sides of hills are notably sweeter than those which grow on plain grounds. Among the Tokay wine-hills, there is but one which directly fronts the south, and the advantage of its situation is not a little remarkable: from the extraordinary sweetness of its grapes, it is called the sugar hill. It affords the most delicious of all the Hungarian wines, and is appropriated to the use of the imperial family.

In very warm dry seasons, the grapes at the bottom of the hills are best; in warm and moist ones, those at the top; such as grow in the mid region being always good. In dry summers, the grapes are sweetest, but least juicy: in rainy ones they abound with juice, which proves proportionably weaker and more dilute. Frosts in autumn promote their ripening; but frosts succeeding heavy rains make them apt to burst and shed their juice.

The grapes in America are remarkably apt to burst; which Mr. Miller imputes, either to the too great moisture of the air in that country, or to their receiving too much nourishment from its over rich soil. But gentlemen of America think that their air, except in marshy places, is drier than ours; and are therefore of opinion, that the bursting of their grapes is not owing to the too great moisture of the air. If it proceeds from too much nourishment, the remedy would seem to be easy, by training up a great number of branches to consume that nourishment. Others, perhaps with more reason, impute their bursting to their ripening too early, while the heavy rains, frequent in autumn, continue to fall. In this case, they may be raised against lofty trees, as was the method of the ancient Romans, and as still is the practice in many parts of Languedoc and Provence. The reflexion of the heat from the earth would then be less, and the leaves of the trees would shelter the grapes from the sun. By this means, being later before they fill, they would not be so apt to burst; and as the latter end of the autumn is generally fair, they may then have an opportunity of coming to their full maturity, without the danger of bursting. Or if it be thought more advisable to quicken their ripening, the warmest soil and situation should be chosen for the vines, and they should be kept low.

A due degree of maturity is essentially necessary in every kind of fruit, the juice of which is to be made into wine: because the juice of unripe fruit is a rough acid liquor, which cannot be made to undergo a vinous fermentation, without great difficulty. In some instances, as in verjuice, it will remain in the same state for years together. Nor is there less danger from the fruit's being over ripe; because the least taint or putrefaction will, as before observed, run through the whole process of the wine, in spite of every art that can be used to correct or remove it.

When a considerable portion of the grapes have attained their full maturity, these should be gathered with great skill and care, leaving the unripe for a future gathering. Most vintagers make it an almost general rule, to gather their grapes at a certain stated time, according to the custom of the country, without attending to their various degrees of ripeness; therein imitating other rustics, who seldom vary their operations as the seasons vary. Thus, in some countries they make it a general rule, to gather their grapes when dry, and in others they as carefully gather them when they are wet with dew. In both, the circumstances of the seasons should perhaps vary this custom: for example, when a warm kindly season has brought the grapes to a due maturity, such juice wants no addition; and if, on the other hand, the dryness of the season should have thickened their juice too much, the dew may remedy that defect. If a cold or rainy season has prevented their ripening thoroughly, and they still continue in an acid watery state, surely the warmest and driest hours should be chosen for gathering them.

In some places the grape is concentrated or rendered richer by suffering it to remain on the tree till great part of its watery moisture has exhaled; the stem of each cluster being cut half through, when the fruit is ripe, to prevent the afflux of any fresh juice from the plant. The sweet Hun-

garian and Spanish wines are made from grapes that have been thus half dried.

In order to make good wine, the grapes of the same vine should be gathered at three different times. The first gathering should consist of the ripest, finest, and most open bunches: they should be cut as close as possible to the fruit, the better to avoid the austere sharpness and bitterness of the stalk, and all their rotten or green berries be carefully picked off, or rather cut off with a pair of sharp scissars. Some are even so nice as to cut off the grapes at the ends of the bunches, because they are always weaker in quality, as well as less ripe, than those which grow higher upon the stalk. By this means they indeed diminish the quantity of their wine; but what they do make, is thereby vastly improved. An inferior wine is, however, made of the grapes which are so cut off. This practice is, indeed, attended with some trouble; but it answers extremely well, and deserves to be much recommended, as a means of obtaining at least some good wine, in years when, and places where, the grapes do not ripen perfectly. The second gathering should be of the large, close, and less ripe bunches; for close bunches never ripen thoroughly: and the third will of course consist of the refuse of the former gatherings; but no rotten grapes should ever be mixed with either. Each of these three cuttings should be pressed separately. It is highly necessary always to employ a sufficient number of gatherers, each of which should be provided with a basket and knife, and should lay the bunches, as fast as they are cut, gently in the baskets, without bruising or squeezing them; for the more expeditiously they are gathered, the finer will be the colour of the wine: and the sooner they are pressed, the better will be its quality. Women are most commonly employed for gathering the grapes, because their labour is cheaper than that of men, and this does not require any great exertion of strength.

This first work, which is of the utmost importance to the making of good wine, may be still more completely performed by duly attending to the following circumstance. The fruits of different vineyards are of different qualities; some, situated on very light and stoney land, yield exceedingly delicate and high-flavoured wine, which seldom is strong, whilst the grapes of vines growing on a richer soil, where they receive more nourishment, afford a wine which has more body. Both these good qualities may be united in the same wine, either by mixing the grapes of the different growths before they are pressed, or by mixing the different wines that have been obtained from them; but the surest way is to mix the grapes, because it is thought that these liquors do not easily incorporate perfectly after they are made: the weakest of them is said to change its colour, and to communicate its defects to the other, instead of being mended by the superior quality of that with which it is blended; so that, according to many who pretend to have had long experience in these matters, the least evil, and that least is a very great one, which can arise from thence, is a cloudiness in the liquor, a sort of floating lees which will always tarnish the beauty of its colour, spoil the perfection of its taste, and prevent its ever becoming perfectly bright. This does not happen when the perfect grapes of one vineyard are mixed with the perfect grapes of another: for, from the juices of these different fruits pressed out and fermented together, proceeds an exquisite, sound, delicate, fragrant, and bright-coloured liquor, which will keep several years without the least alteration. It is by a knowledge of the good effects produced by a judicious mixture of the grapes of three or four vineyards of different qualities, that the celebrated Champagne wines of Salleri, Ai, and Hautvilliers, have been brought to the perfection for which they are so famed. Every thing that can delight the palate seems to be united in them. But this knowledge can be acquired only by many repeated trials, and long experience.

One of the ways of making wine in the highest perfection of which it is susceptible, is to strip the grapes from off their stalks before they are thrown into the vat. By this means all the austere roughness which the stalks would communicate to the liquor, is guarded against; and the must may be suffered to ferment, without danger, till the fermentation has sufficiently opened the body of the fruit. The wine which is thus obtained is the mellowest, best coloured, soundest, and fittest for keeping.

The above directions for gathering and sorting the grapes are equally proper, whether white wine is to be made, or red;

red; for either of these differently-coloured wines may be, and generally is, obtained from the same grapes, that is to say, from black ones. As to the white wine which white grapes yield, it seldom has much strength or flavour, soon grows yellow, and, for want of body, rarely keeps well even till the next summer. All the white wines of Champagne, which look as bright and as clear as crystal, are made from the blackest grapes, and never preserve their colour better than when all the plants of white grapes have been rooted out of the vineyard. Formerly the wine of Aï would hardly keep a year; the thin sweet juice of the white grapes, of which the quantity was great in the vineyards of that district, turning yellow, gained the ascendant, and altered the whole mass of the wine. But since white grapes have been no longer used in the white Champagne wines, that of the mountain of Rheims lasts seven or eight years, and that of the river Marne keeps well for four or five.

The wine of black grapes may be made of almost any depth of colour that one pleases. They who desire to have it perfectly white, proceed thus. The gatherers go into the vineyard very early in the morning, and select the finest bunches, which they cut as close as possible to the fruit, then lay them gently in their small hand baskets, and when these begin to be full, put them, still as gently as can be, into panniers, commonly called dorfers, in which men or women carry them, with the greatest care not to tumble or bruise them in the least, to the end of the vineyard, where they are put carefully into large panniers, with all their bloom, or azure, as it is technically termed, and all the dew upon them. This dew increases greatly the quantity of the wine: but at the same time it weakens it considerably.

If the sun begins to be a little powerful, the vintagers spread wet cloths over the baskets, whether dorfers or panniers; because, if the grapes should be heated, the liquor drawn from them would be apt to contract a reddish teint. If the place where they are to be pressed is not far from the vineyard, men or women carry the dorfers gently on their backs to the press; but if the distance is considerable, the panniers, into which the grapes are in that case put, are loaded upon quiet easy-going beasts, which carry them slowly, and without shaking, to the cellar, where they remain covered and cool. When the heat of the sun is but moderate, the vintagers continue their work safely till eleven o'clock: but when it shines strongly, they leave off at nine.

For the making of white wine, of which we now speak, the grapes are thrown, as fast as the panniers arrive with them, not into the vat, as would be done for red wine, but into the press, of whatever form it be, and the first pressing is given immediately. The wine which runs from this pressing is the most delicate of any. The French call it *vin de goutte*, because it rather drops than runs, as but little force is used in pressing it. After this first pressing, which is but gentle, for fear of discolouring the liquor, the press is raised, the scattered grapes are thrown up upon the cake, and the second pressing, called the turning up (*la retroussé*) is given. Here the press is screwed down with much greater force than before, and if this second running is not quite so plentiful as the first, though it sometimes is more so, it is at least but little inferior to it in flavour or colour, and preferable in this, that it has a stronger body, and will keep a considerable longer time. The wine of the first pressing is, however, always set apart, if it has been drawn from quite ripe grapes and in very warm weather; because the juice of the fruit then runs very plentifully, and there might be danger of reddening it by mixing it with that of the second pressing: but this mixing of them is useful, and sometimes necessary, on account of the greater strength of the second running when the year is not a warm one, and when the first pressing has not yielded plentifully.

After the two first pressings, the sides of the cake of grapes are cut down perpendicularly, with a steel spade, so far as they exceed the breadth of the upper part of the press which is let down upon the fruit; the grapes thereby separated are thrown up on the top of the cake; and the third pressing, commonly called the first cutting, is given. The juices of this first cutting are excellent to make a perfect liquor; and they may also be added to the red wine, if any of this is made separately. A fourth pressing, a fifth, and so on of others, which are called the second, third, and fourth cutting, are given after this; the sides of the cake being cut down and thrown up each time, till the grapes cease to yield more juice.

The liquor of the cuttings becomes gradually more and more red, because the action of the press becomes more and more forcible upon the thin skin which envelopes the berry; and the particles detached from thence are what render the wine red. Sometimes too the heat of the sun, or the shaking of the fruit in the carriage, are so great, and act so powerfully upon the outside of the grapes, that the tingeing particles, which are in the skin of the berries, being let loose, mix immediately with the juice of the grape at the very first pressing, and then a perfectly white wine cannot be made; but it will be the colour of a partridge's eye, or even deeper. The wine itself is not, in fact, at all the worse for this: but the fashion is to have it either perfectly white, or of a full bright red.

The wines of these different cuttings (as the latter pressings are called) are collected separately, and afterwards mixed according as they contain more or less of the quality that is wanted. Those who have many grapes, press them at two, three, or even four different times, and collect each of the runnings separately. For the first they constantly choose the most perfect grapes, and this wine is always worth a third part more than the second, and so on in proportion.

It is essential to observe, that the pressings for white wine, if it be wished to have it very pale, should be performed as quick as possible one after the other, in order that the grapes may not have time to heat, nor the liquor remain long upon the mark. Particular attention should be paid to this for the two first runnings, because they yield the finest wine.

Of the same black grapes, namely, the black morillons, the pinaous, and the Avernats, with which we have seen that white wine is made in Champagne, red wine is made in Burgundy; and indeed, the same has, of late years, been attempted also in Champagne, with no bad success; though not so as by any means to equal the fine white wines of that country, or the best red wines of Burgundy.

As much as the heat of the sun is avoided by the vintagers who make white wine, so much it is sought after and wished for by those who make red wine. These always choose to gather their grapes when the sun shines hottest; because they find that its action upon the outside of the berries produces more effect than several days steeping in the vat would do; for that the grapes then ferment very speedily. As to the rest, the cautions before directed for gathering the grapes for white wine, in regard to their ripeness, the sorting of them, cutting the branches off with as short stalks as possible, clearing them of all damaged, rotten, and unripe berries, &c. should be equally observed here. Some expose the juice of these grapes in the open air, either in the vineyard itself or close to it, by throwing the bunches into large tubs, and there mashing or bruising them to pieces with sticks, or by putting children into the tubs to tread out their juice. Others carry them home, with care not to bruise them by the way, and put them in a vat, in which they are trodden and mashed. This, in either of these cases, is repeated till the vessel is full; and after that, the broken grapes are let lie in their liquor more or less time, according to the heat of the weather, the flavour of the must, and the degree of colour that is intended to be given to the wine. During this time, the whole must be frequently stirred together, the better to raise a fermentation, and tinge the liquor with a due degree of red; for it is known by experience, that the redness of wine proceeds from the more or less intimate mixture of the colouring which is in the skin of the grape, with the juice which is contained in the pulpy body of the berry. It is, in fact, chiefly to give this dye to the wine, that the trodden grapes are let lie to ferment in the tub or vat before they are pressed.

Some advise, as a general rule for all red wine, to let the grapes lie in their liquor forty-eight hours; whilst others, going on in the beaten track of their forefathers, without daring even to suspect that there may possibly be errors in the stated practice of their country, talk of letting the grapes infuse during seven or eight days, or even longer, and act accordingly: but the author of the *Maisons Rustique*, who seem to have taken their directions from more judicious and more accurate observations, say positively, that the duration of this infusion of the husks should be proportioned, not only to the heat of the weather, but also to the natural quality of the grapes, and to the usual, or intended colour of the wine that is to be made. Thus, for the Coulange wine, which is one of the most esteemed growths of Burgundy, only four hours, or at most five, are allowed for the

the steeping of the husks, unless the weather be chilly and rainy, in which case they are sometimes suffered to remain all night in the liquor. This is likewise, now, the practice of the best vintagers throughout the whole province of Burgundy, in most parts of that of Orleans, and, in short, in almost every part of France where the finest, highest flavoured, and most spirituous red wines are made: and the reasons for it are, that this time is found to be sufficient to give the wine a duly deep colour; that it is apt to contract a roughness from the stalks if it remains too long upon them (to guard against which, as much as can be, care be taken to pull the stalks out with the rake or stick, with which the must is stirred in the tubs or vat, whilst others, more cautious, pick the grapes from off them before it is trodden out): and also, because too much fermenting of the must always renders the wine harsh and coarse, deprives it of its most volatile parts, and the quantity of the must is considerably diminished by the loss of what flies off, or is otherwise wasted in the fermentation. Others again make it a rule not to draw off their must till its head begins to fall. But in this they are evidently wrong; because a great part of the most active spirit of the liquor is certainly evaporated thereby. It may indeed be true, and probably is, that the liquor which has lain long upon the murk, acquires the most strength, and is therefore fittest for keeping: but at the same time it also acquires a roughness and bitterness of taste, communicated from the stones and stalks of the grapes, which are far from rendering it the more palatable.

Might not the surest way of judging when the liquor has lain a sufficient time upon the bruised grapes be, to thrust one's hand pretty deep into the vat, to take from thence a handful of the murk, and to smell to it, as the dyers do, to judge of the disposition of their vats? One might then, perhaps, especially with the help of some experience, know pretty exactly whether the liquor be sufficiently concocted, and whether it has acquired colour enough. If it smells sweet, it should be let work a little longer in the vat; at least till it has lost that smell, and has acquired so strong a scent as to affect the nose. Then may probably be the right time for drawing it off. A good bodied wine will never taste of the grape-stone, if it be taken in its proper degree of the vat: but it will keep sound for many years, and be always fit to drink.

To the different ways of managing the must is certainly owing, in a great measure at least, that some people make much better wine than others from grapes of the very same sort, of equal ripeness, and of the growth of equally good and well situated vineyards. Indeed, for thicker, heavier, and coarser wines, than those of either Burgundy or Orleans, of which chiefly we have now been speaking; such, for example, as the Bordeaux claret, of which we are so fond in this country, and of which the French themselves do not drink at home, a whole day is frequently allowed for the steeping the husks, and some times more, before the press is recurred to. But as to the rule of letting the grapes lie to steep in their liquor forty-eight hours, and much less the longer time which some recommend and practise, we cannot, for the above reasons, think it properly applicable to any sort of wine, unless it may, perhaps, be in very cold unfavourable weather, or for such thick, heavy, dark-coloured, and very heady wines, as those of Oporto, which, as is well known, are scarcely drinkable even here, till age has depurated them, and softened their natural roughness. It is true, that wine which has fermented long upon the murk may always be best for keeping; but it will never be the most pleasing to drink.

We consequently do not approve of this part of the method of making red wine in Chianti, from whence we may probably judge of the general practice in Italy. When the grapes there are of a due ripeness, and the weather warm and dry, they are cut as soon as the sun or wind has dried up the dew that was on them, and are put into little barrels commonly called piggins, in which they are carried to the wine vat, on mules if it be distant, but between two men if it be near. They are then bruised to mash in those barrels with a club, and thrown directly into the vat, or else into a kind of very large hopper placed over the vat, with a grate lengthwise, through which the juice, husks, stones, and stalks all pass into the vat, upon their being trodden; and this is continued till the vat is full: when immediately, or sometimes even hours before it is full, the must thus made, ferments. By this means the husks, stalks, and stones, are thrown up to the top of the liquor, where they

form a thick crust; and this ebullition, which will continue for many days if the liquor be strong, for its duration depends on the strength of the must as well as on the temperature of the air, is suffered to proceed till the wine is judged to be fit for drawing off. This fitness is determined by the palate; and herein consists the greatest skill in the art of making wine. Old practitioners know precisely, by the colour, smell, and taste of the must, the exact time that best suits their method of proceeding: but it cannot be learnt without great attention, and long experience. The wines of the plains are generally deemed ready for turning in about ten days, those of the hills in about fifteen, and those of the mountains in Chianti in about eighteen or twenty, or sometimes more; for in this way of proceeding, the weather has always a very great influence on the ripening of the must. When it is judged to be near ready for running, those who are skilled in those matters taste it every eight hours. The longer the ebullition is continued, the drier and deeper coloured will the wine be: and the less it is continued, the sweeter and paler will be the liquor.

The vats are proportioned to the quantity of wine that is to be made at one pressing, and they frequently are several of them in the same vineyard; for the Italians press all their red grapes in the open air. The vats on which the hoppers are set are covered with boards, and a coarse linen cloth, the better to prevent the evaporating of the wine, and other accidents.

When the Italians make their strong white wines, or muscadines, they gather their grapes carefully, and lay them in the sun for three or four days, or more; always housing them at night, or at least covering them, so that no dew may fall on them. They call the ebullition which these undergo in the vat, a short one, because it does not exceed five or six days; after which they run up the wine, and shift it twice or thrice from one cask to another, to make it become fine. As to the Verdea or white Florence, as it is called, they draw it off from the vat almost as soon as an ebullition begins to rise in it, and has thrown up the husks, stones, &c. so as to form a crust at top. They then let the ebullition continue for a day and a half, or at most two days, in the cask into which it has been drawn, from which they afterwards shift it into another; and in a few hours more into a third and fourth, to check and prevent the fermentation. By this means it is made to retain that sweetness which the ladies in most countries are fond of: but wine thus managed never is perfectly fine.

When the must has fermented upon the husks of the grapes in the tubs, or vats, as long as is thought proper, it is poured off from the former into other vessels, and drawn off from the latter by means of a brass cock placed about three or four inches above the bottom of the vat, from whence it runs into a receiver, which, as well as that under the press, generally is a very large cask, open at one end, and placed upright directly underneath the cock or channel through which the liquor flows. A bundle of pretty close-tied twigs, commonly of vine cuttings or of the haulm of a paragus run up to seed, is placed within the vat, before the grapes are put into it to be trodden, close to the entrance of the cock, to prevent the husks from running into it, so as to choke it up; and a large stone or two is laid upon this bundle, to keep it down. Besides this precaution to retain the husks, &c. of the grapes, and prevent their mixing with the liquor that is drawn off, some, for greater security, let their must from the cock through a sieve, into the receiver, from whence (as also from the above-mentioned tubs, in the using of which the same precaution of keeping back the husks, &c. is carefully observed when the liquor is poured out of one into another) it is laded by hand, in bowls, jugs, jets, or pails, and poured into the casks, through pewter funnels.

After the must has been thus poured or drawn off, the murk, that is to say, the remainder of the grapes at the bottom of the tubs or vat, is collected together and put into the press, where it is squeezed very hard, three or four times, in short, till it is perfectly dry, its sides being cut down each time, and thrown up, as before directed, for the latter pressings of the grapes; and the liquor obtained from thence, especially if the press be screwed so tight as to crack the seeds of the grapes, has a stronger body than any of the preceding runnings, but not any part of their fine, high, or delicate flavour. Some, however, mix a little of it with their other wines, to strengthen them, and thereby make them keep the better: but certainly not to mend their taste.

Others,

Others, in whom the spirit of œconomy is very prevalent, pour as much water as they think proper upon the murk in the vat, immediately after the must has been drawn off. They do this immediately, for fear of the murk's turning sour, as it would be very apt to do, if they should wait longer. They then stir it about, and leave it upon the murk a longer or shorter time, according to the heat of the weather, till they find it pretty highly coloured, and judge that it has incorporated all the remaining particles and spirit of the wine. They then draw this water off into another vessel, and carry the remaining murk to the press, where they squeeze it till not a drop of moisture remains in it. The liquor thus extracted is mixed with that which was drawn off before, and is then barrelled. This is principally intended for common use, or rather for servants: but it must be drank in the ensuing winter; for it will turn sour by the next summer. It is brisk and pleasant enough whilst it lasts good, and is much preferable to water cyder; though not equal to the refuse wine, as it is called, of which a vat, or more, is generally made by itself, of the damaged, rotten, or unripe black grapes that were left at the last gathering, as not being fit for the finer wines.

Another use too, which the French make of the murk of their grapes after the must has been drawn off from the vat, is to amend such of their wines, whether red or white, old or new, as are deficient in colour or strength. To this end they empty them out of their casks into the vat, immediately after the must has been drawn off, stir the murk up so as to mix it thoroughly with them, and then let them remain upon it, at most, twenty-four hours if it be new wine, and twelve hours if it be old. When they find it has taken a sufficient degree of colour, and that it is not sweet to the taste, but agreeable to drink, they draw it off, barrel it up separately, in order to know it again, and then put the remaining murk in the press, where it is squeezed as dry as possible.

As to the white grapes that were rejected at the former gatherings, they are let hang upon the vines till the latter end of October or beginning of November, that they may be a little bitten by the frost. They are then gathered, and a wine is made of them which is sold quite warm from the vat, and does well enough to mix with coarse red wine.

The newly pressed murk of grapes soon contracts a heat; and as it contains many spirituous parts, it is then used as an effectual remedy for rheumatic pains, stiffness of the joints, and numbness of the limbs. The way of applying it is to bury the part affected under a heap of fermenting murk.

By the time that the murk has undergone the utmost dint of pressing, it will be as hard as a stone: but even then it will yield, when diluted with water, fermented, and distilled, a spirit which has its medicinal as well as domestic uses. Or it makes a good manure for land; particularly, say some, for vines and for asparagus.

The too great propensity to fermentation in hot countries has laid the inhabitants of those parts under the necessity of using means to retard it: but the method which they practise for this purpose renders their wines, as Dr. Neuman justly observes, scarcely deserving of that name; because they hardly undergo any degree of fermentation at all, and are, in fact, no better than boiled must. Several of the Italian wines are of this sort, and are called by the general names of *vino cotto*, "boiled wine." It is to thin watery juices, extremely prone to ferment, and in which fermentation, when once begun, can scarcely be suppressed till it has run beyond the vinous state, that the process of boiling over a fire is applied. The fermentative quality is thereby restrained, and the liquor becomes richer, and continues fit for drinking at least a year or two, though it is never so wholesome as the fermented wines. The effects of must and of wine upon animal bodies are diametrically opposite: for must relaxes and liquefies, and, if drank immoderately, is apt to produce dangerous fluxes; whereas perfect wine, on the contrary, corroborates and constricts. This the Doctor reckons the first of three classes into which he very properly divides wine, with respect to its fermentation.

The second class comprehends those wines which have undergone fermentation, but not a complete one. Of these there are two kinds. The first is the thin sweet wines; which are no other than must partially fermented, or whose fermentation is checked, while it can be checked, before the sweetness has gone off. These wines can

scarcely be kept above a year. Such as the Tyrol, some of the Savoy, and several of the Italian. The second sort is the strong, full-bodied, rich, sweet wines, which are generally a mixture of fermented and inspissated must; the latter being added to increase the richness of the liquor, and prevent the fermentation from running beyond its due limits. These kinds of wines greatly heat the constitution, and ought to be very sparingly drank: such are Malmsey, Canary, and some of the Spanish and Hungarian wines.

To the third class belong those wines which have been completely fermented, and have thrown off their gross matter. These are the most perfect wines, and for common use the most wholesome.

In cold countries, where, for want of the sun's having force enough to mellow and enrich the juice of the grape, the must is thin and poor; sugar, or dried grapes, should be added to the must, to give it a body. Authors name a variety of other ingredients for this purpose; but they are useful only as they contain a saccharine substance. It is therefore most advisable to use good sugar, which requires no other care than dissolving it in the juice in the proportion desired, or found to be wanted. If part of the juice is evaporated by fire, as is sometimes practised, a ferment must be added, to make up for the inaptitude to ferment, which experience has shewn to be in all juices that have been boiled.

When we here advise the adding of sugar, in particular, we do it on a supposition of its being the substance most easily come at; and also because it has been proved by some late experiments, that all juices are more or less fermentable in proportion to the quantity of saccharine matter contained in them.

If the juice is so sour that it will not ferment kindly, no alkaline salts should be recurred to, though greatly recommended by several authors; because they raise so strong an effervescence, that they deprive the liquor of much of its most volatile and active principles, and thereby leave it vapid. Instead of these, such calcareous substances as will give the least taste to the liquor, or dissolve the least in it, should be preferred. Such are, extremely well cleaned oyster or other shells, and hard lime-stone or marble reduced to powder. These should not be calcined or burnt; because they would then communicate a disagreeable taste to the liquor, and be besides attended with the disadvantage of raising too great an effervescence. Next to these, chalk bids the fairest to answer the desired end. But a caution necessary to be observed when these or any other such like substances are used, is, that the too great acidity of the liquor should be only lessened; for a certain degree of acidity is essentially necessary in all wines. If the juice is otherwise rich in substance, and faulty only in being too acid, warmth alone has, in many instances, been found to be a sufficient cure. Madeira, for example, is always harsh, till it has been mellowed by heat: and thus again, some gentlemen in England and America, when the juice of their grapes has not fermented kindly, have obtained a very good wine by exposing the containing vessels, in a warm situation, to the sun, with an intention of turning it to vinegar. Chemists know that all vegetable acids are volatile in certain degrees of heat; and it is highly probable that the effect of this summer exposure may be the evaporation of the acid, and thereby the conversion of the whole into a mild vinous fluid. Instances are not wanting, of the roughest verjuice being turned to a strong pleasant cyder, or vinous fluid, by means of a warm situation accidentally given it. Habit has made a gently acid even desirable in some wines, as in Rhenish.

In several parts of Germany where the grapes seldom come to full maturity, and are therefore gathered somewhat green, the makers of wine have iron stoves in their cellars, and keep in them a constant fire, at least during the time of fermentation. This, by heightening the fermentation, ripens and meliorates the wines, and renders them much more palatable and agreeable than they would otherwise be. We have already seen that keeping the wines in places considerably warmed either by the sun, or by fire, will have the same effect, even so late as in the summer after the vintage: for acid liquors remain long without either fermenting thoroughly, or putrefying.

As the wines drawn from the last gathering of the grapes cannot be so perfect as the others, for want of due maturity in the fruit, the people of Champagne and Burgundy have recourse to the following method, to accelerate their ripening:

When

When the wines have been about three weeks in the casks, and have been drawn off their first lees, they roll them up and down for some time, five or six times a day, for four or five days running; then two or three times a day, for three or four days; and afterwards twice a day, for about four days; then once a day for about a week; and after that, once in four or five days. If the grapes were gathered very green, the rolling in this manner is continued, in all, for about five or six weeks: but if they were tolerably ripe when gathered, rolling once in four or five days, for about a month or six weeks, is found to be sufficient. This rolling of the liquor in the casks is intended to supply the defect of its first fermentation.

It now appears evidently, from the foregoing account of the practice of making wines in hot and cold countries, that a means to counteract the inconveniencies of the climate is wanting in each. If they had proper cellars and vaults, as before observed, the too quick and too great fermentation in hot countries might be restrained and kept within due bounds; and a proper degree of heat during the fermentation in a cold country, might give the juice that rich mellowness which the too weak sun could not.

The new wines will generally ferment of themselves, within a few days after they have been put into the casks. Those that do not, should be helped, by putting into them a little of the froth, or yeast, which works from the others. The finest wines will ferment the soonest: and this fermentation will continue for about ten or twelve days, according to the sort of wine, and the season of the year.

While the wine ferments, the bung-hole of the cask must be left open, or only covered with a thin linen cloth, to prevent any dirt from falling in: and this cloth should be laid hollow, so that the froth arising from the fermentation may have room to work off.

When the fermentation is pretty well over, which is known by the froth's ceasing to rise so fast as before, the bung may be closed down, after filling up the cask with liquor to within two inches of the top; and a vent-hole should then be opened and left, to carry off whatever may be thrown up by any subsequent fermentation. This filling up of the cask to within two inches of the vent-hole, should be regularly performed every two days, for about ten or twelve days running: for the fermentation will continue a considerable time, though in a less degree; and if the casks are not kept so full as that the foulness thrown up by the fermentation may be carried off at the vent-hole it will fall back again into the wine, and prevent its becoming clear. After filling up each cask in this manner to within two inches of the bung, for about ten or twelve days, it must be filled up to within an inch every fifth or sixth day, for the space of a month; after which, once a fortnight will be sufficient during the next three months.

Though the fermentation will be over long before this last mentioned time, yet the casks must be filled up once a month so long as they remain in the cellar: for as the wine will waste insensibly in them, it will grow flat and heavy, if they are not kept constantly filled up. It were needless to say, that the vent-holes must be stopped when the fermentation is over.

About the middle of December, the wines may be drawn off from their lees into fresh casks, for the first time; taking care to fill the casks up and to place them so that they may not be shaken or disturbed until the middle of February, when it will be right to draw them off again into other casks. If the quantity of lees is then found to be so considerable as to endanger their contracting a putrid taint by remaining too long mixed with the wine, it may be advisable to draw it off again after a proper interval of time; or sometimes it may be necessary to repeat this racking even more frequently, though hardly so often as is practised in Champagne, viz. even twelve or thirteen times in the space of four years; because, though this may render the wine very clear, bright, and pleasing to the eye, it must surely diminish its strength, and consequently make it be the less fit for keeping.

A leathern pipe, about six or seven inches in circumference, well sewed with a double seam, to prevent the wine's running out, is, at the distance of every five or six feet, very tightly bound with strong waxed twine around brass rings of the same dimensions, made to screw into other rings fastened in the same manner to other similar pipes. The number of these pipes may be suited to whatever distance is found proper or necessary: or, when the di-

stance between the casks is always nearly the same, the leathern pipe may be made of one single piece, with only a brass screw-ring at each of its ends. To these screws the extremities of the leathern pipe should be fitted, so as to screw exactly on or into them, two brass strong cocks, which are however first to be thrust as lightly as possible, by their more taper ends, the one into the usual tapping place of the cask which is to be emptied, and the other into the usual tapping-place of that which is to be filled; that is to say, each of these cocks is to be firmly and closely fixed at about two or three inches above the lowest part of the head of the cask to which it is applied. It were needless to observe that these cocks must be quite strait, the better to complete the communication from one cask to the other. When every thing is thus prepared, the cocks being duly fixed in their respective casks, are both opened, and the wine then flows naturally from the full casks into the empty one, till the liquor becomes of an equal height in each, without in the least disturbing the lees of the wine in the cask that is to be emptied. When the wine ceases to run spontaneously, the rest of it is forced out by means of bellows constructed as follows:

These bellows are about three feet long, and a foot and a half broad at their widest part. They are made and shaped in the common manner to within about four inches of their smaller end, from whence the remainder of them is but three or four inches wide. In the inside of the place where their breadth is thus altered, the air passes through a hole of an inch bore; and upon this hole on the side of it that is next to the nozzle of the bellows, is a piece of leather, like the valve of a pump, so fitted that when the bellows are lifted up to take in fresh air, that valve instantly closes upon the hole, in such manner that none of the air which has passed through this hole, and entered into the cask, can be drawn back again; but the bellows take in fresh air by their holes below.

Instead of ending with a strait nozzle like other bellows, these terminate in a tube or pipe of wood, a foot long, closely jointed into their smaller end, and there well glued and strongly fastened by good pegs, in a direction perpendicular to that of the body of the bellows, in order to its conducting the air downward. This nozzle, for such we shall now call it in compliance to custom, is round, and about nine or ten inches in circumference over its outside at the top, from whence it diminishes gradually towards its other end, the better to fit it for entering some inches in at the bung-hole of the vessel, and also to close up that hole so exactly, that no air may get in, or come out, at its sides. The upper part of this nozzle rises about two inches above the level of the small end of the bellows, and is there cut somewhat flat, that it may be the more easily struck with a wooden mallet, and thereby forced the closer into the bung-hole of the cask: and also at about two fingers breadth below the upper part of this nozzle, is nailed an iron ring, through which is passed an iron hook or brace, a foot long, by means whereof the bellows are cramped down to the hoops of the cask: for without this precaution, the force of the air would drive the bellows out of the bung-hole, and the operation of emptying the broached vessel would not be performed.

It is now easy to conceive the manner in which these bellows force the remaining wine out of the cask that is to be emptied: for, upon opening the bellows, the air rushes in at the holes in their bottom; and upon shutting them, it is forced through their nozzle into the cask; the valve just above their nozzle prevents its returning back; and thus a quantity of air sufficient to counteract the weight of the atmosphere on the wine in the cask that is to be filled, is easily forced into that which is to be emptied.

When the wine is drawn off to within about two or three gallons, a hissing is heard in the cock of the then almost empty cask. The cock in the other should then be turned, so as to close it, and the pipe of communication should be taken away. That done, all the remaining clear wine is drawn off from the cask that is to be emptied, but with great care to stop when it becomes in the least cloudy. This bright wine is then poured into the bung-hole of the cask that is to be filled, and the entire filling of it up is completed with sound wine of the same quality as that which has been drawn off. It is then closely bunged down; and when this has been done, the cock may be taken out and a plug put in, with very little loss of wine. Or, if the owner is so curious as to desire not to lose any of his liquor, the little air necessarily left near the bung-hole may be drawn off

off with a small hand-air-pump, and then scarcely a drop of wine will run out when the cock is drawn.

At every racking of this kind a peg-hole is made in the cask, if there be not one before, in order to examine the degree of waisting of the wine: for wine wastes sensibly in keeping, how closely soever the cask be stopped; a part of it transpiring through the pores of the wood: but, as Dr. Neumann observes, it is not the spirituous, but the watery part that is thus lost; for the remaining wine proves stronger than at first, and the strength continues to increase as the quantity diminishes. In filling up the vessels, for it is necessary that they should be kept full, care must be taken never to mix wines of dissimilar qualities.

The Hungarian, for example, does not well bear any other wine, particularly Rhenish: for if the spontaneous diminution of a cask of Hungarian wine be made up with Rhenish, though both of them keep extremely well by themselves, the mixture will presently spoil: and so it is of other wines.

The lees in the several casks that have been racked off may be collected together, and when their thicker part has subsided, a spirit may be drawn from the thinner.

Distempers seldom happen to fermented liquors, but from some fault in the manner of managing them. If the fermentation has been duly carried on, the wine racked off the lees before they can contract a putrid taint, and afterwards kept in an equal degree of heat, the wine will answer the expectation of the maker. When it is to be transported, and thereby necessarily brought into a warmer air, brandy is often added, to check the propensity to a new fermentation. This is also sometimes done to give strength to the wine: but it is not a practice by any means to be recommended.

It is necessary for the preservation of some wines, particularly of such as are apt to be frequently on the fret, to fumigate the casks with burning brimstone, to which some add, perhaps uselessly, vinous spirits and aromatic ingredients. The fumes of brimstone strongly resist fermentation, but wines which are largely impregnated with them cannot be recommended as wholesome. The colour of red wine is destroyed by them. What is called stum, is no other than must, whose fermentation has been prevented, or prematurely suppressed, by fumigation with sulphur.

The colour of wine is frequently artificial. A pale yellow may be natural, but a fine deep yellow proceeds from an addition of burnt-sugar, or other colouring matters, or from the oaken cask in which the wine has been kept. Wine may be naturally of a pale diluted red; but a deep red is almost always the effect of artificial additions, as of the red-woods, elder-berries, bilberries, &c. In France, no secret is made of these practices, the colouring matters being publicly thrown out after they have been used. Turbid wines are fined by a mixture of whites and shells of eggs, powdered alabaster, and isinglass. The use of the shells and alabaster is to correct any small degree of acidity that the wine may have contracted: and indeed if we look into the many compositions made use of by vintners, we shall see that they are all framed upon this principle; wherefore it would be needless here to particularise them. If the wine is grown very sour, the best way of correcting it, so as to preserve the spirit and flavour, is by adding a quantity of salt of tartar sufficient to neutralize the acid, just before it is to be used. It then becomes a pleasant wholesome liquor: but if salt of tartar is mixed with any fermented liquor long before it is to be used, the effervescence which it raises will deprive the liquor of its spirit, and leave it quite vapid. Isinglass is used only for clarifying the wine. Weak wines are improved by an addition of spirit, particularly before the fermentation is completed, for after this period it is apt to spoil the vinosity. Poor wines are enriched by sweets, and flavoured by various additions so as to emulate the more costly: thus elder-flowers give the flavour of Moselle, and the flowers of the yellow clary will make almost any common white-wine resemble new Rhenish. Even the most delicious wines have been imitated also without a drop of the juice of any grape; with solutions of sugar, juice of currants, figs, and other fruits.

After the wine, and particularly that of countries where the sun is not very powerful, has passed its fermentation in the vat, and is drawn off into casks, it will require something to feed upon. To this end, it will be right always to preserve a few bunches of the best grapes, which may be hung up in a room till there be occasion for them; when they should be picked off the stalks, and two

or three good handfuls of them should be put into each cask, according to its size.

The French recommend strongly the two following methods; the one for giving additional strength and colour to red wine, and the other for clarifying wines in general.

For the former, a sound well-hooped cask is set upright on one of its ends, the other end is taken out, and a layer of vine-cuttings is spread at the bottom of the cask, to the depth of about three inches. Some of the finest and ripest black grapes are then chosen, and their berries are cut off from the stalks, as close as possible to the fruit, which the utmost care is taken not to burst or damage. The grapes thus selected are put gently upon the layer of vine-twigs, and the cask is filled with them up to the beginning of the bung-hole. Another layer of vine-cuttings is placed gently upon these grapes, till it reaches the upper part of the bung-hole, and the cask is then filled with grapes, culled as before, to within a foot of the top, where another layer of vine-cuttings is spread over them, and the head of the cask is then replaced. The cask thus prepared is filled with good coarse red wine, to within three fingers breadth of the bung-hole, that the liquor may have room to ferment without much loss, and in this state it is carried gently to the place where it is to remain. Great care is taken to keep this vessel constantly filled up with wine of the same sort, both whilst it ferments, and afterwards as it is used: for if the grapes in it were at any time to be left long without a sufficient quantity of wine upon them, the whole would grow vapid and be spoiled. The principal use which the vintners make of this liquor, is to supply their customers constantly with wine of the same taste and colour, by mixing it with what they sell.

The other method, which is practised only when wine is to be fined very speedily, consists in this. A parcel of very thin chips, the longer the better, or of pretty thick shavings, of new but well dried beech, is steeped for two days in water, which is changed at least twice a day, the better to take off the taste of the wood. These chips are then well drained; and after they have been thoroughly dried in the air, as many of them are put lightly into a cask, of which the head has been taken out for this purpose, as will fill it to within about a finger's breadth of the top. The head is then properly replaced in the cask, so as to fit it for holding liquor, and a pint of good brandy is poured in at the bung-hole, upon the chips. After this, the bung-hole is stopped closely with a bung, and the cask is rolled about till the chips have imbibed all the brandy. The cask is then carried to its allotted place, and immediately filled with some of the wine that is to be speedily fined. The wine will soon be fit for drawing off; and when that is done, the casks with the chips in it should be filled up again directly, because the chips, like the grapes and vine-cuttings before-mentioned, will lose all their virtue if they are left long without a sufficiency of liquor upon them.

When the wine that is poured upon these chips begins to require a length of time in order to its becoming fine, it is a sign that they are overloaded with lees. The head of the cask is then taken out anew, the chips are washed in water till they are cleared of the lees, they are then dried in the air as before, and after being again soaked with brandy, or washed in perfectly clear wine, they are replaced in their former cask; after that this also has been well washed and cleaned, and they continue to answer the same purpose as at first.

All the above-mentioned practices are innocent enough; but, as Dr. Neumann rightly observes, some of the dealers in wine have had recourse to such dangerous artifices as have been pernicious to thousands. They have sweetened acid wines by litharge, or other preparations of lead; and impregnated sweet ones with mercury sublimate and with arsenic. Lead is discovered in wines by adding a decoction of orpiment made in lime-water. If the wine is genuine, it does not sensibly change its colour on this addition, though on standing, a yellowish white powder falls to the bottom: but if it has any saturnine impregnation, its colour becomes immediately darker, brown, reddish, or blackish. Arsenic may be detected by a solution of lead in aqua fortis; and mercury sublimate, by volatile alkaline spirits, or by a solution of fixed alkaline salts.

As to the concentrating of wines by cold, commonly called condensing or congealing of them, it seems to us so much a matter of mere curiosity rather than of use, that, though Dr. Stahl has taken the pains to give a full and accurate account of the manner of performing this

process, by which the wine is not only freed from its superfluous humidity, so as to be greatly diminished in bulk, and of course rendered more convenient for transportation, but also, say the advocates for this practice, infinitely enriched and ennobled in its quality, and rendered so much more perfect and durable, as to be from thenceforth unalterable by any accident or changes of the weather; for by this means, "the philosophic spirit of the wine," (to use the language of the adepts) is obtained.

"When wines, says Dr. Neumann, are exposed to the action of a freezing air, a part of their water congeals, and the unfrozen part proves proportionably stronger and more spirituous. By repetitions of this process, first pointed out by Paracelsus, and since carried to a greater length by Stahl, the best wines are reduced to about one sixth of their original volume. Wines thus concentrated or freed from their redundant phlegm, are no longer the delicate liquors they were before. They are too unpleasant, as well as too strong, to be drank by themselves; and when mixed with other wines, they communicate to them also a disagreeable taint. The phlegm which congeals retains a part of the truly vinous matter, as appears from its being convertible into vinegar; but this phlegm, mixed with the unfrozen wine, does not restore its pristine qualities: both the phlegm by itself, and the mixture, soon corrupt. When once the principles of wine are separated from one another, no art can reproduce wine by joining them together again. When barely the inflammable spirit has been distilled off, the addition of that spirit to the residuum does not restore its vinosity. The residuum itself often suffers a new separation upon this addition, its tartareous parts precipitating."

When the wine is of an age at which it usually is bottled, care should be taken to examine whether it be sufficiently bright; because a natural brightness is the most certain indication of the liquor's having undergone a due fermentation, and consequently of its being rendered most wholesome. If any small degree of cloudiness is observed in it, the whites of eggs will easily remove that imperfection; and if it inclines to tartness, the shells of the eggs should be mixed with their whites: but if the degree of cloudiness is thought to be greater than the whites of eggs will cure, recourse is had to isinglass, the quantity of which should be proportioned to the quantity of the liquor, and to its degree of foulness; for wine that becomes bright of itself does not need any. The proper way of using the isinglass, is to dissolve it over the fire in so much water as will form it into a jelly; then to dilute it sufficiently with some of the same wine as it is intended to clarify, afterwards to strain it through a flannel bag, and finally to pour it into the cask, and stir it well about with a whisk that reaches only to about half way down the cask. For wine that is very tart, the proper corrective is powdered marble, alabaster, or un-burnt lime-stone, as before directed.

A quite fashionable gentleman would hardly have vouchsafed, a few years ago, to taste a glass of Champagne which did not sparkle or froth strongly: but that notion of its excellency is now pretty much laid aside. Opinions have been so greatly divided in regard to the cause of this sparkling, some ascribing it wholly to the force of drugs used for that purpose by the dealers in this wine; others imputing it to the unripeness, or as some call it, the tartness of the wine, because, in fact, most of the wines that do sparkle and froth are extremely tart; and others again attributing this effect to the influence of the moon, according to the times of bottling these wines, that we cannot do better than copy here the substance of what the authors of the *Maison Rustique* have said on this subject.

"It is true that many dealers in wine, seeing how immoderately fond most people were of this sparkling liquor, did often put into it alum, spirit of wine, pigeon's dung, and many other drugs, to make it froth exceedingly; but it is certain, from experience, that the bottling of it at any time between the vintage and the month of May, will also make it froth. Some pretend that it froths most when it has been bottled nearest to the time of gathering the particular sort of grapes of which it was made; but many deny this. There is no time of the year in which it froths more than at the end of the second quarter of the moon in March; and that without any artifice at all. One may always be sure that the Champagne wine which has been bottled between the tenth and the fourteenth days of the same moon will froth perfectly. This has been proved by such reiterated experience, that it cannot be doubted. It is, however,

proper to observe, that the wine does not froth immediately after its having been bottled. It must have been at least six weeks, and often two months in bottles, before it will froth well. If it has been transported to any distance, it must be let rest for a month in the vault, especially in summer, to recover itself.

"But as the Champagne wines, and particularly those of the mountain of Rheims, are not in general sufficiently ripe for bottling at the above mentioned time, but still retain too much tartness and hardness, if the season has been cold and moist; or too much sweetness, if it has been hot; the surest and best way to have exquisite wine which shall froth perfectly, is not to bottle it till the rise of the sap in August. Experience has certified that it froths excessively when bottled between the tenth and the fourteenth of the moon in August: and as it will by that time have lost its too great tartness, or its over great sweetness, one may be assured that the wine which is bottled then will be the ripest and most frothy.

"Another experiment has been tried, which is, not to bottle the Champagne mountain-wine till the spring of the second year, that is to say, eighteen months after it has been made; and it has been found to froth sufficiently, though not above half so much as that which was bottled while the spring-sap of the preceding year was rising. It is not thought that the river wine, which has less body than that of the mountain, can froth so much in the second year.

"They who would have Champagne wine that does not froth at all, must bottle it in October or November of the year after the vintage. If it be bottled in June or July, it still will froth a little, though but very little.

"As these wines, especially in their first year, work continually in the cellars and vaults, and still more in bottles than in casks, according to the different seasons and the different impressions of the air, it is not surprising that the same wine, particularly the new, should sometimes appear different to the taste. A wine, for example, which is fit for drinking in January and February, shall seem hard in March and April; because of the rising of the sap which then agitates it: and this same wine, after seeming to be perfectly ripened in the next June and July, shall again have, in August and September following, a hardness which could not be perceived in either of the two preceding months; because the rising of the sap in August will have increased the motion of its parts, or in other words, have set it on the fret. Thus the same Champagne wine of the first year, if it be of the river growth, and frequently that of two years old, if it be of the growth of the mountain, will appear more or less ripe or mellow, more or less exquisite, more or less forward, according to the different motions it receives from the different impressions of the air, which vary most sensibly in the different seasons of the year."

What is here implied, though perhaps not quite clearly expressed, is, we apprehend, the true cause of the sparkling or frothing of wine; namely, its not having been perfectly fermented, and consequently not had a thorough assimilation of its constituent parts. The want of this certainly makes it fret in the bottle: and accordingly we see, that the better to secure its sparkling, the people of Champagne bottle it in the very season when it is most likely to be on the fret; viz. at the time of the weather's turning from cold to warm. Several other causes will likewise put wine on the fret, and among these a principal one is the want of cellars in which an equal temperature of the air is preserved all the year round. This, and the imperfectness of the fermentation of the liquor, are undoubtedly the real cause of the sparkling or frothing of wine.

As a general rule, if it be intended that the wine should not froth, the best time for drawing it off, whether into bottles or into casks, is when the weather is extremely fair and clear, the barometer high, and of choice, during a northerly wind; because the air is then coolest, and the wine least apt to be on the fret. By inverting these rules, and drawing off the wine in warm damp weather, when the barometer is low, and the wind southerly, what is bottled at this time will froth; for wine in the cask is always cloudy then, and consequently disposed to fret.

It may not be uninteresting, and certainly cannot be unentertaining to our readers, if we copy here Dr. Neumann's account of, and curious remarks on, the principal wines that are drank in Europe. "1. The Madeira islands, and Palma, one of the Canaries, afford two kinds: the first called Madeira Sec; the latter, which is the richest and best

best of the two, Canary or Palm Sec. The name Sec (corruptly written Sack) signifies dry; these wines being made from half-dried grapes. There is another sort of Sec wine, inferior to both the foregoing, prepared about Xeres in Spain, and hence called, according to our orthography, Sherris, or Sherry. 2. The wines of Candia and Greece, particularly the latter, are of common use in Italy. Malmsey was formerly the produce of those parts only, but is now brought chiefly from Spain: it is a sweet wine, of a golden or brownish-yellow colour: the Italians call it *Manna alla bocca e balsamo al cervello*, "Manna to the mouth and balsam to the brain." Zant and Cephalonia send also to Venice some good, and no small quantity of indifferent wines: almost all the wines indeed made use of in the Venetian territories come from Greece and the Morea; of which there are some sorts so bad, and so cheap, that large quantities are made into vinegar for the preparation of cerusse. 3. Italy, not Greece, produces the *vino Greco*: this is a gold-coloured unctuous wine, of a pungent sweetness, the growth of Mount Vesuvius, greatly sophisticated by the Neapolitans. In the neighbourhood of Vesuvius is made the Mangiaguerra wine, as also a thick blackish one called Verracia; and at the foot of the hill, the delicious *vino vergine*. The Italians apply this last name likewise to all the other wines made without pressure. The kingdom of Naples affords the Campania or Paullippo and Muscatel, the Surrentine, Salernitan, and other excellent wines, as also the Chiarello, much drank at Rome. But the principal of all these wines is the red, fat, sweet, and gratefully poignant one, called *Lachryma Christi*. The ecclesiastical state produces the light, pleasant Albano; and the sweet Montefiascone, a yellowish not very strong wine, which comes the nearest to good Florence, but does not keep well; together with several of less note, as the Nomentan, Monteran, Velitrin, Prænetic, il Romanesco, d'Orvieto, &c. 5. In Tuscany are the excellent white and red Florence; the celebrated, hot, strong red wine of Monte Pulciano; the Montalneo, Porte Hercole, &c. But along the coast of the Adriatic, at Ancona, Rimini, Pesaro, and as far as Bologna, one meets with exceeding bad wines, chiefly of the boiled unfermented kind, heavy, disagreeable, and unwholesome. 6. In Lombardy also there is abundance of bad wines: the Modenese and Montferrat are tolerable; the Marzemino, produced about Vicenza and Padua, pretty good. The other wines most commonly drank in that province are the Brescian, Veronese, Placentine, Lumelline, and Pucine; and in the Genoesse, the *Vino di Monte Vernaccia*, *Vino amabile* or *Vino di cinque terre*, and *Vino Razzese*. Between Nizza and Savona is produced an incomparable Muscadine: near Aquileia is the Rosatz, and near Pavia the *Vino Piccante*. 7. Piedmont, and part of Savoy, have excellent light wines. 8. The Sicilian, Sardinian, and Corsican wines are also good: the first, as particularly the Catanian, Panormitan, Messinian, and Syracusan, are accounted the best, and are chiefly bought up by the knights of Malta. 9. Most of the Spanish wines are composed of fermented or half fermented wine, mixed with inspissated must and variously manufactured, or of an infusion of dry grapes in weak must. No wines freeze more difficultly than the Spanish; these abounding both with unctuous matter and with inflammable spirit. The principal of them are, the Alicante, which is a thick, strong, very sweet, and almost black as well as nauseous wine; Sherry, Spanish Malmsey, Malaga, commonly called mountain, and what is simply termed Spanish wine. These, at least, are the sorts most generally imported here: but in Spain itself there are many more, such as, the Tarragon, Salamanca, Cordova, Galicia, Andalusia, sundry bastards, *Vino de toro*, &c. 10. In Portugal there is plenty of red Port, a cheap but not a very excellent wine, drank in large quantities in England, and often dreadfully sophisticated. The best *Vino tinto*, a blackish red wine used by the coopers for colouring other wines, is said by some to be the produce of Portugal. So largely do the Portuguese deal also in Madeira, that their king receives yearly twelve thousand pipes of this wine by way of tythes. 11. In France, there is a great variety of wines; of which the strong, sweet, full-bodied, spirituous ones are called *Vins de liqueur*. There is scarcely a province in France that does not produce wine: Languedoc and Provence afford the sweetest: and the same provinces, with Champagne and Burgundy, the strongest. The wines of the northern parts of that kingdom, as Picardy and Bourdeaux, are the worst; and those about its middle, as

Paris and Orleans, of a middling kind. The most celebrated of the French wines are those of Champagne and Burgundy, the Coterotie, St. Lawrence, Frontinac, Muscat de Lion, Cahors, Hermitage, Grave, &c. 12. In Switzerland, the best are the Neufchatel, Velteline, La Cote, and Reiff wines. The Velteline straw-wine, so called from the grapes being laid for some time upon straw before they are pressed, is particularly celebrated. 13. The dry-grape wines of the Upper Hungary are in general excellent, and greatly superior to those of the Lower. They have a delicious aromatic smell and taste, a notable diaphoretic, and corroborating virtue, and when drank freely occasion no head-ach, heaviness of the limbs, or other inconveniences. They do not easily become vinewed even in open vessels; and retain their sweetness and agreeableness for a length of time, though they lose a little of it from year to year. 14. Among the German wines, the Tyrol are very delicate, particularly those of Tramin and Etsch; but they do not keep. 15. Good Austrian wine is not to be rejected. Those of Kloster-Neuberg and Brofenburg are counted the best, and, in the opinion of some, excel in taste that of Edenburg in Lower-Hungary. There are also good wines in several other parts of the imperial dominions. 16. In the Palatinate, the best wine is that of Worms, especially the sort called woman's milk; and next to this, those of Edinghoff and Ambach. 17. Among the more esteemed German wines are to be reckoned also Rhenish, Mayne, Moselle, Neckar, and Elsass. A certain writer calls the Rhenish made in Hockheim (hock) the prince of the wines of Germany. 18. The Bohemian, Silesian, Thuringian, Misnian, Naumburg, Brandenburg, and other German wines, are generally inferior to the foregoing. Some, however, of those of Misnia and the Marche, made from ripe picked grapes, have this advantage, that they are greatly meliorated by age, so as to be preferred by many to the Rhenish, Neckar, and Franconia wines, and frequently mixed with other of greater note. The tartish German wines keep the longest of any: some of them have been kept two or three hundred years; and in Strasburg there is a cask of it fourteen hundred years old, and many above seventy; the wine being occasionally racked off into smaller and smaller casks, that the vessel may be constantly full. These very old wines are preserved rather for curiosity than use, as they not only grow too strong for drinking, but at last quite disagreeable. The best are those of a middle age, from twenty to about fifty years."

We cannot close more properly than with the above quoted excellent chemist's definition of the characters of good wine.

"The goodness and wholesomeness of wines are judged of, from their being bright, clear, and sparkling in the glass; of an agreeable reviving smell and taste; leaving, when held in the mouth for some time, a slight sense of astringency; being moderately strong and spirituous; passing freely by urine; exciting appetite; producing a gentle sweat in the night; keeping the belly open the next day; without being followed by any head-ach, heaviness of the limbs, or other uneasiness. Such a wine, moderately used, is a very valuable cordial. The sweet rich wines are either new, or very strong and fiery: they heat the body much more, and, if drank to any degree of excess, their effects continue much longer than those of the thinner wines, which contain an equal quantity of spirit. The red wines, in general, have the greatest astringency."

The following directions for making domestic wines, taken from the *Museum Rusticum*, will, we are persuaded, be agreeable to our readers.

"As to the art of making wine, I think the rendering it more generally known, and practised here, may not only afford a convenience with regard to expence, and a security with regard to health, to private persons; but an advantage to the public, in the balance of trade, a principle at present overlooked: though, in a short time, it will probably be seen in a more interesting light.

"Among the various articles of foreign luxury, wine certainly makes one of the most capital; and yet what with the taking such extreme great quantities, as oblige us to receive, as well the product of inferior, as good vintages; and what with adulterations, as well practised before the wine is imported hither, as after, we in general drink very indifferent natural wines, or very exceptionable artificial mixtures of liquors, called so. Though for these we either pay great annual sums to foreign countries, or

to those who make it their business to impose upon us at home.

"This is the more to be regretted, because we have it in our power wholly to avoid it; and, by a little attention and trouble, to provide ourselves with wine that is superior in flavour, cordial effect, wholesomeness, and every other quality, with a saving of at least fifty or sixty *per cent.* of the expence. The means by which I suggest it to be in our power to do this, is by the domestic production of wine in our own families: which, were the art well known, and the advantages, as I have here enumerated them, well understood, could not surely fail to be a much more general practice than it is at present.

"It may be said to appear from experience, that wine thus made here, is not so good as the foreign: and that we find, in the instances of those who have tried to introduce it, the success is not equal to my representation. To this I answer, that experience has verified what I advance, in the few instances of those who have made domestic wine with skill, and kept it to be of a due age; without which, even foreign wine would not be good. But the reasons why great numbers do not succeed, is the want of knowledge; a fardiness with respect to expence; or the drinking the wine before it be fit; which is almost universally the case. For, where this art has been practised without any of these disadvantages, such wine has been produced as not only has equalled the foreign, in all general good qualities, but has even been mistaken for several of the most valuable kinds, even by the most skilful judges.

"The want of knowledge in the art of making domestic wine being, therefore, one principal cause of the neglect of doing it more frequently, I shall here endeavour to remove it, by furnishing such instructions, as can scarcely fail to enable any attentive person to practise it with ease and certainty. And, I am persuaded, that, to middling people, especially those living in villages and places remote from sea-ports, where it is difficult to procure even indifferent wine in small quantities, I shall do a material kindness: though the advantage of making domestic wines is, by no means, confined to such persons, or situations; but even all others might find their account in it, both with respect to expence and health.

"I will therefore, first give a recipe for making the most perfect wine, that can be produced, by composition, in this country. By composition, I mean, such as is not made of the simple native juice of any one kind of fruit. But this kind is, indeed, in great degree native, as the water added to the dry fruit is only, in fact, the restoration, of what evaporated in the drying and ripening the fruit: and the produce of this process is, therefore, in reality a natural wine, and superior to any that can be made of the native juices of the fruits of our own country; or perhaps equal to the best of those of any other. This recipe will serve, also, as a basis for the showing afterwards how other, and cheaper kinds, may be made.

"Take thirty gallons of soft water, either rain, or river water. It should be obtained in as clear a state as possible, but boiling is needless. Put this water into a vessel, at least one third bigger than will contain that quantity: and then add to it one hundred weight of Malaga raisins, grossly picked from the stalks. Mix the whole well together, that the raisins may not remain clotted in lumps: and then cover it partly, but not entirely, with a linen cloth; and let it stand in a warm place, if the season be not hot. It will soon begin to ferment, and must be well stirred about, twice in twenty-four hours, for twelve or fourteen days. It must be then examined, by the taste, to try if the sweetness be nearly gone off: and if that be found so, and the fermentation be greatly abated, which will be perceived by the raisins beginning to lie quietly at the bottom, the fluid must be strained off; and pressed out of the raisins, first by the hand, and afterwards by a press, if such be easily procured. But, if there be no press, two boards may be used, with the assistance of a large weight, or other strong compressive force, which must be continued as long as any fluid can be made to drop from the mass. The fluid, thus separated from the skins, or marc of the raisins, must be then put into a good sound wine cask, well dried and warmed, together with eight pounds of Lisbon sugar, and a little yeast: but some part of the liquor must be kept out, to be added, from time to time, as the abatement of the fermentation, that will come on again, may admit, without the wine rising out of the cask. In this state it must continue for a month, with the bung-hole open: and then the whole

of the liquor kept out, having been now put in the vessel, must be closely stopped up, so that no air may enter: and in this state it must be kept for a year or longer. At which time it may be bottled off.

"This wine may be drunk, and will be very good at the end of a year and a half: but will be much better, if kept longer: and will improve for four or five years. When it has a proper age, it will equal any of the strong cordial foreign wines: and may, by the addition of proper substances to flavour and colour it, be made to resemble them.

"This is the most perfect kind of what may be called artificial wine; but others may be made cheaper. There are two methods of making a saving in the expence. The one is, to substitute, instead of the whole quantity of raisins here directed, a greater proportion of sugar, leaving out four pounds of raisins for one of sugar added: or the quantity of both sugar, and raisins, may be diminished, and a proportion of clean malt-spirits added, when the bung of the cask is closed up. The use of distilled spirits, in this manner, is not so objectionable as it may at first appear to persons who are not unacquainted with these matters. For such spirits will lose their fiery quality, and be rendered soft and mellow, by their incorporation with the oily part of the wine. And there is nothing more certain than that the practice of using them is general in the preparation of all the foreign wines for our market; and most particularly those stronger kinds, which are most esteemed by us.

"Any other kind of large raisins, which are cheap, may be used as well as the Malaga: and the thinner the skins, and the sweeter the pulp, the stronger will be the wine.

"It has been practised formerly to bruise the raisins; but it is unnecessary with respect to the common sorts, as they will soon burst with the fermentation, and freely give out their contents. But there are some small kinds with tough skins, which, if employed for this purpose, should be bruised, or they will resist the penetration of the water. These kinds are not, however, so good for the purpose of making wine as the larger; or, at least, if they be chosen for any particular flavour they may give the wine, there should be only a certain proportion mixed, added to some of the other kinds: and, in this case, they should be first bruised.

"The practice of a double fermentation, as here directed, first of the raisins themselves, and afterwards of the sugar, is not the common method: and very good wine may be made, by fermenting both at the same time. But this method is, nevertheless, preferable; for it sometimes happens, from some unknown circumstances in the fermentation, when such method is not practised, that the wine will turn out cloudy, and not admit of being fined, by any means at present understood: which accident is prevented by this double fermentation remaining, as the second perfectly works all the remaining half-fermented part of the pulp. Moreover, in consequence of this more perfect fermentation, the wine is lighter, and becomes wholesome and perfect with less age, the glutinous matter of the raisins being entirely resolved.

"Of this wine, by adding the proper flavour, may be formed imitations of all the natural wines, of a very strong body: and, by abating the proportion of raisins, sugar, or both, other smaller kinds may, by the same means, be produced.

"If this wine be perfectly fermented, and kept a long time, so that no sweetness remain, it will resemble Madeira; and has very frequently passed for it.

"An imitation of Frontinac may be made by this wine, in which the proportion of sugar, or of malt spirits, to the raisins, is large, and the whole body weaker. The muscadell flavour of Frontinac, being exactly to be imitated by an infusion of the flowers of meadow-sweet, in some of the wine: and added in that proportion, which may be found sufficient to raise the due degree of the flavour. In the making this artificial Frontinac, the fermentation should be stopt, by closing the cask, and adding the spirit, while a considerable sweetness yet remains: and the wine may be drunk after it has been a short time in bottles.

"Cyprus wine may be imitated, also, by the same means: the infusion of the meadow-sweet being added to the wine prepared in the best manner above directed. But, in this case, three or four pounds more of sugar, than the quantity given in the recipe, should be used; and the fermentation stopt while a considerable degree of sweetness remains. This kind will be the better for age: and, if properly managed, can never be distinguished, even by ac-

tual.

tual comparison, from the true Cyprus: as I can assert from the fact itself.

"The imitation of mountain is to be made, by preserving a small degree of sweetness, giving the nut-like flavour, and keeping the best kind of the above wine to a due age. This nut-like flavour may be obtained, by the infusion of the Florentine orris root, powdered with a very small proportion of orange and lemon-peel: and the wine may be rendered more dry or sweet, by continuing the fermentation a greater or less time; and adding a correspondent proportion of clean malt-spirits, when the fermentation is stopt sooner. The adding some of the stoney feeds of the raisins well bruised, also, give the nut-like flavour: and the putting in a part of the stalks of the raisins, gives a sharpness, found in general in this kind of wine.

"The racy taste of Canary, now commonly called sack, may be counterfeited by the addition of a proper quantity of the juice of white currant-berries to the wine, made with a large proportion of sugar to the raisins, and left very sweet in the fermentation. But it is said, that a spirit distilled from the leaves of clary and clean malt-spirits, and put to the wine, will give to it such a strong resemblance of sack, as renders it absolutely undistinguishable from that wine.

"It is said also, that the juice of the bramble-berries, added to the mixture of the wine, before the fermentation, gives both the exact colour and flavour of claret. But, in this case, the quantity of raisins should be considerably diminished, and that of the sugar increased, though not to the full proportion, as the fermentation must be continued till all sweetness be destroyed; and this wine is not intended to have so great a body as the others.

It is better, therefore, for this imitation of claret, to work it only of moderate strength, and to add some proportion of distilled spirit: it will be perfect at the end of two years. This, and the imitation of sack, by the spirit of clary, I have never seen tried; but have them on very good authority. I should be apt to believe, a small proportion of red-argol, or tartar, dissolved in some of the wine, and added together with the spirit, when the bung is closed up, would assist the imitation very materially.

"Any intelligent person may easily collect, from these instructions, sufficient lights to qualify them to make better or cheaper kinds of wine, according to their inclination. But whatever kind is made, at least a year should be given to it; and, in most cases, a longer time. For nothing has so much contributed to the discrediting, and excluding the use of domestic wines, as the drinking them too new, especially after an injudicious, and undue management of the fermentation; by which means they have been made to appear flatulent, accefcnt, and foul. But the very opposite of these qualities will be found in them, when properly treated and kept." See the article VINE.

To WINNOW, to clear corn from the chaff, &c. See the article THRASHING.

WINNOWER MACHINE. See THRASHING.

WITHERS, the part of a horse where the shoulder bones join at the bottom of the neck and mane.

All pinches of the saddle on the withers, should be treated with repellers; for this purpose bathe the tumour well with hot vinegar three or four times a day: if that does not succeed alone, an ounce of oil of vitriol may be put to a quart of vinegar, or half an ounce of white vitriol dissolved in a little water, and added to the same quantity. These are generally very effectual repellers for this purpose in horses, and will frequently prevent imposthumation: when the swelling is attended with heat, smarting, and little hot watry pimples, the following mixture will then be more proper to bathe with:

Take two ounces of crude sal ammoniac, boiled in a quart of lime-water; where that cannot be had, a handful of pearl or wood-ashes may be boiled in common water; pour off the decoction when settled, and mix with it half a pint of spirit of wine: anoint the part afterwards with linseed oil, or elder ointment, to soften and smooth the skin.

But when these swellings are critical, the consequence of a fever settled on this part, you must avoid the repelling method, and assist in bringing the swelling to matter, by means of suppurating poultices; experienced farriers advise never to open these tumours till they break of themselves; for if they are opened before they are ripe, the

whole sore will be spongy, and discharge a bloody ichor, which soon degenerates into a sordid ulcer. But take care to enlarge the openings and pare away the lips, that your dressings may be applied easily; and avoid the ligament which runs along the neck to the withers: if a gathering forms on the opposite side, open it in the same manner, but take care they incline downwards, for the sake of depending orifices, and letting the matter flow off easily, and if the bones should be found foul, they must be dressed with tincture of myrrh till they scale off: if the fungus is very troublesome, and the discharge oily, yellow, and viscid, pledgets soaked in the following, made hot, have been found very effectual, bathing the swelling round with spirit of wine and vinegar.

Take half an ounce of blue vitriol, dissolved in a pint of water; oil of turpentine, and rectified spirit of wine, of each four ounces; white wine vinegar, six ounces; oil of vitriol and Ægyptiacum of each two ounces.

These sharp liquid applications are often found more efficacious dressings than ointment with precipitate, or verdigris, or indeed any other digestives; as they insinuate themselves more readily into the interstices of the funge, or little quag-holes, so commonly observed in these kinds of ulcers; and at the same time, level and destroy the rising and exuberant papillæ; whereby the ulcer grows more smooth and dry, soon heals up, and cicatrises.

When the cavities are truly fistulous, the callosities must be cut out, where it can be done with a knife; and the remainder destroyed by corrosives; viz. precipitate, burnt allum, and white vitriol. *Bartlett's Farriery*, p. 273.

WITH-WINE. See the article BIND-WEED.

WOAD, the English name of a plant, called by botanists, *Isatis sativa*, vel *latifolia*.

This plant puts forth stems about three feet high, and of the thickness of a man's finger: these divide at their top into several branches loaded with many leaves irregularly placed; and these leaves, which resemble pretty much those of dog's-tongue, are sleek, and of a bluish green colour. The branches bear also great numbers of flowers composed of four yellow petals disposed cross-wise: the pointal becomes a capsule flattened on the edge, and each capsule contains two oblong seeds; the root is large, woody, and penetrates deep into the ground. This plant delights in a warm climate, such as Italy and the southern parts of France: though it has likewise been cultivated in Normandy, and is said to succeed in Germany; as experience has shewn that it does also in this country.

A light, black, kindly, and rich soil, or a meadow newly broken up, is chosen for the cultivation of woad; but it must not by any means be sown on stoney or shallow land. It thrives well in plains, but still better on the south side of a hill: the essential point is, that the soil be good, and that it have the above-mentioned qualities.

Though the land which is intended for woad be ever so good, it must be dunged a year before it is sown with this plant, and be made at first to bear a crop of wheat, or of onions, &c. After these are taken off, three deep stirrings should be given with the plough, or which is much better, with the spade: the first stirring should be in November, and the other two in February, March, or April. If the land which is intended for woad lies flat, and has not slope enough to carry off the wet, channels must be cut of a greater or less size, according as the ground is more or less disposed to retain the water.

In warm climates, woad is sown so early as the beginning of April, unless the weather chances then to be too cold, in which case this sowing is deferred till the beginning of May: but for countries like ours, where the spring is attended with frosts, particularly in the night, Mr. Miller is certainly right in advising to lay the land up in narrow high ridges just before winter, that the frost may mellow it: to cross plough it in the spring, laying it again in narrow ridges, and between this time and the ensuing month of June, to harrow it well twice, at different intervals, in order to root up whatever weeds may have appeared; then, in June, to give the ground a third ploughing as deep as the plough will go, making the furrows narrow; after this to harrow it again when any new weeds are come up; and finally, towards the end of July, or the beginning of August, to plough it for the last time, laying it as smooth as possible.

possible. A good harrowing after this will fit it completely to receive the seeds, which if rain fall soon after their being sown, or if they are steeped in water during the night before the sowing, as Mr. Miller advises, will appear in a fortnight, if the season be favourable. They should be but lightly covered, and should be sowed so thin as that the plants may stand six inches asunder. Some strew pigeon's dung on the land just after having sown it with woad, and the plants become much the finer for this manure.

It is a common custom to sow woad in broad cast: but all plants which require being hoed should certainly be sowed in rows, because this method greatly lessens the labour and time of hoeing; and besides, it is much easier, in this case to give each plant its due distance.

When the woad is grown large enough to be distinguished, it should be carefully cleared of all weeds, for these would hurt it greatly; and at the same time the plants should be thinned where they stand too close: without this precaution, the woad would produce but very few leaves, and would remain extremely stunted in its growth.

The intervals between the plants should be stirred whenever the season requires it; and in the doing of this, by which the weeds thereby rooted out will soon be destroyed in dry weather, care should be taken to lay a little earth up around the stems of the woad. M. Du Hamel, whose account we have here resumed, says he has been assured, that, in countries where there is a convenience of water, the woad-grounds are flooded; but to reap any benefit from this practice, the water should be in sufficient plenty for the husbandman to be able to repeat the flooding frequently; for otherwise the heat of the sun, after having exhaled the water too soon, would harden the surface of the earth, and thereby greatly injure the plants.

Woad generally affords two crops in the same year, and sometimes when the season has been favourable, it has yielded even four. The two first are the best, and these are commonly mixed together in the manufacturing of this plant: but the after crops are always kept separate; for if these are mixed with the other, the whole will be spoiled. The two first crops will sell for from twenty-five to thirty pounds a ton; but the latter will not bring more than seven or eight pounds, and sometimes not so much. An acre of land well husbanded will produce a ton of woad, and in good seasons near a ton and a half. The first crop is gathered towards the end of August, and the last at the end of October, or in the beginning of November: but this last crop must be got in before the first frosts comes on; for the leaves that might be gathered afterwards would not be worth any thing. When the plant is ripe, which is known by its first leaves beginning to dry, all the leaves are cut off by a man who grasps the plants by handfuls, and they are then laid up to wither. Whilst they are in this situation, they must be sheltered from the sun and rain, and they must be frequently turned, in order that they may heat equally: they are then carried to a mill somewhat like that which is used for pressing the oil out of linseed, and are there ground till they are reduced into a paste, which is afterwards formed into cakes of about a pound weight, and these are laid to dry in a covered place, where neither the sun nor rain can come to them. This paste is dried thus for about a fortnight, that is to say, till it has acquired consistence enough to be formed into small roundish lumps, by means of little wooden moulds into which it is put for that purpose. As fast as these lumps are taken out of the moulds, they are laid upon wicker hurdles loosely woven, so as not to touch one another, and in such manner that the air may come at every part of them, as is practised in the drying of starch. These lumps become very hard, and in this condition it is that they are sold. When they are to be used, they must be steeped a long while in water before they can be broken.

The woad thus prepared yields an excellent blue dye, very lasting, and with which all the degrees of this colour may be made. It is not long since this plant was preferred to indigo; afterwards, through a kind of toleration, the dyers were allowed to put a small quantity of indigo into their vats of woad; but now that the making and manner of using indigo have been greatly improved, it is looked upon as a matter of indifference whether that or woad be used for dying blue.

At the last cutting of the woad, and with that cutting, the crown of the root is taken off; whereas only the leaves were gathered in the preceding cuttings. When it is intended to save the seed of woad, a small portion of the plantation

should be allotted for this purpose at the last cutting, and then a part only of the leaves there should be taken from the plants: but it is proper to retrench some of them, because experience has shewn that the plants on which all their leaves are left run to seed soon, and that their seeds have in this case often been destroyed by the cold of the ensuing spring. Thus woad, being a biennial plant, should not be suffered to seed before the month of August in the second year after it has been sown; and therefore some of its leaves should be cut off in October, to prevent its being too forward.

Besides cold, weeds and drough, which are very pernicious to woad, locusts will sometimes devour a whole field of it in an evening. When these enemies are observed, all the leaves should be immediately cut off, that the plants may put forth new ones.

The same field should not be made to bear a second crop of woad immediately after the first; for this plant is a great impoverisher of the ground: but after it has been taken off, wheat may be sown the first year, millet the second, and in the third it may be laid down again to woad, if it has been well manured.

WOLVES TEETH, a name given to those teeth, which grow in such a manner, that their points prick, or wound either the tongue or gums, in eating. Old horses are most liable to this infirmity, and whose upper overshoot the under teeth in a great degree.

To remedy this evil, you may either chop off the superfluous parts of the teeth with a chisel and mallet, or file them down; which is the better way, till you have sufficiently wasted them.

WOOD, a large and thick plantation of trees.

The two most substantial timbers of this country are the oak and chesnut; though the latter has been of late years almost entirely destroyed in England, so that there are scarce any remains of trees of size in the woods at present; but there can be no doubt of this tree having been one of the most common trees in this country, as may be proved by the old buildings in many parts of England, in which the greatest part of the timber is chesnut. Next to these, the elm is esteemed as a profitable timber; but of these there are few cultivated in woods, especially in the south part of England, where they chiefly grow in hedge-rows, or plantations near houses; but in the north-west part of England, there are numbers of very large trees of the witch-elm, growing in parks, and some in woods, as if that tree was a native of this country, which has been much doubted; though as this tree propagates itself by seeds, it may be deemed an indigenous plant in England.

The beech is another tree common in the woods, especially upon the chalky hills of Buckinghamshire, Kent, Sussex, and Hampshire, where there are some very large woods entirely of this sort; some of which have been of long standing, as appears by the age of the trees; but whether this tree is a native of this country, has been a point often disputed.

The ash is a very profitable tree, and of quick growth; so that in less than an age, the trees will arrive to a large size from the seeds; therefore a person may hope to reap the profits of his labour, who sows the seeds; but this is not a beautiful tree to stand near a habitation, being late in the spring in putting out its leaves, and the first that sheds them in autumn; nor is it a friendly tree to whatever grows near it, the roots drawing away all the nourishment of the ground, whereby the trees or plants which grow near are deprived of it; so that where the ash grows in hedge-rows, the hedges in a few years are entirely destroyed; and if they are in pasture-grounds, and the cows browse on them, the butter made with the milk will be bad; for which reason the ash should be sown separate in lands which are inclosed, where cattle are not permitted to come, and at a distance from the habitation.

Upon sandy or rocky soils, the Scotch pine will thrive exceedingly, and turn to great advantage to the planter, provided the plants are planted young, and treated in a proper manner. There are also several aquatic trees, which are very profitable to those who have low marshy lands, where the harder kinds of timber will not thrive: these are the poplars of several sorts, the willow, alder, &c.

Where there are young woods, great care must be taken of the fences; for if cattle should get in among the trees, they will, in a short time, do infinite damage to them, by browsing on their branches, or barking their trees; and during the first ten years of their growth, they should be secured

secured from hares and rabbits, otherwise, in severe frost, when the ground is covered with snow, whereby they are deprived of other food, they will get into the woods, and eat off the bark from the young trees, and gnaw all the branches within their reach; so that in a few days, where there are plenty of these animals, there may be such destruction made among the young trees, as cannot be retrieved, but by cutting them down to the ground, which will be a loss of several years; therefore those persons who have the care of young woods, should be very diligent in frosty weather in looking over the trees, and stopping holes in the fences to keep out the vermin.

Another care to be taken of young woods, is the thinning the trees from time to time, as they increase in their growth; but in doing of this, there must be great caution used, for it should be gradually performed, so as not to open the trees too much, to let the cold air among them, which will greatly retard their growth; nor should the trees be left so close as to draw each other up like May-poles, but rather observe a medium in this work, cutting down a few each year, according as there may be necessity for it, being careful not to permit those to stand, which may spoil the growth of the neighbouring trees, always observing to leave those trees which are the most promising.

The young trees in these woods should not be lopped or pruned, for the more they are cut the less they will increase in bulk; every branch which is cut off will rob the tree of its nourishment, in proportion to the size of the branch; therefore the hatchet should not be suffered to come into young woods, unless in the hands of skilful persons.

Where persons have more regard to the future welfare of the timber than their immediate profit, the underwood should be grubbed up as the trees advance, that the roots may have the whole benefit of the soil, and their stems enjoy the free air, without which their stems are generally covered with moss, and their growth greatly stunted; as may be observed in all such woods where there is any quantity of underwood remaining, in which places it is rarely found that the trees do ever grow to a large size; therefore when large timber is desired, the trees must have room to extend their roots and branches, without which it cannot be expected: but from a covetous temper, many people let their underwood remain as long as it will live; for as the timber increases, the underwood will be gradually decaying by the shade and drip of the large trees, so that by this method the timber suffers more in a few years than the value of the underwood; therefore by endeavouring to have both, neither of them can be so good as where they are separately preserved.

If persons who have estates would be careful to nurse up trees in their hedge rows, it would in time become a fortune to their successors; as hereby the timber growing in the hedges may be worth more than the freehold of the estate, which has often been the case with estates from which their possessors have cut down timber for fortunes for their younger children; the frequency of this should encourage persons to be a little more attentive to the growth and preservation of young woods, since the expence and trouble is not great, and the future profit very certain; besides, the pleasure of seeing trees of a man's own sowing make yearly advances, must be very great to those who have any relish for country amusements.

There are several persons who plant copses for cutting every ten or twelve years, according to their growth. These are usually planted in autumn, either with stools or young plants, which are drawn out of the woods; the latter should always be preferred to the former. These copses are commonly planted with several sorts of trees, as oak, beech, chestnut, ash, birch, willows, &c. But the ash and chestnut are the most profitable, where they grow kindly, because the poles of ash are very valuable: these

also are good for hoops, so that there is no danger of having sale for these copse woods when they are fit for cutting; but where the copses are intended to remain, there should be no standard trees left for timber, because as the heads of the trees spread, and overtop the underwood, it will cause that to decay, and where the standards are left upon the stumps of the copse wood, they will never grow to a large size, nor will the timber be so valuable as that produced immediately from a young root; therefore whoever will make the experiment, will be convinced that it is more for the advantage of both to keep them in distinct woods.

But where persons plant copses upon land free from trees, it will be the better method to sow the seeds, especially if chestnut, oak, or beech, are the trees intended; for although it is a prevailing opinion with the generality of persons, that by planting they save time, yet I am sure of the contrary; for if the seedling plants are kept clear from weeds, they will, in eight or ten years, out-grow those which are planted; and these unremoved copses will continue much longer in vigour than the other: so that for either timber or copse wood, the best method is to prepare the ground well, and secure the fences and sow the seeds, which is so far from losing, that in twenty years it will be found to gain time, which is what every planter wishes to do.

The usual time of felling timber is from November to February, at which time the sap in the trees is hardened; for when the sap is flowing in the trees, if they are cut down, the worm will take the timber, and cause it to decay very soon; therefore if the durability of the timber is considered, the trees should always be cut in the winter months; but as the bark of the oak is so very valuable for tanning leather, there has been a law passed to oblige persons to cut these trees during the spring-season, when the bark will readily peel off, by which the timber is rendered unfit for building either ships or houses, as it will be very subject to cast, rift, or twine, and the worm will soon take it; therefore it will be more for the public benefit, if a law was enacted to oblige every person to strip off the bark of such trees as are designed to be cut down in the spring when the bark will run, leaving the trees with their branches standing till the following winter, which will be found to answer both purposes well. *Miller's Gard. Dict.*

WOOD-COCK Soil, ground whose soil under the turf is of the colour of a wood-cock, and is not good.

WOOD-LAND, ground covered with woods. It is also a term used by the farmers of many counties of England, for a sort of soil, from its constant humidity and dark colour, resembling the soil in woods, which, of whatever nature it originally is, will always be made to appear thus from the continual dropping of trees, and the want of a free air and sun, together with the fall of leaves, destroyed and washed to pieces by the wet.

This soil in the open countries has a considerable quantity of clay in it, and holds the water a long time that once falls upon it: in wet weather it sticks firmly to the ploughshare; and, in dry, is very apt to crack. In uncultivated places it usually produces rushes and rush grass. A moist and dripping year is extremely detrimental to this sort of land.

WOODEN HORSE COLLARS. See **COLLARS.**

WOODY, abounding with wood.

WOOL, the covering of sheep. Each fleece consists of wool of several qualities and degrees of fineness, which the dealers therein take care to separate.

The English and French usually separate each fleece into three principal sorts, viz. 1. Mother-wool, which is that of the back and neck. 2. The wool of the tails and legs. 3. That of the breast and under the belly. The wool most esteemed is the English, chiefly that about Leominster, Coltsfold, and the Isle of White; the Spanish, principally that about Segovia; and the French about Berry.

An account of three experiments made to discover whether wool, laid up in the fleece, alters in its weight.

It has been a matter of some doubt amongst graziers, farmers, and dealers in wool, whether or not wool, after it is shorn and laid up in the fleece, alters in its weight. The following experiments were made to decide this question.

EXPERIMENT I.

This wool was shorn dry, and laid up in a two-pair of stairs room on a boarded-floor.

		Weight	
		lb.	oz.
1746,	Aug. 10	76	6
	Sept. 7	76	8
	Oct. 14	77	11
	Nov. 18	78	0
1747,	Jan. 26	80	0
	Feb. 20	80	4
	Mar. 23	79	8
	Apr. 18	77	13
	June 24	76	8
	July 28	76	8
	Sept. 16	75	15
	Nov. 2	78	1
	Dec. 8	78	14
1748,	Feb. 15	79	1

The weight was increased from Aug. 10, 1746, (when it was first laid up) to Feb. 20, 1747, in the proportion as 100 to 105.

EXPERIMENT II.

This wool was shorn dry and laid in a lower room, with a brick floor one foot above the floor.

		Weight	
		lb.	oz.
1749,	Oct. 15	100	4
	Nov. 18	101	2
1747,	Jan. 26	102	8
	Feb. 20	102	11
	Mar. 23	102	9

The weight increased from October 15, 1746, to February 20, 1747, as 100 to 102½.

N. B. It is something difficult to account for this parcel of wool not increasing more in its weight, as it lay so near the ground floor: but very probably the air had been very damp and raw from the time it was shorn till the 15th of October, 1746, when it was first weighed, so that the wool had then very likely gained weight considerably.

EXPERIMENT III.

This wool was shorn dry, and laid up in a two-pair-of-stairs room with a boarded floor.

		Weight	
		lb.	oz.
1756,	Aug. 30	36	9
	Nov. 19	37	2
	Feb. 19	37	12
	Mar. 24	37	6
	April 1	37	4
	Ditto 21	36	14
	May 2	36	13
	June 1	36	8½
	Ditto 13	36	4
	July 8	36	1½
	Ditto 27	35	12
	Sept. 30	36	4
1758,	Jan. 25	37	11½

The weight of this wool increased from the time it was laid up, August 30, 1757, to Feb. 19, 1757, as 100 to 103¼.

Both wool, and woollen rags, make an excellent manure

WORKING HORSES. See HORSE.

WORKING OXEN. See OXEN.

WORMS are very prejudicial to corn fields, eating up the roots of the young corn, and destroying great quantities of the crop. Sea-salt is the best of all things for destroying them. Sea-water is proper to sprinkle on the land, where it can be had; where the salt springs are, their water does; and where neither are at hand a little common or bay-salt does as well. Soot will destroy them in some lands, but is not to be depended upon, for it does not always succeed. Some farmers strew on their lands a mixture of chalk and lime; and others trust wholly to their winter-fallowing to do it, if this is done in a wet season, when they come up to the surface of the ground, and some nails with sharp heads be driven into the bottom of the plough. If they are troublesome in gardens, the refuse brine of salted meat will serve the purpose, or some walnut leaves steeped in a cistern of water for a fortnight or three weeks, will give it such a bitterness that it will be a certain poison to them. A decoction of wood-ashes, sprinkled on the ground, will answer the same purpose; and any particular plant may be secured both from worms and snails by strewing a mixture of lime and ashes about its roots. It is a general caution among the farmers to sow their corn as shallow as they can, where the field is very subject to worms.

WORMS, a well known species of insects, very troublesome to horses.

Authors have described three different sorts of worms that affect horses, viz. bots, which young horses are often troubled with in the spring: the rotundi, or those resembling earth-worms; and the ascarides, or those about the size of the largest sewing needle, with flat heads.

For the method of curing the bots, see the article BOTS.

As the source of worms in general proceeds from a vitiated appetite and a weak digestion, recourse must first be had to mercurials, and afterwards to such things as are proper to strengthen the stomach, promote digestion, and by destroying the supposed ova, prevent the regeneration of these animals. Thus, two drams of calomel may be given with half an ounce of diapente, and mixed up with conserve of wormwood over night; and the next morning the above purge: these may be repeated in six or eight days. Or the following mercurial purge may be given, which will be less troublesome, and no less efficacious.

Take crude quicksilver, two drams; Venice turpentine, half an ounce; rub the quicksilver till no glistening appears; then add an ounce of aloes, a dram of grated ginger, thirty drops of oil of favin, and a sufficient quantity of syrup of buckthorn to make a ball.

One of these balls may be given every six days, with the usual precautions in regard to mercurial physic: and these powders intermediately.

Take powdered tin and Æthiops mineral, of each half an ounce: give every night in a mash, or his corn.

The various preparations of antimony and mercury must be given several weeks together, in order to get entire rid-dance of these vermin. The Æthiops mineral may be given to the quantity of half an ounce a day; the mercurius alkalifatus to two drams a day, incorporated with a bit of cordial ball. The cinnabar powders, as directed in the farcy, are no less effectual: and when worms are bred from high feeding, or unwholesome food; rue, garlick, tansy, favin, box, and many other simples, may be given successfully; being for that purpose mixed with their food; as also cut tobacco, from half an ounce to an ounce a day.

As the generation of worms perhaps principally proceeds from a weak stomach, and bad digestion, if the horse be of a tender constitution, and a bad feeder, the following bitter drink should be given to strengthen his stomach, and mend digestion, which will prevent the formation of these animals, interposing now and then a gentle stomach purge, prepared with an ounce and half of hiera picra made up into a ball, with syrup of buckthorn.

Take gentian root, zedoary and galangals of each two ounces; chamomile flowers, and tops of centaury, of each two handfuls; Jesuit's bark powdered, two ounces; filings of iron half a pound; juniper berries four ounces: infuse in three gallons of ale for a week, shaking the vessel now and then: and give a pint of this night and morning.

To answer this purpose also, an ounce of filings of steel finely powdered, has been successfully given every day for a fortnight or longer, in the horse's corn. Bartlett's Farriery, p. 150.

WOUND, a hurt given by violence.

In all fresh wounds made by cutting instruments, there is nothing more required than bringing the lips of the wound into contact by suture or bandage, provided the part will allow of it; for on wounds of the hips, or other prominent parts, and across some of the large muscles, the stitches are apt to burst on the horse's lying down and rising up in the stall; in such cases the lips should not be brought close together; one stitch is sufficient for a wound two inches long; but in large wounds may be at an inch or more distance; and if the wound is deep in the muscles, care should be taken to pass the needles proportionably deep, otherwise the wound will not unite properly from the bottom.

Should

Should the wound bleed much from an artery divided, the first step should be to secure it, by passing a crooked needle underneath, and tying it up with a waxed thread. If the artery cannot be got at this way, apply a button of lint or tow to the mouth of the bleeding vessel, dipped in a strong solution of blue vitriol, styptic water, oil of vitriol, or hot oil of turpentine, powdered vitriol, or colcothar, &c. and remember always to apply it close to the mouth of the bleeding vessels, and take care that it is kept there by proper compresses and bandage, till an eschar is formed; otherwise it will elude your expectations, and frequently alarm you with fresh bleedings.

I purposely avoid setting down any famous receipts for fresh wounds, whether ointments, or Fryar's balsams, being well assured, that in a healthy sound constitution, nature furnishes the best balsam, and performs herself the cure, which is so often attributed to the medicine; when it is otherwise, and the blood is deprived of its balsamic state, as will appear from the aspect of the wound, and its manner of healing, it must be rectified by proper internal medicines, before a great foundation for healing can be laid by any external applications whatever.

The lips of the wound then being brought together by the needle or bandage, it needs only to be covered with rags dipped in brandy, or a pledgit of tow spread with the wound ointment, and the wounded part kept as much as possible from motion.

Remember to dress all wounds of the joints, tendons and membranous parts, with terebinthinate medicines: to which may be added honey and tincture of myrrh; and avoid all greasy applications whatever; fomentations and poultices are also generally here of great use; the former thin and attenuate the impacted fluids, greatly promote a free perspiration in the limb, and facilitate the unloading the surcharge on the vessels, by quickening the motion of the fluids; while the latter, by relaxing the vessels, abate their tension, and relieve the obstruction, by promoting digestion.

Punctured wounds from thorns, or any other accidents, should be treated in the same manner; applying the beer, or bread and milk poultice over the dressing, till some signs of digestion appear; and fomenting the part well every day. This method is also very successfully used to those swellings, which often arise on the neck from bleeding, the sores being sprinkled with precipitate, and burnt allum powdered, to fetch out the core, or fungus, which choaks up the orifice. The usual method is to introduce a piece of vitriol, or sublimate, which often brings on a plentiful discharge, fetches out the core, and makes a cure; but it is often with the loss of the vein, and it sometimes leaves a large swelling and imposthumation.

In gun-shot wounds, when the ball has not penetrated too deep, it should be extracted, if it can be fetched away without disturbance, together with any extraneous bodies that might pass in with it; the wound should be dressed with the old digestive of Venice or common turpentine,

divided with the yolks of eggs, to which may be added some honey and tincture of myrrh. The entrance of these wounds frequently requires to be enlarged, and a depending orifice should always be procured if possible; and if the wound should not digest kindly, apply the beer poultice, and foment with the discutient fomentation.

In scalds, or burns from gun-powder, or any other cause, when the skin remains entire, bathe the part well, and keep it soaked with rags dipped in spirit of wine camphorated: salt bound thick on the part has been found very effectual for this purpose: and indeed all saline and spirituous applications excel others, while the skin is yet unbroke; but when the skin is separated, anoint the part, and keep it constantly supple with linseed or fallad oil, and a plaister spread with bees-wax and oil; if the skin is so scorched, that sloughs must be digested out, dress with the wound ointment and oil of turpentine, and finish the cure with any drying ointment. Should the horse be feverish from the pain, bleed him, give cooling clysters, and treat him as we have directed in simple fevers.

The fire supposed to be left in the part after injuries of this kind, is nothing more than the inflammation, which is the natural effect of such causes; so that the whimsical notions and conceits concerning fire remaining in the burnt part, is extremely absurd.

Wounds in the Feet from Nails, Gravel, &c.

Accidents of this sort are very common, and sometimes for want of early care, prove of bad consequence: for the parts being naturally tender, are very susceptible of inflammation; and when matter is once formed, if a free discharge is not procured, the bone which is spongy, soon becomes affected, and the whole foot is then in danger.

When any extraneous bodies, such as nails, stubs, thorns, &c. have passed into the horse's foot, you should endeavour to get them out as soon as possible; and after washing the part with oil of turpentine, dress the hole with lint dipped in the same, melted down with a little tar; the foot may be stopped up with bran and hogs-lard heated together, or put into the turnep, or any soft poultice: this method is generally successful, when the nail, &c. is entirely removed; but if any piece, or particle, should remain behind, which may be suspected by the degree of pain, and discharge of matter, after paring away the sole as thin as possible, introduce a bit of sponge tent in order to enlarge the hole, that it may be drawn out by a small pair of forceps, or brought away by digestion: if this method should not succeed, but the lameness continues, with a discharge of a thin, bloody, or stinking matter, you must no longer delay opening the wound with a drawing knife to the bottom, and then dress as above directed, or with the turpentine digestive, divided with the yolk of an egg, and a little tincture of myrrh, afterwards with the precipitate medicine. *Bartlett's Farriery, p. 246.*

Y.

YARD-LAND, a quantity of land, in some countries fifteen acres, in some twenty, and in others, twenty-four, thirty, and thirty-four acres.

YELLOWS, a disease incident to horses and other cattle, and more properly called the jaundice. See the article JAUNDICE.

"Having, says a correspondent of the editors of the Museum Rusticum, noted the frequent fatal effects of the disease in cattle, called the yellows, I some years since resolved to let no opportunity slip of being acquainted with this complaint, in order to assign its cause, inasmuch as I apprehend it to be the forerunner of most chronical diseases,

to which great cattle are subject, as the murrain in the guts; scowering, asthma, or wheezing, dropsy, and loss of milk, &c.

"I have not hitherto been able to find any author who has treated of this complaint in a manner suitable to the consequence thereof, so as to trace the symptoms in its several stages, in order to effect a cure; and, where this complaint has been quite neglected or ill cured, to point out the consequence, by shewing how it may appear under the above-mentioned shapes, which, being mistaken for originals when they are only consequents, are rarely cured, through the first cause being unknown.

"This complaint, I apprehend, proceeds from a waste of bile, that is, a preternatural running out of what is called gall; occasioned by the rugæ, which are in the inner membrane of the neck of the bilious duct, becoming, by some accident, too weak to perform their office, so that the gall runs out of the bladder nearly as fast as it runs in; by which means it forceth itself, or a considerable part at least, into the porus bilarius, instead of being discharged by the ductus communis cholidochus into the intestines, and, by the means of the vena porta, mixes again with the blood, filling that with its sharp pungent quality; which causeth that fluid to become of a fizy nature, and, consequently, to move slowly in the channels through which it passes; whence arises that sluggish disposition the beast in this complaint is subject to, and which is one of the first symptom of the disease.

"And the liver, being deprived of the natural heat and weight thereof, is, together with the fiziness of the blood, rendered incapable of performing its office, so that the supply of bile is not equal to the expence; nor is the blood purified from it as it ought, but passes on together till it fixes in some part, and there (if not timely prevented) forms a tumour very prejudicial to the beast.

"These tumours I have seen appear externally in the glands behind the ears, in the shoulders, and in the flank, in the dewlap, round the corner of the hoofs, and in the udder, or milk-bag; internally, in the form of water, in the veins of fat between the muscular parts of the body, in the kidney fat, and even between the coats of the guts.

"When these tumours, which appear externally, come to suppuration, the beast commonly recovers, though frequently it be a long time first.

"The seasons of the year in which cattle are most subject to this complaint, are for about the five first weeks after they are put out to graze in the spring, during which time the season is apt to be very warm at days and cold at nights; the grazes being also tender, and abounding with moisture: and in like manner in autumn; at which time the days are also warm and nights cold; and the grazes, on account of autumnal rains, tender as in the spring and more so, if the preceding summer was tolerably dry.

"The cattle at these seasons being faint and very subject to perspire much, by which the pores are greatly opened in the day, and sudden cold coming on at night hastily contracts them; and before the warmth of the next day becomes sufficient to set the parts thus contracted at liberty, the matter, which should have been discharged by perspiration, returns into the blood in order to pass off by urine, by which means a much greater quantity of bile is secreted than otherways would; which passing into its receptacle, the gall-bladder, causes it to extend to a preternatural size; thereby extending the passage by its pressure, till the rugæ are scarcely to be seen: whereby the resistance made by them is not equal to the pressure of the bile, which consequently forces its way hastily into the blood, in the manner before observed, instead of passing off as excrement by the guts.

"The early symptoms attending this disease, are, a shaking of the beast in a morning, and more particularly the hinder parts, as the loins, thighs, and legs; hollowness of the eyes, and the hair staring; a dry nose, and if the cold taken be great, hanging of the ears, the swelling of the dewlap, of the glands of the ears, the shoulders, or the flanks, and of one or more quarters of the udder, or milk-bag in cows; with a sudden decrease of milk, what remains becoming, after a few days, more yellow than usual, and will, if boiled, curdle: the fore teeth are generally loose, as tho' they would drop out.

"If these symptoms, especially the first, remain unobserved, as is often the case in barren cattle, and such as range at large, it frequently happens that the disorder settles in some inward part; as on the pericardium, which

causes wheezing, and the hark, and uncommon poverty; when in the guts and mesentery, (or sweet bread) causes the hark and scowering; and when in the vein of fat, between the muscles, causes the dropsy and uncommon weakness.

"In this last complaint, on opening a beast, the milt or spleen was very small, and thin, not half so large as in a healthy state, as was also the liver; but other ways sound and perfect, the gall-bladder of an uncommon thickness, and its contents very little.

"In opening a beast which was wasted, and subject to wheezing and the hark, the pericardium was become hard, and inclined to callosity towards the part which joined the heart: the heart unusually large, but sound: the lights very sound, but small: the milt or spleen thin and withered: and the liver dryish, with a few small hard knots therein: the gall-bladder near as the former.

"I have observed these knobs in others, and generally found the gall-bladder, liver and spleen less or more affected; those which had the hark, and scowered, generally having their guts covered, the inside with a large quantity of mucus resembling frogs spawn: the flesh of these is always of a yellow cast.

"Having said thus much of what I apprehend the cause, I will now prescribe what I have very many times known used with good success for a cure.

"First, Suffer no blood to be taken away from the beast.

"Take a handful of rue tops, the like quantity of the greater celendine; shred them small, and mix with them one ounce of turmeric root in powder (or instead thereof red sanders); put these in three pints of stale old ale or beer, and cause it just to boil up; when it is cold enough, give it the beast warm: there is no occasion to keep the beast in before or after, unless the inclemency of weather oblige.

"Two of these drinks, at forty-eight hours distance, will perfect a cure, if the disease be not of long-standing.

"Should a scowering be come on, then, after the first drink, give the following on the intermediate days.

"Take two pounds of oak-bark, boil it in one gallon of water till one fourth be consumed; strain it; in this water boil two pounds of rice till it be soft; mix with it half a pound of the burnt crust of bread, taken from the underside of the loaf; and to all this put two quarts of milk; let it boil for twenty minutes; divide it in two parts, and give one to the beast at a time warm." *Museum Rusticum*, vol. II. p. 144.

YEOMAN, the first or highest degree of the plebeians of England. The yeomen are properly freeholders, and who cultivate their own lands.

YEW-TREE, the name of a well known tree, common on cold soils in many parts of England. The timber of the yew-tree is much esteemed for various uses.

These trees may be easily propagated by sowing their berries in autumn, as soon as they are ripe, upon a bed of fresh undunged soil, covering them over about half an inch thick with the same earth.

In the spring the bed must be carefully cleared from weeds, and if the season prove dry, it will be proper to refresh the bed with water now and then, which will promote the growth of the seeds; many of which will come up the same spring, but others will remain in the ground until autumn or spring following; but when the seeds are preserved above ground till spring before they are sown, the plants never come up till the year after, so that by sowing the seeds as soon as they are ripe, there is often a whole year saved.

These plants, when they come up, should be constantly cleared from weeds, which, if permitted to grow amongst them, would cause their bottoms to be naked, and frequently destroy the plants when they continue long undisturbed.

In this bed the plants may remain two years; after which in autumn, there should be a spot of fresh undunged soil prepared, into which they should be removed the beginning of October, planting them in beds about four or five feet wide, in rows about a foot asunder, and six inches distance from each other in the rows, observing to lay a little mulch upon the surface of the ground about their roots,

as also to water them in dry weather until they have taken root; after which they will require no farther care, but to keep them clear from weeds in summer, and to train them according to the purpose for which they are designed.

In these beds they may remain two or three years, according as they have grown, when they should again be removed into a nursery, placing them in rows at three feet distance, and the plants eighteen inches asunder in the rows, observing to do it in autumn, as before directed, and continue to trim them in the summer, for what they are intended; after they have continued three or four years in this nursery, they may be transplanted where they are to remain, always observing to remove them in autumn where the ground is very dry; but on cold moist land it is better in the spring.

These trees are very slow in growing, but yet there are many very large trees upon some barren cold soils, in divers parts of England.

YOAK, or YOKE, a frame of wood, fitted over the necks of oxen, whereby they are coupled together, and harnessed to the plough.

Horses and oxen are the animals used for drawing ploughs. Sometimes the one, sometimes the other, and sometimes both together. It is impossible to determine which of these is the most proper. This depends upon the kind of food most easily obtained, the kinds of work required, and the expence of breeding, or purchasing. If the real labour is to determine this, without any other consideration, then oxen are to be preferred; because as they stand to the draught, they will overcome a resistance which horses will yield to.

As it cannot be determined, what kind of cattle are most proper for the plough, so neither can it be determined, what number is necessary. This depends upon the strength of the cattle, and the nature of the soil. The number varies according to the work in which the plough is to be employed, and often according to the custom of the place, and fancy of the farmer.

The methods of yoking cattle in ploughs, vary almost as much as the number used. Some of them at first sight are so awkward, that it is needless to consider them. The only thing worthy of being enquired into, is, whether the cattle should be yoked in pairs, or in a line before each other? We shall therefore consider the advantages and disadvantages attending each way, and compare them together.

The most common way of yoking cattle in ploughs is in pairs. There are some disadvantages attending this way that are obvious. In ploughing the furrows betwixt ridges, the land-cattle go upon the ploughed land, and tread it down with their feet: this, especially if the land is wet, hurts it very much.

There is another disadvantage very obvious. When there is but as much of the ridge unploughed as to allow the land cattle to go upon it with difficulty, they are frequently either going into the opposite furrow, and thereby giving the plough too much land; or, which is worse, they are justling the furrow-cattle upon the ploughed land.

To remove these inconveniences that attend the ploughing with cattle yoked in pairs, some yoke them in a line before each other. It is obvious, that cattle yoked in this manner, going always in the furrow, neither tread upon the ploughed land, nor jostle one another. In these respects the yoking the cattle in a line before each other, seems to have the advantage.

It is to be observed, however, that this method is not quite free from inconveniences. When examined it may perhaps be found attended with as great inconveniences as the other.

When cattle are yoked in a line, they go all in the furrow. This makes it necessary to give the plough more land than ordinary, either by the foke or the muzzle; for if this be not done, the head and foke being in the same direction with the beam, and the cattle yoked to the middle of it, the plough will directly follow the cattle, without taking any thing off from the land. Now it is inconvenient to be obliged to give the plough land either by the foke or muzzle; for, when the foke is turned out of the plane of the beam, it makes the plough heavy to draw; and when the muzzle puts the draught too much to one side of the beam, it prevents the plough from going upright. The yoking the cattle in pairs is attended with none of these inconveniences; for, in this case, the quantity of land, which the

plough has naturally, when right made, is sufficient to make it take off a proper furrow.

There is another inconveniency that attends yoking cattle in a line, arising from the nature of the animals. Horses and oxen, like men, love their ease, and are disposed to throw the burden upon their fellows. This they have a better opportunity of doing when yoked in a line before each other, than when yoked in pairs. When yoked in a line, each pulls by the traces of the one behind him; and therefore, though it may be known when the foremost neglect his work, by the slackening of his traces, yet it cannot be known when any of the rest neglect their work; for though one of them does this, yet by the pulling of the one before him his traces may be fully stretched. But this is easily discovered, when the cattle are yoked in pairs; for then every one of them has a separate draught. The goadman, or driver, knows, by the position of the yokes or cross-trees, whenever one does not draw equally with his fellow; and the ploughman perceives by the going of the plough, whenever any of the two pairs does not draw equally with the other: for if the pair that goes foremost neglect their work, the plough is pulled out of the ground; and if the pair that go hindmost neglect their work, the plough is pulled in too deep. The reason is obvious; the plough is made to go at a proper depth, when the two forces by which different directions are given the plough, act at the same time. If one of them then should cease to act, the plough cannot go right. If the foremost pair should cease to draw, the plough having too little eard for the direction of the draught of the hindmost pair, will come out of the ground: and if the hindmost pair cease to draw, the plough having too much eard for the direction of the draught of the foremost pair, will go in too deep. This does not hold in an ox-plough: for as the beam by which the foremost pair draw is fixed to the yoak of the hindmost pair, the whole force applied to the plough is in the same direction: and therefore, though any of the pair cease to draw, there is no alteration in the going of the plough.

There is yet another inconveniency that attends the common way of yoking cattle in a line before each other. When the fore cattle are all yoked to the traces of the hindmost, it is obvious, that as the beam, to which the draught is fixed, is much lower than his shoulders, by which the rest pull, such a weight must be laid upon his back or shoulder, as must render him incapable of giving any assistance. Besides, as the whole force is applied in the direction of the traces of the hindmost horse, it cannot have such influence on the plough, as when a part of it is in a direction more horizontal. When a body is to be moved forward in any direction, the nearer that the direction of the force applied approaches to the direction of the body, it acts with greater influence. And therefore, as the plough moves horizontally, and as the direction of the united draught of a plough with the cattle yoked two abreast, is more horizontal than the direction of the draught in a plough with cattle yoked in a line, the same force applied will have greater influence.

When these two different ways of yoking cattle in ploughs are thus considered and compared together, it is difficult to determine which ought to be preferred. Each of the two seems preferable to the other in a certain situation. When the land is stiff and the labour severe, the yoking the cattle in pairs seems preferable, as it is certainly the strongest draught; and when the land is wet, and in danger of being much hurt by the treading of the cattle, the yoking them in a line before each other seems preferable; as thereby they are confined to the bottom of the furrow, which is the firmest part of the land, and prevented from doing harm.

When a person uses two or more ploughs, it is a very proper way to have one with the cattle yoked in a line, and the rest with the cattle yoked in pairs. The ploughs with the cattle yoked in pairs continue as long as the land-cattle have room to go easily upon the firm land; and the plough with the cattle yoked in a line, follows, and clears up the furrows. In this way the cattle yoked in pairs do no damage, and the cattle yoked in a line are never used but where they are of real benefit.

To persons that incline to yoke the cattle in a line before each other, it will not be amiss to point out a way to remove the inconveniency last mentioned, and show how the cattle may be yoked so as to lay no additional weight on the back or shoulders of the hindmost horse, and to make the direction of the draught more horizontal. This is done by making the

the traces of the horse next to the plough but one very long, and fixing them, not to the shoulders of the horse behind him, but to the cross-tree, and by fixing the traces of the horse before him, not to his shoulders, but to his traces at the place where the back-rope is fixed. By this the hindmost horse is delivered from the burden laid upon him in the other method; as his draught is entirely independent of that of the rest. There is indeed some weight laid upon the horse immediately before him, to whom the others are yoked. But this is but small; for his traces are nearly in the same direction with theirs, and they are yoked to him at a place lower than his shoulder. By this, likewise, the direction of the united draught is more horizontal, when there are three or more horses yoked: it is even more horizontal than when the cattle are yoked in pairs. In a four-horse plough yoked in pairs the two forces are equal; but in a four-horse plough, yoked in this manner, the force most horizontal is to the other, as three to one.

The traces of the horse hindmost but one being long, will incommode the hindmost horse in turning, if they have nothing to support them. To prevent this, two links must be fixed to the shoulders of the hindmost horse, and the traces passed through them; the links long enough to allow the traces to be stretched.

When two horses are sufficient for the draught, the yoking them in this manner described for the two hindmost, removes also the second inconvenience mentioned, that attends the yoking cattle in a line: for the ploughman discerns, by the going of the plough, when any of them neglect their work, in the same manner as when there are four horses in the plough yoked in pairs.

The ordinary method of yoking oxen, is attended not only with all the inconveniencies of yoking cattle in pairs, but also with the last-mentioned inconveniency, of yoking cattle in a line. For the foam, by which the foremost cattle draw, is fixed to the yoke of the hindmost pair. Their yoke being higher than the beam, a great weight is laid upon their necks by the drawing of the foremost cattle. This inconveniency may be removed, and the oxen yoked in such a manner, as to give two directions to the plough, as is done when horses are yoked in pairs; by which the draught will likewise be made stronger. To do this, the foam of the pair immediately before the hindmost must be fixed, not to their yoke, but to the beam; and, to prevent this foam from incommoding the hindmost in turning a link must be fixed to their yoke for it to pass through, the link long enough to allow the foam to be fully stretched. When there are more than two pair in the plough; as is most common, the largest-sized cattle should be placed next the plough, and the smallest-sized immediately before them. For the lower that the yoke of these last is placed, the nearer will the direction of their foam be to the foam of those before them; and thereby the less weight laid upon their necks. This method of placing the cattle is contrary to the ordinary way: for it may be observed that the smallest-sized oxen are always placed next to the plough. But these different ways of placing the cattle are both founded upon the same reason: for the smallest-sized oxen are placed next the plough in the

ordinary way of yoking, that to their yoke, to which the foam of the pair before them is fixed, may be as low as possible: for the lower that it is placed, the nearer the directions of the two foams approach each other, and the less weight is laid upon the necks of the hindmost pair. And, for the same reason, the lowest-sized oxen should be placed in the middle, when yoked in the manner proposed, that so they be less incommoded by the pair before them.

If, in considering the most proper method of yoking cattle in ploughs, we had nothing in view but the strength of the draught, and conveniency of the cattle, we would always recommend the yoking the cattle in such a way, as to apply two forces to the plough in different directions. But as we must also have in our view the going of the plough, hence it becomes necessary to observe, that sometimes it is an advantage to have the draught of the whole cattle in the same direction.

In ploughing sea, where the sward is tough, or any kind of land, where there are interruptions from roots or the hardness of the bottom, the plough, if two forces are applied to it in different directions, goes very unsteadily, sometimes too deep, and at other times too shallow, and is very difficult to manage. The reason is obvious: when the plough meets with such interruptions, as tend to make it go deeper, or shallower, than its ordinary way of going; if at the same time, the force that acts contrary to the interruption ceases, then the plough, in spite of all the attention of the ploughman, will either start out of the ground or go in too deep, according to the tendency of the interruption. But when there is only one force acting upon the plough, it is, in some respect, like the wheeled plough; it goes steadily and at a certain depth; at last, it is not so difficult to manage it, as when there are two forces acting in different directions: for though some of the cattle at the time when the interruption is given, should cease to draw, yet the draught continues still in the same direction, and the ploughman has only the alteration occasioned by the interruption, to rectify. Every person knows, that an ox-plough goes much more steadily than a horse-plough: and this is occasioned, not only by the nature of the animals, oxen being more steady in drawing than horses, but also by the manner of yoking them, oxen being yoked in such a manner, as that one force only is applied to the plough.

Thus it appears, that no absolute determination can be given, which of these two ways of yoking cattle in ploughs is to be preferred. Men must weigh the advantages and disadvantages attending each way, and determine according to circumstances. If the land is of a kind not easily ploughed, the cattle not well trained, and the ploughmen not expert, the work will be best performed, if there is only one force applied to the plough. But if the land is easily ploughed, that is has few things in it to incommode the plough in going; if the cattle are well trained, and the ploughman expert, the work will be well enough performed, and the labour less severe upon the cattle, if two forces are applied to the plough in different directions.

Yoke of land, the quantity of land which a yoke of oxen might plough in a day.